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# From The Editor's desk

*The prolonged period of pandemic and resultant 'work from home ' has not only changed the teaching –learning methods and environment but also has made an impact on research activities. However, the researchers have continued their researches adapting methodologies appropriate for the present conditions and imposed limitations. The use of internet has been increased as a medium of data collection. Some researches have been carried out regarding impact of COVID-19 on various aspects of life of people. A few of them have found place in the present issue of the journal.*

*Increased number of research papers submitted for publication in The Indian Journal of Home Science is highly appreciated and is very encouraging.*

*Stay safe,*

***Prof. Maneesha Shukul***

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# AURANGABAD ARCHITECTURE, A DESIGN INSPIRATION FOR HIMROO TEXTILES

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## ABSTRACT

India is one of the oldest civilizations, with the most diverse cultural history inhabited by multiple races, religions, languages and architectural creations. India has a varied mix of monuments, baroques and modernistic buildings. Each transition or inclusion of new culture has created an impact on Indian architecture. Also, out of the 830 World Heritage Sites listed by UNESCO, 26 of them are from India. The architecture and textiles of India have simultaneously developed though different ages, hence there might be an impact of architecture on the textiles of the same area. This article discusses the influence of architecture of Aurangabad on *Himroo* textile that originated in the same area.

**Key words:** Ajanta Caves, Ellora caves, *Himroo*, Bibi-ka-Makhbara, Indo-Islamic architecture

## INTRODUCTION

Architecture and Textiles both require planning, designing and constructing for its completion. Textile heritage of India is very rich and has developed during the same time period as architecture. They might have influenced each other with respect to designs, materials, rulers of that era, artisans, lifestyle etc. This article focusses on the relationship between architecture and a traditional royal woven fabric known as *Himroo* belonging to Aurangabad, Maharashtra.

Indian architecture, which has evolved through centuries, is the result of socio-economic and geographical conditions. Different types of Indian architectural styles include a mass of expressions over space and time, transformed by the forces of history considered unique to India. As a result of vast diversities, a vast range of architectural specimens have evolved, retaining a certain amount of continuity across history.

Though the cities of Indus Valley provide substantial evidence of extensive town planning, the beginnings of Indian architecture can be traced back to the advent of Buddhism in India. It was in this period that a large number of magnificent buildings came up. Some of the highlights of Buddhist art and architecture are the Great Stupa at Sanchi and the rock-cut caves at Ajanta (Qureshi D).

Another most significant part of Indian cultural history is Textile and costumes. India has one of the finest textile traditions in the world with respect to dyeing, weaving and surface embellishment. The richness of its crafts is evident in the excavated findings of Harappa and Mohenjo-Daro in the Indus Valley, which can be dated back to 5000 years. Indian textile history has been layered and enriched by nuances of migratory weavers, foreign invasions and religious influences. The wide range of design and weave, specific to the region of their origin, are masterpieces enhanced by the skills of

the particular craftsmen and their tradition. The crafts thrived on the exploration and ingenuity of the craftspeople and their knowledge of locally available material (CBSE).

*Himroo* is one of the traditionally woven brocaded fabric belonging to Aurangabad and forms the main subject for this study. It is a fabric of intricate weave with a cotton warp and silk as weft. *Himroo* fabrics were known for its superior brightness and elegance. *Himroo* had reached the pinnacle of prosperity and has tried to survive till this day in spite of depression and keen competition from power looms. It has flourished, evolved and declined with time.

## OBJECTIVE

The objective for this paper was to find the influence of architecture of Aurangabad on the woven craft of *Himroo* which also originated in Aurangabad.

## METHODOLOGY

While reviewing the literature it was found that *Himroo* was a lesser known woven craft and very few literary sources mentioned this unique craft in depth. It was also found that none of the sources have mentioned the inspiration and significance of the designs and motifs of *Himroo*. Hence, this study was done to gather more information about *Himroo* motifs and the inspiration behind these patterns. Since architecture is Aurangabad's forte, it was explored for this purpose.

Several monuments and historically popular sites were visited for the same purpose. Data was collected mainly in photographic form to bring out clarity in the motifs used in both architecture and *Himroo* textiles. Museums and private collections were studied to fine traditional *Himroo* patterns. This field work and literature survey took place in Aurangabad, Hyderabad and New Delhi.

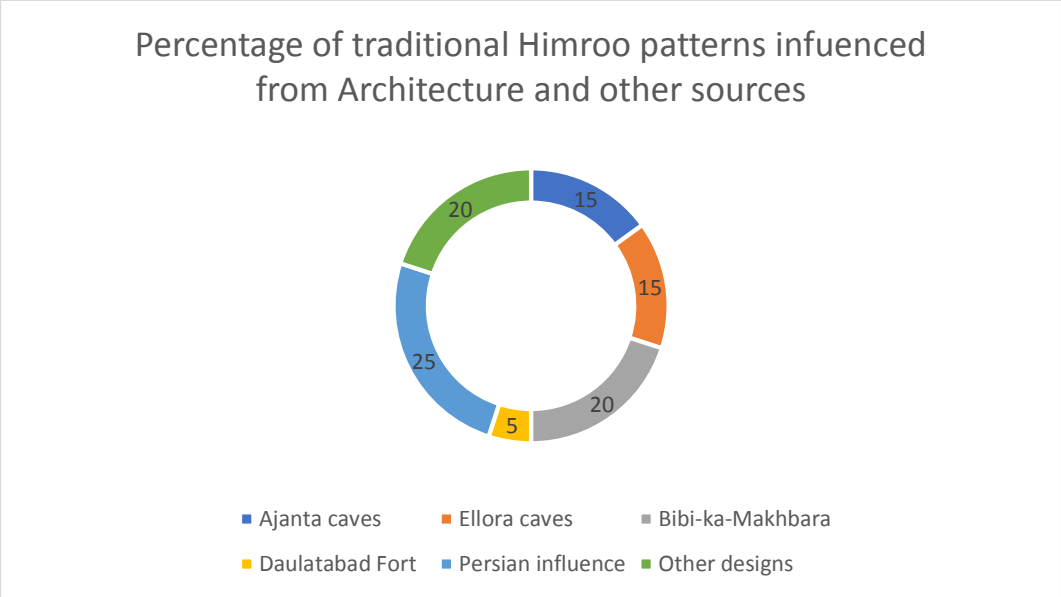
Monuments visited were from Aurangabad, as it was the place of origin of the craft of *Himroo*. All popular historic places were visited to find evidence to fulfil the objective stated. The monuments visited were:

- Ajanta Caves
- Ellora Caves
- Aurangabad Caves
- Daulatabad Fort
- Bibi-ka-Makhbara
- Panchaki

The data regarding the influence of architecture was found mainly from Ajanta caves, Ellora caves, Bibi-ka Makhbara and Daulatabad Fort. Hence these monuments were revisited for collection of data.

Traditional *Himroo* design were collected from museums, private collections and secondary sources like books, e-books, journals and articles related to the topic of research. Several local handicraft shops of Aurangabad were also visited to collect as many *Himroo* designs as possible. A total of more than five hundred designs were collected and studied in terms of inspiration, colours, stylisation and significance.

It was found that most of the traditional designs were architecturally inspired and woven with slight design modifications as *Himroo* patterns. The findings are in form of photographs, which was considered a good source from comparison of textile pictures and architectural pattern comparison.




## FINDINGS

### Indian Architectural Styles

India has seen a plethora of architectural styles which developed throughout its history. The **cave architecture** in India is believed to have begun in the third century BC. These caves were used by Buddhist and Jain monks as places of worship and residence. Initially the caves were excavated in the western India. Some examples of this type of cave structure are Chaityas and Viharas of Buddhists.

Aurangabad is a classic example of architectural diversity. It combines the various types of architecture as well as textiles. This paper analyses the ornamentation of *Himroo* textiles and study the architecture of Aurangabad as an inspiration to the designs and motifs woven in *Himroo*. Though Aurangabad is known as the city of gates, the most significant architecture of the city involves Ajanta caves, Ellora caves, Aurangabad caves, Daulatabad fort and Bibi-ka-Makhbara, a visit was made to each one of these creations to find similarities between textiles and architecture of this historic city.

Aurangabad is a destination steeped in a rich historical past. The city is immersed in the most spectacular heritage monuments dotted in ever lane, but the world heritage monuments like Ajanta and Ellora have ellipse these lesser known memorials. The town has inherited a rich historical and cultural past inclusive of architecture, sculpture, paintings, fine fabrics (*Paithani* and *Himroo*), music and exotic cuisines.

**Design inspiration for *Himroo* textiles: Aurangabad Architecture**

The **Ajanta Caves** (Fig.1) were built in a period when both the Buddha and the Hindu gods were simultaneously revered in Indian culture. It is known for its paintings and carvings which are an inspiration to many crafts of our heritage. The 30 caves at Ajanta lie to the north of Aurangabad in the Indhyadri range of Western Ghats. The caves, famous for many delicately drawn murals, are located in a 76 m high, horseshoe-shaped escarpment overlooking the *Waghora* River.

**Fig.1. Ajanta Caves**

Paintings from Ajanta Cave no. 1 and 2 and carving from 26 reflect as a major inspiration on a local woven textile craft called *Himroo*. It is a unique woven craft with cotton warp and silk weft.

**Fig.2. Ajanta cave no. 2**

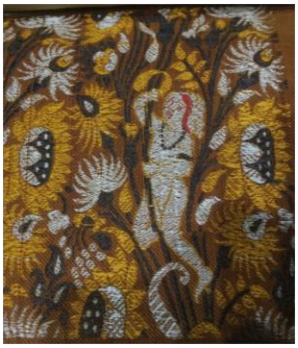


**Fig.3. 35-40-year-old *Himroo* Design**

This pattern of *Himroo* is known as the Ajanta motif, lady climbing a tree (Fig.2.). These is lot of similarity seen between the painting in Ajanta cave no.2 and an old *Himroo* woven piece (Fig.3) in the types and position of the flowers especially lotus and the way of lady climbing a vine with one leg forward and holding a branch with one hand.

**Fig.4. Ajanta cave no. 1**

The above design is known as Ajanta Lotus (Fig.4). The similarity in the shape if the vine, placement of lotus flower, stylisation of semi opened flowers, lotus stem and peacocks in between in remarkable. Also, all the elements were quite proportionate to each other.

**Fig.5. Ajanta cave no. 1**

This is a flower vine seen on the ceiling of Ajanta cave no.1 (Fig.5), which is similar to a contemporary *Himroo* shawl design. The stylisation and placement of small and different flowers on a single vine with curled up leaves is seen in both. Also, the size of elements in both, painting and the fabric was almost similar to each other.

**Fig.6 Ajanta cave no. 2**

The above image from Ajanta cave no.2 (Fig.6) has inspired the craftsperson to weave this design. Stylisation of lotus, fully opened last row petals and semi opened lotus, with lotus leaf on the side can be very clearly seen in both.

**Fig.7 Ajanta cave no. 2**

This image is also of a lotus flower painted in Ajanta cave no. 2 (Fig.7), which is similar to a traditional *Himroo* design. It comprises of a full bloomed lotus with lotus bids and few other flowers on each side. Both of them are quite proportionate to each other and the placement of elements is very similar, even the direction the lotus and buds is the same in both.

**Fig.8 Ajanta cave no. 26**

The above image (Fig.8) is from a Buddhist cave in Ajanta, which has inspired the style and pattern of this bunch of flower and buds, entangled in one another.

**Fig.9 Ajanta carvings**

Ajanta caves display lots of stylization of lotus flower in its pillars and ceilings which is also a significant motif of *Himroo* (Fig.9)

## Ellora Caves:

Most of the **rock-cut** structures were related to various religious communities. India has more than 1,500 known rock-cut structures and many of these structures contain artworks which are of global importance, and most are festooned with wonderful stone carvings. Initially, remarkable Buddhist and Jain monuments were produced in Bihar and Maharashtra.

**Fig.10 Ellora Caves**

**Ellora caves** consist of Buddhist, Hindu and Jain cave temples built between the 6th and 10th centuries AD near the ancient Indian village of Ellora (Fig.10). Ellora consists of 34 magnificent rock cut temples. Ellora is a World Heritage Site and the most visited ancient monument in Maharashtra State.

The Ellora Caves were built at time when Buddhism was declining in India and Hinduism was beginning to reassert itself. The Brahmanical movement was especially powerful under the patronage of the Chalukya and Rashtrakuta kings, who oversaw most of the work at Ellora - including the magnificent Kailasa Temple built in the 700s (Fig.11).

The last period of building activity took place in the 10th century, when the local rulers switched allegiance from Shaivism (Hinduism devoted to Shiva) to the Digambara sect of Jainism. Ellora caves are popular for intricate carvings, delicate patterns and also religious forms and figures.

**Fig.11 *Kailasa*, Ellora**

Ellora is known for its magnificent carvings especially animal and human figures.

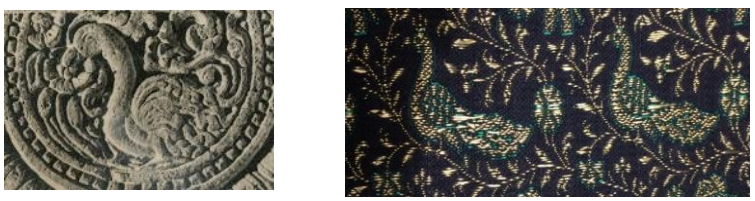


**Fig.12 Ellora cave no.16**

This image is from Ellora cave no. 16 (Fig.12, it has peacock carved on its pillars, with some leafy vines. The design weaved in *Himroo* is influenced from this carving, the peacock is sitting peacefully without its feathers spread, and is surrounded by stems and leaves. Both images have a side view of the elements. Peacock is an important part of *Himroo* textiles as well.

**Fig.13 Ellora cave no.**

**Fig.14 *Himoo* motifs**

The above carving is from Ellora cave no. 15 (Fig.13), which inspires the design of paired birds in *Himroo* (Fig.14). Two birds sitting together and crossing each other is the main element of this design. Both of them have a front view and are quite proportionate to each other.

**Fig.15 Ellora cave no. 16**

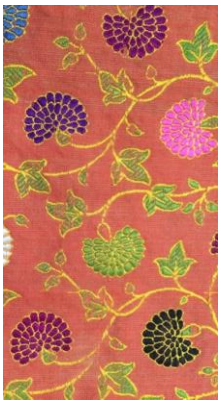


**Fig.16 Bibi-ka-Makhbara**

This design is a floral design, with semi-circular shaped flowers twined with leaves and stems. This design does have a Persian touch in it, but is also resembles a pillar carving from Ellora and the door pattern of Bibi-Ka-Makhbara (Fig.15,16).

Fig.17 Ellora cave no. 10

The image above shows a pillar in Ellora cave no. 10 with diagonal lines and small floral motifs places between the lines (Fig.10). A similar design is also seen in *Himroo* fabric which was earlier used in furnishing.

With the coming of the Muslim rulers, there developed a new architectural style in India- the **Indo-Islamic architecture** (Qureshi D). The Indo-Islamic style was neither strictly Islamic nor strictly Hindu. The architecture of the medieval period can be divided into two main categories. They are the Delhi or the Imperial Style and the Mughal Architecture. The Mughal architectural style is a unique blend of Islamic, Persian and Indian styles. Starting from the 16$^{th}$ century until the early 18th century, Mughal architecture flourished largely in the Indian subcontinent. During this era, India was ruled by the Mughal's and different rulers built some of the finest structures in the country like Humayun's Tomb, Akbar's Tomb, Fatehpur Sikri, Red Fort at Delhi, Jami Masjid Delhi and the Taj Mahal at Agra (Fig.18). The development of Muslim Style of Architecture of this period can be called the Indo-Islamic Architecture or the Indian Architecture influenced by Islamic Art.

**Fig.18 Taj Mahal**

It was followed by a new style of architecture that developed as a result of colonization of India. This style of architecture came to be called as Indo-Saracenic. **The Indo-Saracenic architecture** combined the features of Hindu, Islamic and western elements. The colonial architecture exhibited itself through institutional, civic and utilitarian buildings such as post offices, railway stations, rest

houses and government buildings. Indo Saracenic architecture is the brilliant architectural engineering movement by the British architects. This style is a fusion of Indian architecture and Indo-Islamic architecture. It is also known as Indo-Gothic, Mughal-Gothic, Hindu-Gothic and Neo-Mughal architecture. This form of architecture absorbs exotic elements from the Indian Architecture and native Indo-Islamic architecture.

**Bibi-Ka-Makhbara** an example of Indo-Islamic Architecture, was created in memory of the Mughal emperor Aurangzeb's wife, Dilras Banu Begum, popularly known as Begum or Bibi (wife). Dilras Banu Begum was given the title of Rabia-ud-Daurraini ('the modern-day Rabia'). The title refers to Rabia Basra (in Iraq), a generous lady who was known for her pious and kindhearted nature.Aurangzeb's son built this monument in 1679 AD in memory of his mother Rabia-Daurraini. (Sahapedia). This historic monument is also a replica of the Taj mahal and hence has beautiful floral carvings in its walls which has an influence on *Himroo* designs.

**Fig. 19 Bibi-Ka-Makhbara**

Bibi-Ka-Makhbara is a classic landmark and is a must in Aurangabad's tourism (Fig.19). It has lots of carvings which has a major influence on *Himroo* textiles.

**Fig.20 Bibi-ka-Makhbara**


**Fig.21 Bibi-ka-Makhbara**

In this image the main element is the placement of small floral designs in ogee pattern. This pattern is seen on the ceiling of Bibi-ka-Makhbara (Fig.20,21). In *Himroo*, the design inside the ogee pattern is quite intricate and also has a Persian influence.

**Fig.22 Bibi-ka-Makhbara**

This image shows stone carving in the wall of Bibi-ka-Makhbara (Fig.22) that has a S-shapes floral vine with various flowers and leaves. A very similar pattern is seen in an old *Himroo* Sherwani seen in Salarjung Museum, Hyderabad.


**Fig.23 Balcony pattern in Bibi-ka-Makhbara**


**Fig.24 Pillar in Bibi-ka-Makhbara**

Geometric patterns in *Himroo* are very rare. Some old patterns seen in *Himroo* are found to have inspiration from Bibi-ka-Makhbara (Fig.23,24). Zig-Zag lines and small plus signs were the most common geometric patterns seen in *Himroo*. Also, the placement of the plus sign is alternate in both.

**Fig.25 Bibi-ka-Makhbara**

This *Himroo* Pattern is known as *Sia-Jangla*, it combines two different patterns inspired from the carvings of Bibi-Ka-Makhbara (Fig.25). One row of design follows a small flowering plant with a single flower with buds and second row follows a ogee pattern with small intricate floral designs. This is a very traditional pattern and was mainly used in furnishings.

**Fig.26 Bibi-ka-Makhbara** **Fig 27 *Guldasta***

The above image shows very traditional *Himroo* Pattern Known as *Guldasta* (bouquet) (Fig.27) inspired from Bibi-ka-Makhbara (Fig.26). The shape of the flowers, delicate branches with small leaves and buds and the placement in both can be observed.

**Fig.28 Bibi-ka-Makhbara**

This image (Fig.28) shows a very symmetrical arrangement of a flowering plant. The stylisation of flower and shape of the leaves, slightly dropping in both is similar and a front view is observed in both.

**Daulatabad fort** was once known as Devagiri, is a magnificent 12th century fortress standing at top of a hill. Daulatabad, which is constructed with excellent architecture, is one of the few invincible forts in Maharashtra. Mohammed Bin Tughluq, the sultan of Delhi gave the name Daulatabad 'The city of fortune'. Series of trick defence and secret escapes routes are the famous features of this fort.

**Fig.29 Daulatabad Fort**

**Fig.30 Daulatabad**

The above image is of a rock carved elephant from Daulatabad Fort (Fig 29,30), the decorations on the head and back of the elephant, the side view is also seen in *Himroo* Designs.

**Fig 31 *Ambi* in *Himroo***

***Ambi*** is the most common design found in *Himroo*. Traditionally and presently, most of the *Himroo* shawls have an *ambi* pattern in them. *Ambi* motifs have a Persian influence and are rarely found in the architecture of Aurangabad. Various sizes of *ambi* are seen in *Himroo* like elongates, small, combined with flowers, placed inside certain patterns etc. (Fig 31).

## CONCLUSION

The influence of architecture on various traditional *Himroo* patterns can be seen through this primary data collected from various architectural sites in Aurangabad and museums, libraries etc. to study traditional *Himroo* patterns. Similarities in Design, placement, shape of the motifs, proportion, view can be clearly observed through the pictures collected. *Himroo* textile does have an architectural influence amalgamated with Persian impact. A lot of traditional *Himroo* pieces were observed and studied in depth in terms of motifs, stylisation, colours and combination of variety of motifs. While studying the influences and history of *Himroo*, architecture came out as a major influencer. Most of

the motifs found in *Himroo* textiles have an architectural influence with a touch of Persian stylisation which brings out the intricacy in motifs and uniqueness in designs.

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# RESURGENCE OF LOST TECHNIQUE: AN APPROACH FOR DESIGN INNOVATION IN MASHRU TEXTILES

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## ABSTRACT

India is very well versed and consecrated with art and craft. Its credit goes to the artisans whose craftsmanship and dedication has filled every region with beautiful products since long back. Textile artisans play a major role in crafting such diverse range of products. Their ability to absorb, assimilate and reflect new ideas based on surrounding and need had been appreciable. With the commencement of millennium, craft sector has undergone huge transformation, affecting the relation between artisan and consumer, curtailing in-between interaction and reducing its demand. Change in occupation and lifestyle of people has brought change in nature of product in demand which needs to be addressed. Gujarati craftsmen have adapted well in respect of this change, many of its crafts have got good exposure and recognition. Designers too have played very crucial role in encouraging crafts of Gujarat. However, after so much of efforts few crafts are still lagging behind; Mashru is one of such least explored craft of the state. It is a languishing craft which needs to be revived. Previously being woven in several techniques and pattern is limited to few at present. Taking this account into consideration this study was undertaken. The major objectives of this study were to understand historicity of cotton Mashru and its brocade technique. Also, to use those lost material and technique for design innovation of such products that can be targeted to contemporary users. For this, extensive secondary and primary studies followed by skill mapping of artisan were done. Revival of lost material &techniques as basis for design innovation in Mashru can be found useful in re-establishing its grandeur, in setting broader visual aesthetics, in offering wider product techniques, category and most important in boosting livelihood of artisans.

**Keywords:** Brocade, Cotton, Innovation, lost technique, Mashru

## INTRODUCTION

Crafts, consumption and its making process interweave all purviews of the society: social, political, economic, cultural, ritual, ecological and emotional. Placed in the post digital era, the need of handlooms and handicrafts has necessitated again. The significance of human touch has been realized, possibly this has led to the rise of crafted products, craft based tag lines in all sphere of life whether it is food, cloth, construction, cosmetics or recreation. Researches had been done to revive lost process, raw material, tools and techniques to re-establish a responsible production and consumption ecosystem. In this transitional phase collective effort and its acceptance at wider level is very crucial for the progress of communities involved in it. India had been admired globally for its gigantic and rich cultural products. Somehow in due course of its journey towards industrialization and liberalization certain products and techniques were lost or left behind. This period is very encouraging to re-establish such product, process and system again which can help in growing shared operation, function and growth in holistic manner encompassing all the purviews of society.

Gujarat is amongst the profoundly known centers for art &craft of western India. It's a land rich in creative energies since ages whose history can be traced long back to Indus Valley Civilization of the region. This ancestral exalt can be deeply observed today also. Textiles advocate a foremost role in creating such identity. It can further be intensified by bringing its left crafts in the mainstream of socioeconomic facet. *Mashru* is a handloom craft practiced mainly in Patan and Kutch regions of Gujarat which needs to be connected with aforesaid proclamation. Once flourished throughout the country, at present it is limited to few centers of this state. Mashru has been mainly documented as union fabric of silk and cotton in satin weave where silk comprises warp and cotton as weft (Ali, 1900; Watt, 1903; Elese, 1988; Kacker, 1994; Hatanka, 1996 & Crill, 1998). The exquisiteness and ingenuity of the fabric lies in its material play where warp-silk faces the outside world and weft-cotton below it touches the wearer, transacting glossy appeal and enabling inner surface to be breathable. However, from few records it had been found that historically *Mashru* had also been made in cotton with satin or plain weave with supplementary warp/weft in contradiction to most of the documents of *Mashru*. This study was an attempt to understand historicity of cotton and brocade techniques in Mashru & to revive those lost material and technique for design innovation. The study was limited to Patan and Kutch regions of Gujarat. Design innovation through revival of lost techniques and materials gives huge scope in recharging limited product category, technique, and its promotion, in motivating interest among artisans as well as in disseminating its information.

## METHODOLOGY

This was an exploratory cum experimental study. Here researcher had made an attempt to explore the possibilities of *Mashru* textiles from designer's perspective through re-establishing lost material and technique. Exploratory method was used to discover the historicity of cotton and brocade techniques in *Mashru* fabric through detailed study of primary and secondary sources. Experimental method was adopted for design innovation by varying usual reed-pick, fabric weight and re-introducing cotton material and brocade technique of *Mashru* weaving. After understanding of material and technique the study was executed in collaboration with a young weaver Harish Hemraj Manodia of Bhujodi village of Kutch. He has been practicing weaving since past 15 years. He is a traditional weaver of *Dhabla* shawl whereas after observing his interest and skill, he was found apt for this study. Although there were few traditional *Mashru* weavers in Patan as well as Kutch who were practicing Mashru weaving since long but extra warp/ weft technique has been dropped long back by them. At present no one among *Mashru* weavers in either centers have ever used supplementary warp and weft technique. They had been weaving *Mashru* only in stripes except few dot designs. Therefore, it has restricted researcher to select any *Mashru* weaver for this study. *Mashru* in the region of Patan and Kutch had been traditionally done in eight and seven shafts whereas Kutchi weaving is mainly done in four shafts. Therefore, after analyzing the infrastructure of many weavers, discussing the exploration with them and mapping their skill, Harish Hemraj Manodia (Harish Bhai) was selected for the execution of the study. To re-establish the technique suitable changes in reed, pick, and number of threads in weave repeat were done for product development.

## RESULT AND DISCUSSION

### Exploring the historicity of cotton *Mashru*

To understand the material and technique of *Mashru* it is important to understand its origin. Mashru was among those Indian textiles which were premeditated with some symbolic meaning to fulfill specific needs. It was conceived to offer courtly clothes to conformist Muslim men who assumed pure silk ostentatious to wear. The blend of silk with cotton made it modest for them to wear (Elese, 1988). Mashru literally means 'permitted', and pure silk fabric can be only used in exceptional cases like war or in the form of narrow borders. This belief gave rise to several exceptionally attractive silk and cotton mixed textiles throughout the country (Watt, 1903). *Mashru* is a Persian word which means cleverly woven, a term pragmatic to display the adroitness of fabric where cotton weft is entirely covered with silk warp (Kacker, 1994). *Mashru* is such a fabric where vast degree of diversity and specialization can be observed. It is multi niche fabric encircling satin weave, brocade and ikat technique in silk, cotton, silver and gold yarn. This reflects the outstanding talent of artisans to work within restrictions of pre-industrial knowhow.

According to Watt (1903), for Delhi Exhibition objectively cautious examination was done for *Mashru* fabrics. A tie-dyed significant cotton Mashru fabric from Chamba state was selected. He further describes that it was patterned with alternate bands of cotton and gold thread where cotton were resist dyed to create wave design in dark red within the cotton strips. This evidence reflects that earlier *Mashru* has been made in pure cotton augmented with gold and Ikat. Mukund (1992) stated that during seventeenth and eighteenth century textile industry; especially cotton was very developed in context of distinct specialties, product distinction and techniques. Among different stripe and chequered fabrics woven on loom, he has given example of *alachas.* This description too indicates about *Mashru* (*alachas*- a *Mashru* variety) being made in cotton. Although silken fabrics were forbidden to wear to males as per Islamic law, then also it was widely used during festivals by prosperous section of people. From the take of climate, silk fabrics were not suitable for maximum part of our country (Naqvi,1983).This account gives insight of possibility of use of more of cotton material based on climatic requirement of the region. In addition to it, Naqvi has also presented a table listing fifty eight varieties of silken fabrics referred from several Persian sources, where it was mentioned that the distinction of silk and cotton material in each variety were not indicated always. "For example *aljah*, *cheerah* or *narima* could both be cotton or silken, could have been silken at one point of time or place, or cotton or mixed at another point of time or place". In aforesaid description *Aljah* resembles '*Alacha, Alleja, Allegais, Elatches: Turkialcha, alacha* which is a variety of *Mashru* (Irwin, 1996). After analyzing previous descriptions given by Naqvi and Irwin it can be assumed that today's generalized term *Mashru* earlier possibly contained wide gamut of fabrics including variety of material either used individually or in combination like cotton, cotton silk or silk. Hence it also validates *Mashru* being made in pure cotton. After sixteenth century, admixtures of silk and cotton became more common due to decline of influx of silk because of ban on export of silk by Persia. Hence, several variations of fabric which were initially of pure silk like '*alijah, cheera* for *dastars* (turbans) or *mindil* formerly implicated cotton appeal (Naqvi, 1983). This description highlights the possibility that in the succeeding centuries *Mashru* might had lost its silken appeal somewhere and had adopted cotton character.

During an interview with a master weaver cum trader (Fig.-1) of Patan who belonged to traditional *Mashru* weaver family brought a new perspective behind nomenclature of *Mashru*. He told *Mashru* means a fabric made of mercerized cotton. Cotton is an indigenous fiber crop of Gujarat which is known as *rooi* in Hindi and is *rooh* (soul) of Gujarat, a staple fiber of Gujarat and mas refers mercerized. Therefore, its name is *Mashru*. Earlier both warp and weft were of cotton, in course of its journey cotton warp were replaced by silk.

**Fig.-1 Master Weaver/Trader of Patan describing meaning of *Mashru***

However, according to recent records in *Mashru*, it is found that silk warp was replaced by cotton in Kutch whereas with rayon in Patan; which seems to be partially correct. One of such record states that 'artificial silk has now replaced genuine silk for the warp threads, & in Mandvi a satin weave cloth is made in imitation of *Mashru* with cotton for warps and wefts' (Crill, 1998). Somehow, this view of genuine or imitation cannot be generalized as cotton *Mashru* weaving had existed long back. Historically also, cotton had been yarn of Indian origin characterizing Indianess. In due course of journey, *Mashru* might have changed its material character owing to political scenario and availability of raw materials. So, *Mashru* had been made in pure cotton or as admixture of silk and cotton.

**Exploring the historicity of brocade technique in *Mashru***

*Mashru* had been mainly documented to be made in satin weave in stripes. However, supplementary warp- weft also known as brocade technique in addition to satin had been widely used for decorative purpose in past. Its connection with brocade variety is hardly noticeable. In an account given by Elese (1988), it was given that in comparison to Benares pure silk brocade; *Himroo* is of inferior quality. *Himroo* comprises of cotton warp and silk in weft. *Mashru* is also a variety similar to *Himroo* where silk lies in warp and cotton in weft but is finer in quality. Therefore, after analyzing above description it can be assumed that *Mashru* is also a brocade variety.

In the book titled "Textile Arts of India", *Mashru* cloth piece or fragment description has been presented with possible place of association, period, size, yarn type in warp, weft and weave type. In description of those fabrics (Fig.-2) abundance presence of supplementary warp and weft has been observed which justify brocade technique being used in *Mashru* fabric in the past. Although in all the photographs *Mashru* name has not been specified, however on the basis of

visual organization most of them seems to be belonging to *Mashru* clan (Hatanka, 1996). Few of the selected *Mashru* fabric images from the book for reference have been mentioned below:

Fig.-2 Brocade *Mashru* Fabrics (Source: Hatanka, 1996, pp. 251-61)

From above figure it can be analyzed that brocade weave in combination with satin had been broadly used in *Mashru* textiles earlier. It was further analyzed that till 19th century in comparison to 20th century, nature of brocade motifs and patterns were comparatively complex. Overall, the nature of brocade designs used in *Mashru* had been linear, simple, symmetrical and geometric in nature. In addition to it, in few of the presented designs; evidence of *Mashru* made in cotton by cotton in contrast to silk by cotton has also been found.

In Deccan, Thanjavur and Tiruchirappalli had been popular centers for non-*ikat Mashru* (Fig.-3) with gold yarn or completely in pure silk in stripe pattern ornamented with woven arrow head designs. These designs were often considered as 'lighter alternative' to the heavily woven *Mashru* fabric (Crill, 1998). So, on the basis of this description as well as the visual analysis of the below *Mashru* image in context of brocade confirms about *Mashru* being made with brocade technique. This also narrates about remarkable craftsmanship of weavers who developed detailed and intricate brocade motifs similar to Ikat pattern of *Mashru*. In given account Crill also adds the comment of Havell that "the weavers seem to be of northern origin, both from type of features and language, the latter a dialect strongly mixed with Gujarati", indicating the migration of weavers from Gujarat. As the weavers have migrated from Gujarat, possibly brocade *Mashru* must have existed long back in Gujarat.

**Fig.-3 Sample of Stripe Patterned *Mashru*, Tiruchirappalli, Tamil Nadu (Crill, 1998, p.134)**

During field visit to Bhuj, researcher came across few brocade *Mashru* samples (Fig.-5) from the collection of Mr. Wazir (Fig.-4), who is a guide and collector of antique textiles. They were mainly supplementary warp swatches that belonged to 20th century. These evidences justified *Mashru* being made with brocade technique in contemporary past. In these swatches brocade motifs were found to be floral, yet geometrical in nature.

**Fig.-4 Researcher Interviewing Mr.Wazir Fig.-5 Collected Brocade *Mashru* Samples**

## DESIGN INNOVATION

In recent period strategic innovation in design has been judiciously used for strengthening various craft forms. In India craft and design sector share a symbiotic relationship (Kapur & Mittar, 2014). Designer's role is very crucial in bridging the gap between artisan and consumer, in facilitating making of commercially, aesthetically, socially, culturally and emotionally relevant product by optimizing the use of traditional skill for contemporary users. In this process maintaining the stylistic feature of the craft is very imperative. At present Gujarat is the only state producing traditional *Mashru*. Unfortunately, there is hardly any demand for it except few local communities. This consumption is also under threat due to easy availability of power loom imitations. Current design vocabulary is limited to stripes mostly which are easily imitated by power loom. This study enabled researcher in expanding and exploring its technique in such a way that restrict easier power loom imitation of designs as well as can suit contemporary users ensuring traditional design essence. Crill (1998) states that bringing back the quality and material of nineteenth century *Mashru*, its strong positioning in domestics and overseas market can anticipate future to *Mashru*. This vision motivated researcher in looking back into the quality products of *Mashru* developed during nineteenth century and to develop such products. For this, researcher reviewed old *Mashru* designs and tried to understand its features, material and technique.

To develop designs for weaving researcher first selected the product - stole, so that its other specifications can be defined as per the end use. Designs were developed on squared paper between hand and illustrator in creative layout. Cotton raw material was selected for weaving the product. The rationale for selecting cotton was that it's a local and indigenous fiber of the Gujarat state and its historicity with *Mashru* has been traced in previous discussion. For weave; Satin with supplementary weft were selected due to its historicity with *Mashru*. For satin weave suitable changes in ends per repeat were done according to the availability of harness and product function. From primary and secondary study it was established that every region had varying end repeat of satin in *Mashru*. Customarily in Deccani *Mashru* satin weave structure had warp thread floats covering six weft, in Varanasi *Mashru* satin weave structure warp cover three or four wefts, in Gujarati *Mashru* in Patan warp thread float covers seven weft and in Kutch six weft thread. As in weaving to analyze the relation amongst yarn count, reed number and denting in accordance to product function is very important. Therefore, sixty numbered reeds with two yarns per dent order were selected. As the intended product needed to be light weighted that can go with traditional as well as western attire that is why aforesaid specification were taken. Extra weft was chosen specifically with the intension of its resurgence in *Mashru*. Apart from it, while field visit to cluster

and interaction with weavers, it was found that supplementary warp and weft is an obsolete narrative, only used in form of broken lines to separate coloured stripes. Motifs were not made any more with this. Their current loom setup and infrastructure also didn't support extra warp. Therefore, extra weft was selected that can be implemented with existing setup and resource. Again, the other issue was that since it was not into practice by *Mashru* weavers so they were not found proficient for this. For this, skill mapping of artisans in adjacent region was done to find who can execute this. A young weaver Harish Hemraj Manodia was selected for this. Although he was not traditional *Mashru* weaver but he was willing to take this. Earlier specific craft were limited to specific communities while at present it is not so. Today proficiency matters rather than lineage. To re-establish lost technique in *Mashru* and to regain variation and quality in product, researcher found it needful to come over the social barrier of community. Caste or community is just a social situation which were framed earlier for transmitting skills probably when there were no institution; family were the only institution to transmit the knowledge. Today scenario has changed. So, judiciously Harish Bhai was selected for weaving the product. This thought process can help in motivating and developing variable skill set and product variations like fine, medium and coarse under same technique or craft among the weavers.

All the three designs of stole were woven in common bright yellow coloured warp with variation of motif, colour and layout. *Mashru* is known for luster and bright colours. Hence, Yellow colour was selected as satin base with contrast undiluted bright colored motifs. Yellow also comes among the traditional colours (red, yellow, green) of *Mashru*. Colour contrast of motifs helped in visually separating them with its plane. Motifs used were mainly variation of triangle as traditionally mainly geometrical motifs were used in *Mashru* with major emphasis on triangular forms. Designed layouts for products were quite creative in nature and difficult for power loom imitation. In first and second designs; motifs were repeated in asymmetrical pattern yet maintaining order and rhythm whereas in third design it was repeated in contrast of first two- in systematic order defining simplicity in the bright plane. In layout of designs researcher has taken care to incorporate judicious number of motifs in the layout that will be visible during draping as every motif was going to add cost to the product. The change in reed-pick, count of yarn played vitol role in creating light weighted stole which was easy to carry, and care. The product has broken the myth of *Mashru* to be medium to heavy weighted fabric suitable only for, blouses, jackets and furnishing items. The overall concept was to represent the flair of youth in product who are vibrant, energetic and believes in self-expression through their lifestyle with aesthetic sensibility rooted in tradition.

**Fig. 6 Developed Brocade Mashru Fabrics**

## CONCLUSION AND IMPLICATIONS

Historically, *Mashru* weavers had developed diverse products in terms of material, technique and quality. Researcher's experience during the visit to Patan and Kutch *Mashru* weaving centers of Gujarat were that the artisan's firm proficiency in dealing diverse material and technique has

weakened. Weavers are working with few conservative easy-going designs. The beauty of Ikats, brocade in silk and cotton *Mashru* that existed in past was lost. Similar to many other handloom craft that has been revived, this also needs attention to sustain its identity. Artisans too need to be flexible in production process. The collaborative approach between artisan and designer can be a way to re-establish lost material, technique as well as to establish new one. Craft community needs to retort according to manifold needs preserving the rich heritage, generating livelihood, disseminating its knowledge and connecting potential users with them. The crisis of lack of skill had arisen due to lack of transference of skill and knowledge to next generation. The demise of skilled artisan closes the gateway of learning oral and practice-based tradition. This needs documentation of its diverse material and process. Explorations done during this study might be considered non-conformist but it was a way to propagate this craft and encourage its weavers. Harish Bhai also explored this, out of his traditional vocabulary. Of course, his inherent skill has helped him in weaving process. Researcher too had made few changes that helped in meeting the objective of development of *Mashru* designs though resurgence of lapsed material and technique practically possible. Growing mindfulness among craft consumers and connoisseurs about the knowledge, unspoken hardship and cultural connect can bring monetary benefits for weavers and related artisans with interest to continue willingly in flexible manner. This kind of study can be done for documenting, reviving lost techniques and material of other crafts also.

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# A STUDY OF SELECTED CONSOLIDANTS FOR THE CONSERVATION OF VELVET ARTIFACTS

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## ABSTRACT

The historical evidence, extravagance and exquisite craftsmanship of velvets makes them an importance fabric to conserve. With various types of velvets, including plain, voided, embroidered and brocaded velvets, they have always stood apart from the rest of the fabrics. Velvets have been put to use in many ways; from robes to curtains to palanquin covers to fabrics for special occasions, velvets hold a great deal of significance. One problem faced by velvets over the years is the detachment of pile from the surface, resulting in the loss of its characteristic feature. It is thus important to retain the pile of the fabric to maintain its value. The study focuses on addressing the problem of pile detachment commonly seen in historic velvet artifacts and to test the efficacy of three commonly used consolidants in textiles in various combinations to deal with this problem. In textile conservation, among many consolidants, Gelatin, Hydroxypropylmethylcellulose (HPMC) and Klucel G were selected based on the criteria of popularity, feasibility and applicability. Based on the availability of fabric, a suitable pure cotton velvet fabric was selected. The fabric was aged and pre and post ageing properties were evaluated based on tensile strength, abrasion resistance, bending length, whiteness and yellowness indices. The consolidants were then applied in 10 different concentrations, their respective optimum concentration selected, and combinations of optimum concentrations were made and applied on the fabric. Their properties tested based on the aforementioned tests, and a suitable analysis was made. The study revealed that the drawbacks of one consolidant were fulfilled by the others, thus making certain combinations a success. Since the selection of consolidant depends on the condition of the artifact and the type of treatment it requires, more than one combination of consolidants can be considered as optimum.

**Key words**: Textile conservation, velvet, consolidation

## INTRODUCTION

Velvets have gained the position of one of the most luxurious fabrics, owing it to its rich history and complex weaving. With its flamboyant status, velvets were a favourite among the royals and were used in making a variety of products ranging from garments such as robes and gowns to upholstery such as curtains and cushions. Indian velvets were also used by the Kalabiris of Nigeria as a symbol for their various social hierarchical standings and other special occasions of the tribe (Harris, 1993). Silk and cotton velvets were quite popular, with wool velvets being the least manufactured.

Indian museums contain a plethora of velvets. As time passes, being inherently organic in nature, fabrics degenerate. For velvets in particular, major damage faced by the fabric over the

years is the loss of pile. While the ageing of historic textiles cannot be arrested, their life can be prolonged. Pile being the characteristic feature, while conserving velvets, it becomes important to focus on devising methods to retain that pile.

Textile Conservation aims to provide textiles with subjective preventive and interventive treatments to fulfill the aim of prolonging the life of the textile. Consolidation is a process in Textile Conservation which aims at holding together deteriorated and friable fibres, imparting physical strength to the textiles with the use of certain chemicals known as a consolidant. The properties of a consolidant include:-

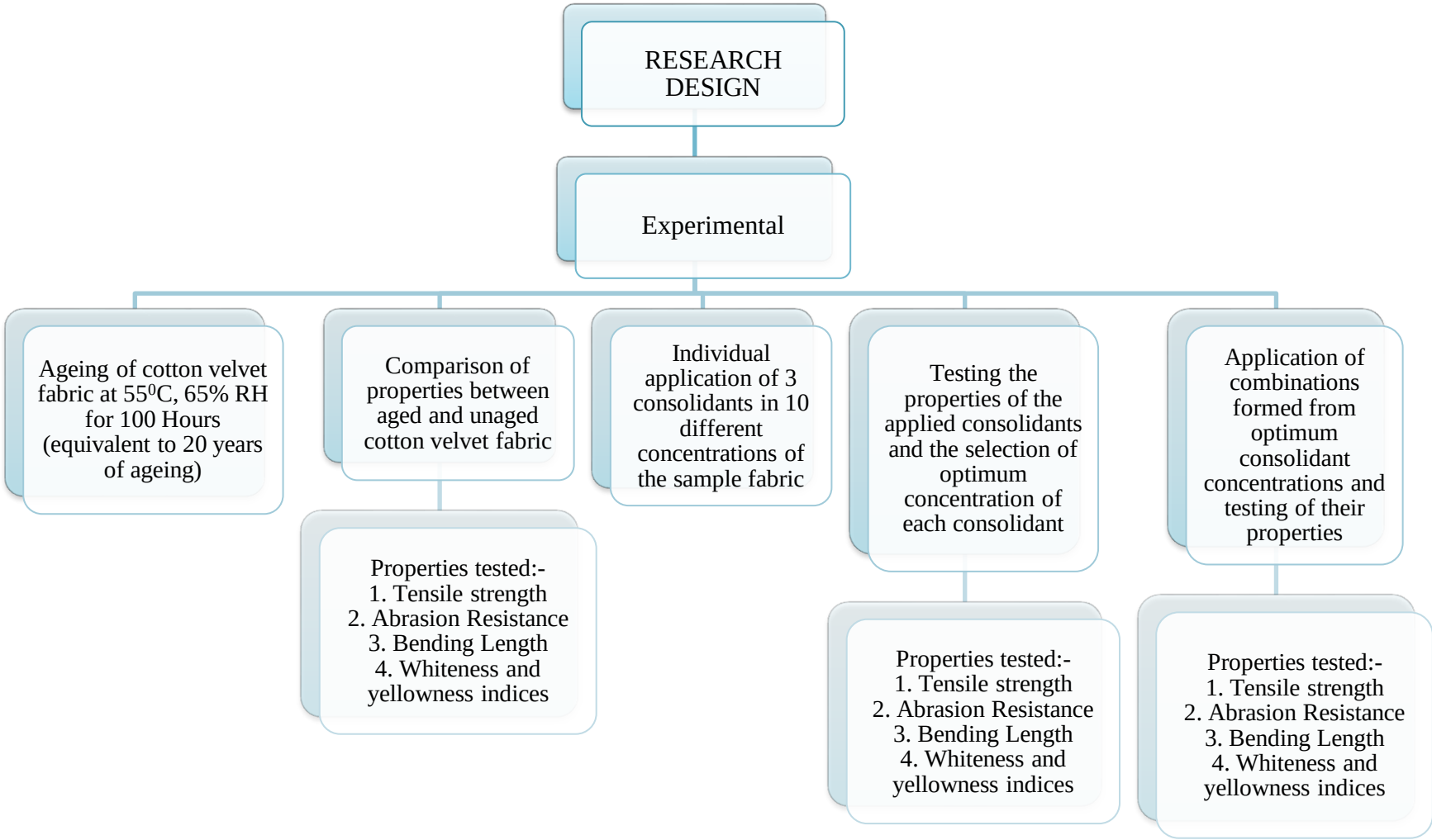
- it must be flexible and retain that flexibility over a period of time
- it should be resoluble
- it should retain its properties upon ageing (Balazsy and Eastop, 1998)

While the use of chemicals on historic textiles is debatable, in some cases it may not be a necessary step, but since textile conservation is an extremely subjective procedure, in some cases consolidation may aid in retaining the characteristic features of a textile.

## OBJECTIVES OF THE STUDY

The study aimed to explore how consolidants can effectively deal with the problem of pile shedding in velvets. Fabrics made in the present day and age are resilient to many factors that may instantly degrade historic textiles; thus, it becomes imperative to age the fabric that is being tested. Keeping in mind the focus of the study, the following objectives were formulated:-

a) To study the effect of ageing on the physical properties of velvet
b) To study the effect of selected consolidants in the conservation of velvet
c) To explore the efficiency of combinations of the selected consolidants


RESEARCH DESIGN
Experimental
Ageing of cotton velvet fabric at 55$^0$C, 65% RH for 100 Hours (equivalent to 20 years of ageing)
Comparison of properties between aged and unaged cotton velvet fabric
Properties tested:-
1. Tensile strength
2. Abrasion Resistance
3. Bending Length
4. Whiteness and yellowness indices
Individual application of 3 consolidants in 10 different concentrations of the sample fabric
Testing the properties of the applied consolidants and the selection of optimum concentration of each consolidant
Properties tested:-
1. Tensile strength
2. Abrasion Resistance
3. Bending Length
4. Whiteness and yellowness indices
Application of combinations formed from optimum consolidant concentrations and testing of their properties
Properties tested:-
1. Tensile strength
2. Abrasion Resistance
3. Bending Length
4. Whiteness and yellowness indices

## MATERIALS AND METHODS

### A) Materials

Fabric

White Cotton velvet, 250 GSM, 20" X 20"

Museum objects mention the use of pure silk and cotton velvet fabrics. Based on availability, white cotton velvet fabric was selected to ensure observation of colour change. The size of the sample was finalized after assessing the amount of fabric required to perform all the tests.

Consolidants

Hydroxypropylmethylcellulose (HPMC), Gelatin and Klucel G

The following 3 consolidants were selected for experimentation based on availability, popularity and recommendation by conservators. 10 concentrations of each of the consolidants were experimented with i.e. 0.1%, 0.2%, 0.3%, 0.4%, 0.5%, 1%, 1.5%, 2%, 2.5% and 3% of volume 100 ml each.

i) Hydroxypropylmethylcellulose (HPMC)

100 ml solution of HPMC contained 30 ml Ethanol and 70 ml deionised water. This ratio is a tried and tested method for optimal dissolution of the chemical, however, this proportion is subjective to the condition of the object.

ii) Gelatin

100 ml solution of Gelatin was prepared by adding deionised hot water to the required amount of Gelatin crystals.

iii) Klucel G

30 ml ethanol, required amount of Klucel G and 70 ml deionised water was used to dissolve the chemical. After 72 hours, solutions of concentrations 1.5% to 3.0% gave a clear solution with a gel like texture.

The solutions were applied on each sample with a brush in a unidirectional manner and to achieve an even coating. A single layer of stroke was given to ensure even application. Since the piles were not shedding off, brush application was possible. Pile did not crush on application.

Taking the optimum concentrations of each consolidant, 12 combinations were formulated, applied on the aged fabric, and tested for the desired properties.

Ageing

The samples laid flat on a grid and aged at $55^0$c, 65% RH for 100 hours which ages the fabric by 20 years (Luxford and Thickett 2011).

### B) Methods

i) Tensile strength

Studying the strength imparted by the consolidant helps to determine the efficacy of the chemical. Percentage elongation along the warp and weft along with the breaking load were analysed.

ii) Abrasion resistance

Abrasion resistance can be used to assess the amount of strength and stability the chemical would provide to the pile of the fabric. One of the main aim is to ensure that the pile of the velvet is retained after consolidation which can be tested via the abrasion resistance tester. A standard of 5000 abrasion cycles was taken to measure the effect of abrasion on the various samples.

iii) Bending length

Shirley's stiffness tester was used to measure the bending length of the fabric
Bending length helped assess the stiffness imparted by the chemical. If excessive stiffness is imparted, it may result in development of cracks and cause the textile to turn brittle.

iv) Whiteness and yellowness indices

Yellowing can drastically alter the appearance of an object which is not a desirable property while conserving any form of object. Although many indices exist for the calculation of these indices, the Hunter 10 deg/65 and the D1295 2 deg/C were used for the calculation of the whiteness and the yellowness indices respectively. A spectrophotometer was used to calculate the indices. (http://www.xrite.com/spectroeye-spectrophotometer/support/kb3691)

## RESULTS AND DISCUSSION

Interviews with museum personnel revealed that velvet was an extremely popular fabric among the royal families of India. Museums hold velvet pieces made of mainly pure silk or pure cotton fabric. Mostly embroidered velvet pieces were seen belonging to the royal kingdoms of India of the 16$^{th}$ century, and include artifacts like furnishings, and men's formal winter wear.

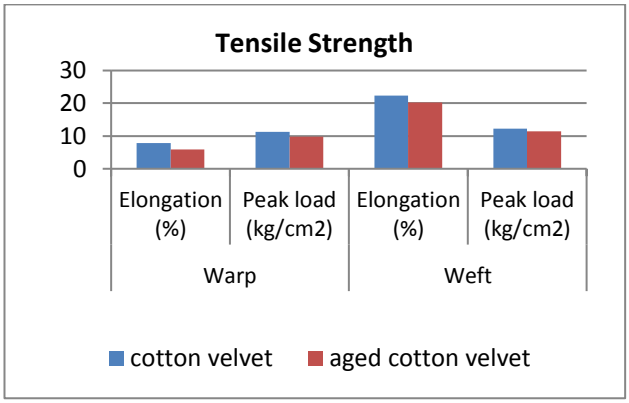
Interview with conservators revealed that no measures are taken to retain the pile. Wherever stitch repair is required, darning is used to stabilize the fabric, or given a lining. No chemicals are used for treatment. Although the museums say that the velvet pieces are of extreme value, no velvet specific method is used in their conservation.

**Impact of ageing on velvets**

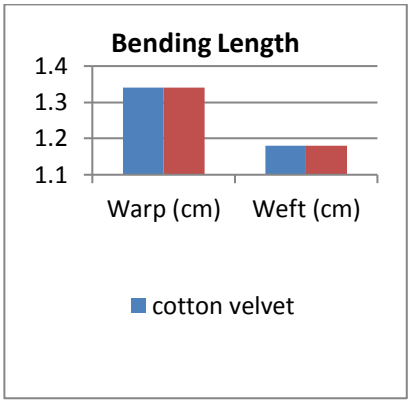
To assess the change in properties, after the ageing of the fabric, tests were performed, and a difference between the pre and post ageing properties were recorded.
The effect of ageing on the aforementioned properties has been given in Table -1. Table -1 and Graphs -1, 2, 3, 4 and 5 show that after ageing, tensile strength lowered, and peak load decreased, indicating the yarns became weaker. An increase in the abrasion validates fibre weakening. There was however no significant effect on the bending length. Ageing also decreased the whiteness of the fabric, and increased the yellowness, however no effect was seen on the bending length. Thus, it can be concluded that ageing has a significant impact on the deterioration of fabric.

**Table -1: Effect of ageing on the tensile strength, abrasion resistance, bending length, whiteness index, yellowness index of white cotton velvet fabric**

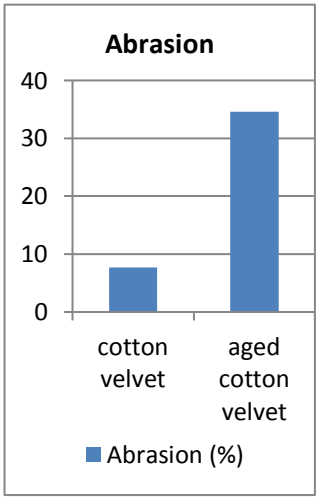
| Sample | Tensile strength | | | | Abrasion (%) | Bending length (cm) | | Whiteness index (Hunter 10deg/D65) | Yellowness index (D1295 2deg/C) |
|---|---|---|---|---|---|---|---|---|---|
| | Warp | | Weft | | | | | | |
| | Elongation (%) | Peak load (kg/cm$^2$) | Elongation (%) | Peak load (kg/cm$^2$) | | Warp | Weft | | |
| cotton velvet | 7.78 | 11.24 | 22.31 | 12.24 | 7.69 | 1.34 | 1.18 | 96.21 | 2.29 |
| aged cotton velvet | 5.89 | 9.86 | 20.23 | 11.44 | 34.61 | 1.34 | 1.18 | 94.05 | 2.89 |



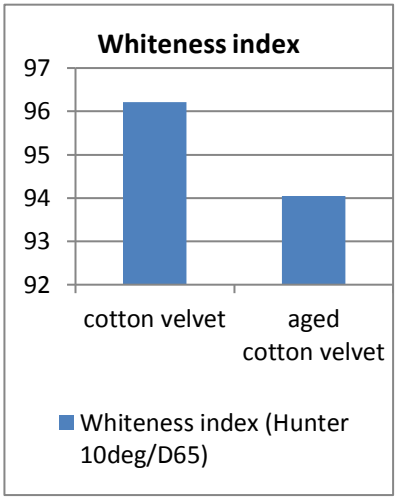

**Graph -1: Effect of ageing on tensile strength**



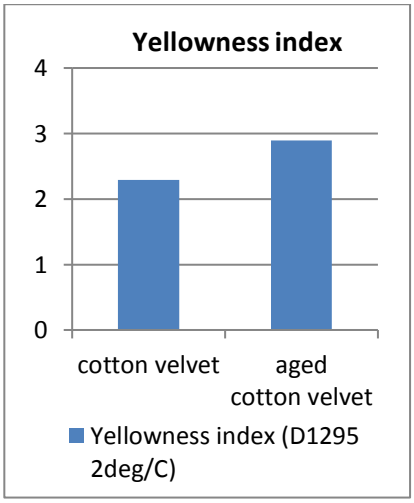

**Graph -2: Effect of ageing on bending length**




**Graph-3: Effect of ageing on abrasion resistance**




**Graph-4: Effect of ageing on whiteness index**




**Graph-5: Effect of ageing on yellowness index**

**Analysis of individual consolidants**

Evaluation of Samples Subjected to Consolidation

**Plate -1- Visual examination and point of change for HPMC, Gelatin, and Klucel G**

| | | | |
|---|---|---|---|
|  |  |  |  |
| (a) HPMC 0.5% | (b) HPMC 1% | (c) Gelatin 0.1% | (d) Gelatin 0.2% |

| | | | |
|---|---|---|---|
|  |  |  |  |
| (e) Gelatin 0.5% | (f) Gelatin 2% | (g) Klucel G 0.1% | (e) Klucel G 3% |

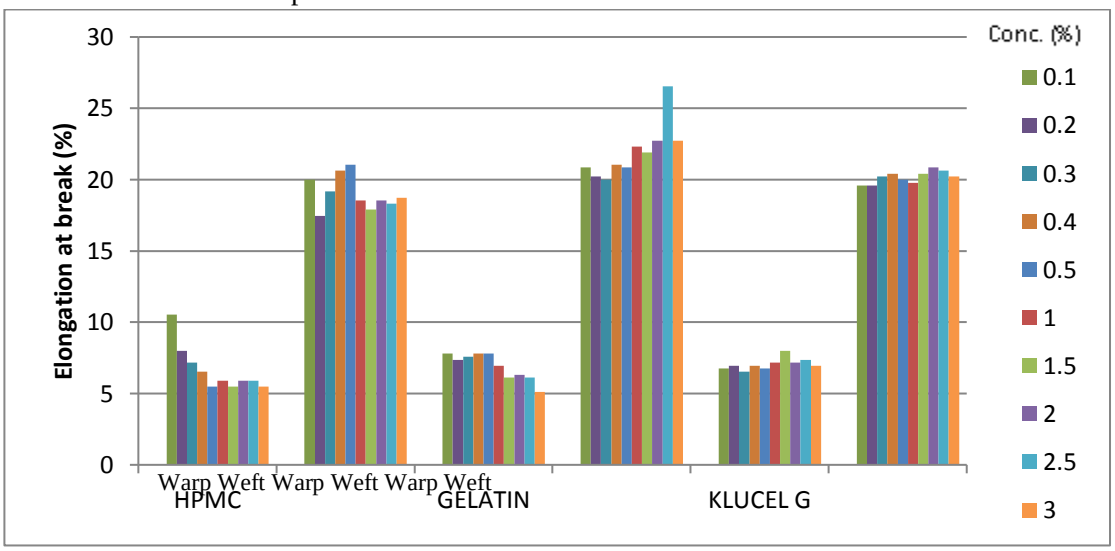
Plate -1 shows that for HPMC, until the concentration of 0.5%, there was no warping. From the concentration of 1% onwards, visible warping was seen, depicting stiffness. For Gelatin, from the concentration of 0.2% itself, considerable stiffness was imparted, however warping in the samples was seen from the concentration of 0.5%. Visible yellowing was noticed from concentrations 2% to 3%.Klucel G imparted the least amount of stiffness. No warping was seen in any of its samples and no yellowing was observed from the range of 0.1% to 3%. It showed the best results among the three chemicals in terms of stiffness.

Tensile strength

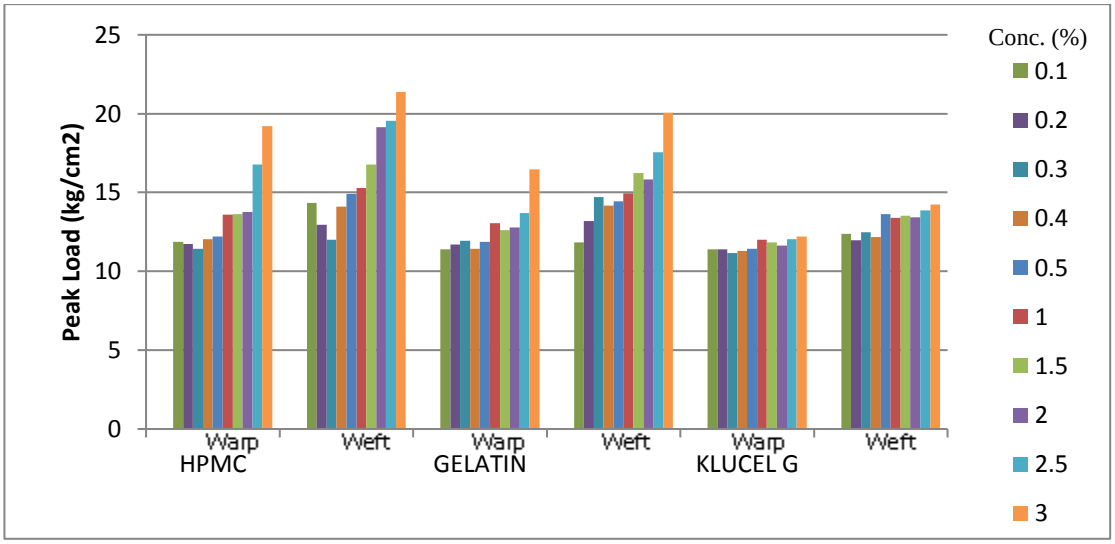
From Table -2 and Graphs -6 and 7 it is seen that with the increase in concentration, there was a significant increase in the peak load. However, there was a reduction in the warp and weft elongation. The weft peak load showed drastic increase only towards the last two concentrations. This could be due to the stiffness imparted by the consolidant.

Initial strength imparted by Gelatin was high and thereafter the strength remained similar for concentrations ranging from 0.3% to 1.5%. There was an increase in the peak load for both warp and weft. For warp there was a decrease in elongation, but for the weft, there was an increase in the elongation. This could be because Gelatin forms an elasticized film on the surface which could lead to higher elongation. However, it does not provide lesser strength when compared to HPMC.

Klucel G imparted minimal strength to the fabric. This could be because Klucel G is a weaker consolidant when compared with HPMC and Gelatin. Even at 3%, the warp peak load was 12.2 kg/cm$^2$ which is less than that of the peak load of HPMC and Gelatin.




**Graph -6: Effect of HPMC, Gelatin and Klucel G on elongation at break**




**Graph -7: Effect of HPMC, Gelatin and Klucel G on peak load**

Table -3 and Graph -8 show that the bending length increased with increase in concentration. For HPMC, after a 0.5% concentration, the stiffness increased beyond 10cm which cannot be measured by the Shirley's Stiffness Tester.

Gelatin has imparted much stiffness even at low concentrations. Higher stiffness was achieved at much lower concentrations when compared to HPMC, however after a concentration of 0.4%, there was a drastic increase in the stiffness.

Klucel G had imparted the least amount of stiffness. This could be due to the weak nature of the chemical.

Abrasion Resistance

From table -4 and graph -9 it is seen that HPMC resulted in the least amount of abrasion from of 0.4% concentration onwards. Gelatin resulted in a reduction in the abrasion of the fabric. 0.1% and

**Table -2: Effect of HPMC, Gelatin and Klucel G on tensile strength**

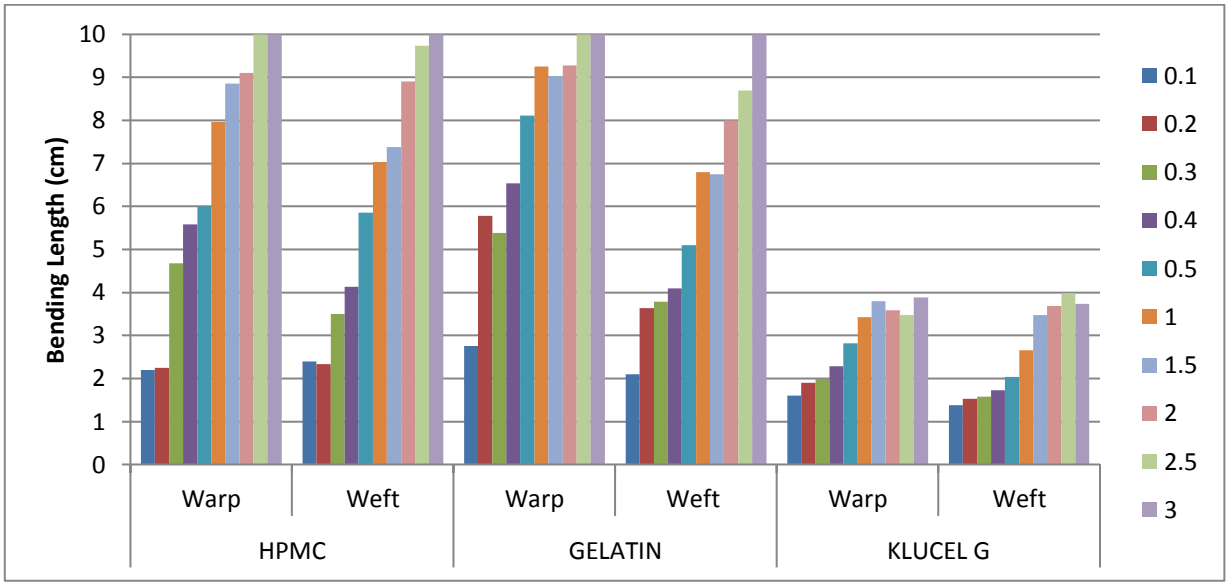
| | HPMC | | | | GELATIN | | | | KLUCEL G | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conc. (%) | Warp | | Weft | | Warp | | Weft | | Warp | | Weft | |
| | Elongation at break (%) | Load at break ($kg/cm^2$) | Elongation at break (%) | Load at break ($kg/cm^2$) | Elongation at break (%) | Load at break ($kg/cm^2$) | Elongation at break (%) | Load at break ($kg/cm^2$) | Elongation at break (%) | Load at break ($kg/cm^2$) | Elongation at break (%) | Load at break ($kg/cm^2$) |
| 0.1 | 10.53 | 11.86 | 20.00 | 14.34 | 7.79 | 11.38 | 20.84 | 11.84 | 6.74 | 11.38 | 19.58 | 12.36 |
| 0.2 | 8.00 | 11.74 | 17.47 | 12.94 | 7.37 | 11.70 | 20.21 | 13.20 | 6.95 | 11.38 | 19.58 | 11.96 |
| 0.3 | 7.17 | 11.42 | 19.16 | 12.02 | 7.58 | 11.94 | 20.00 | 14.70 | 6.53 | 11.16 | 20.21 | 12.48 |
| 0.4 | 6.53 | 12.04 | 20.63 | 14.10 | 7.79 | 11.42 | 21.05 | 14.18 | 6.95 | 11.30 | 20.42 | 12.16 |
| 0.5 | 5.47 | 12.22 | 21.05 | 14.92 | 7.79 | 11.88 | 20.84 | 14.44 | 6.74 | 11.42 | 20.00 | 13.62 |
| 1.0 | 5.89 | 13.58 | 18.52 | 15.28 | 6.95 | 13.04 | 22.32 | 14.94 | 7.16 | 12.00 | 19.79 | 13.38 |
| 1.5 | 5.47 | 13.62 | 17.90 | 16.78 | 6.11 | 12.62 | 21.89 | 16.24 | 8.00 | 11.84 | 20.42 | 13.54 |
| 2.0 | 5.89 | 13.76 | 18.53 | 19.14 | 6.32 | 12.78 | 22.74 | 15.84 | 7.16 | 11.64 | 20.84 | 13.42 |
| 2.5 | 5.89 | 16.76 | 18.32 | 19.54 | 6.11 | 13.68 | 26.53 | 17.54 | 7.37 | 12.04 | 20.63 | 13.88 |
| 3.0 | 5.47 | 19.22 | 18.73 | 21.38 | 5.10 | 16.48 | 22.74 | 20.06 | 6.95 | 12.20 | 20.21 | 14.24 |

**Bending Length:**

**Table -3: Effect of HPMC, Gelatin and Klucel G on bending length**

| Conc (%) | HPMC | | GELATIN | | KLUCEL G | |
|---|---|---|---|---|---|---|
| | Warp (cm) | Weft(cm) | Warp (cm) | Weft (cm) | Warp (cm) | Weft (cm) |
| 0.1 | 2.2 | 2.4 | 2.75 | 2.1 | 1.60 | 1.38 |
| 0.2 | 2.25 | 2.33 | 5.78 | 3.63 | 1.90 | 1.53 |
| 0.3 | 4.68 | 3.5 | 5.38 | 3.78 | 1.98 | 1.58 |
| 0.4 | 5.58 | 4.13 | 6.54 | 4.10 | 2.28 | 1.73 |
| 0.5 | 6.00 | 5.85 | 8.11 | 5.10 | 2.82 | 2.03 |
| 1.0 | 7.96 | 7.03 | 9.25 | 6.80 | 3.43 | 2.65 |
| 1.5 | 8.86 | 7.38 | 9.03 | 6.75 | 3.80 | 3.48 |
| 2.0 | 9.10 | 8.91 | 9.28 | 8.00 | 3.58 | 3.68 |
| 2.5 | >10 | 9.73 | >10 | 8.70 | 3.48 | 3.98 |
| 3.0 | >10 | >10 | >10 | >10 | 3.88 | 3.73 |

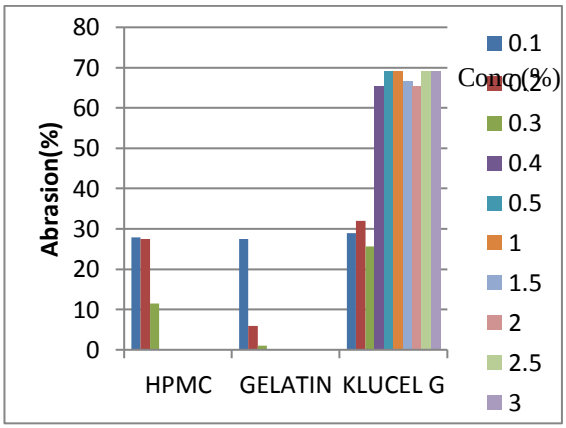
0.2% solutions showed abrasion, however from 0.3% onwards, the abrasion was minimal. Klucel G drastically effected the abrasion of the sample, with concentrations beyond 0.4% resulting in complete abrasion of the fabric.




**Graph -8: Effect of HPMC, Gelatin and Klucel G on bending length**

**Table 8.4: Effect of HPMC, Gelatin and Klucel G on abrasion resistance**

| Conc (%) | HPMC | GELATIN | KLUCEL G |
|---|---|---|---|
| 0.1 | 27.88 | 27.50 | 29.00 |
| 0.2 | 27.50 | 5.90 | 31.92 |
| 0.3 | 11.54 | 0.96 | 25.63 |
| 0.4 | 0.00 | 0.00 | 65.38 |
| 0.5 | 0.00 | 0.00 | 69.23 |
| 1.0 | 0.00 | 0.00 | 69.23 |
| 1.5 | 0.00 | 0.00 | 66.66 |
| 2.0 | 0.00 | 0.00 | 65.38 |
| 2.5 | 0.00 | 0.00 | 69.23 |
| 3.0 | 0.00 | 0.00 | 69.23 |




**Graph-9: Effect of HPMC, Geltin and Klucel G on abrasion resistance**

Whiteness and yellowness indices

From table -5 and graphs 10 and 11, it is seen that for HPMC, with the increase in the chemical concentration there was a decrease in whiteness and an increase in yellowness beyond a concentration of 0.5%, which is not a desirable property.

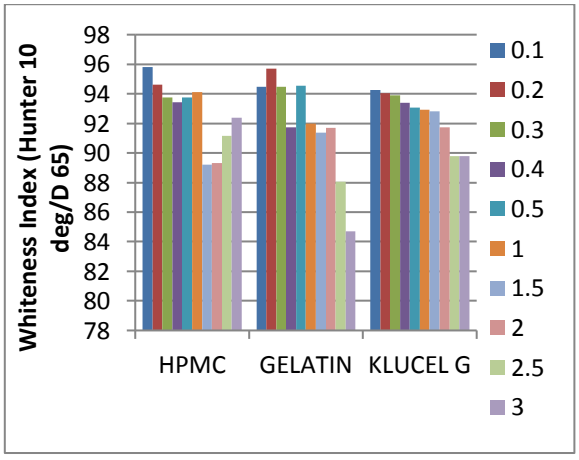
Whiteness index at low concentrations for Gelatin was high. This could be due to the Gelatin's film forming nature. Since the whiteness index is based on reflectance, the shiny film could have reflected a

higher amount of light giving a higher whiteness index. However, yellowness index for Gelatin increased at higher concentrations. Beyond 1%, the yellowing drastically increases along with the reduction in the whiteness of the sample.

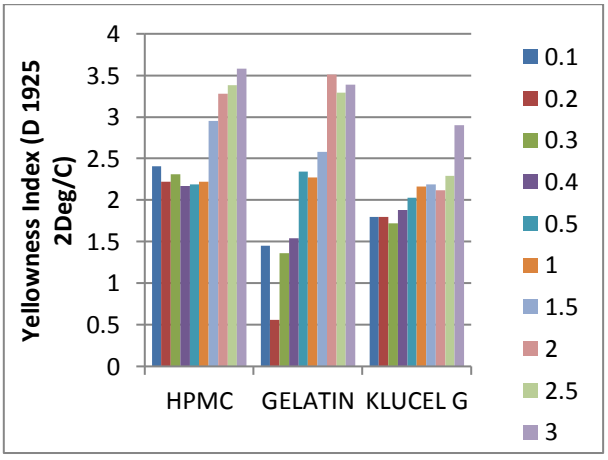
**Table -5: Effect of HPMC, Gelatin and Klucel G on Whiteness and Yellowness Indices**

| Conc (%) | HPMC | | GELATIN | | KLUCEL G | |
|---|---|---|---|---|---|---|
| | Whiteness Index (Hunter 10 deg/D 65) | Yellowness Index (D 1925 2Deg/C) | Whiteness Index (Hunter 10 deg/D 65) | Yellowness Index (D 1925 2Deg/C) | Whiteness Index (Hunter 10 deg/D 65) | Yellowness Index (D 1925 2Deg/C) |
| 0.1 | 95.82 | 2.41 | 94.48 | 1.45 | 94.25 | 1.80 |
| 0.2 | 94.61 | 2.22 | 95.69 | 0.56 | 94.05 | 1.80 |
| 0.3 | 93.77 | 2.31 | 94.46 | 1.36 | 93.89 | 1.72 |
| 0.4 | 93.44 | 2.17 | 91.73 | 1.54 | 93.39 | 1.88 |
| 0.5 | 93.74 | 2.19 | 94.53 | 2.34 | 93.06 | 2.03 |
| 1.0 | 94.13 | 2.22 | 92.00 | 2.27 | 92.92 | 2.16 |
| 1.5 | 89.22 | 2.95 | 91.36 | 2.58 | 92.80 | 2.19 |
| 2.0 | 89.33 | 3.28 | 91.69 | 3.51 | 91.73 | 2.12 |
| 2.5 | 91.16 | 3.38 | 88.07 | 3.29 | 89.79 | 2.29 |
| 3.0 | 92.39 | 3.58 | 84.70 | 3.39 | 89.78 | 2.90 |

Klucel G caused minimal yellowing. Only higher concentration of 2.5% and 3.0% led to a major decrease in the whiteness index.




**Graph-10: Effect of HPMC, Gelatin and Klucel G on whiteness index**




**Graph-11: Effect of HPMC, Gelatin and Klucel G on yellowness index**

Among the three chemicals, it is observed that the limitation of one chemical is the forte of the other/s. Based on tests, optimum concentrations of each chemical can be narrowed down to:-

i) HPMC- 0.4% and 0.5%

Although the indices and tensile strength incorporate more concentrations, the abrasion eliminates the lower concentrations and the bending length eliminates the higher concentrations.

ii) Gelatin- 0.3% and 0.4%

With the yellowness index and bending length having a marked increase at higher concentrations, and the lower concentrations showing significant abrasion, these concentrations can be taken as optimum concentrations in case of Gelatin.

iii) Klucel G- 0.3%

Klucel G displayed the best results for bending length and yellowness index at all concentrations. The tensile strength imparted was lower than HPMC and Gelatin but was higher than that of an aged cotton velvet sample. However, extreme mount of abrasion after a concentration of 0.3% eliminates its possibility to be used at higher concentrations. The only reason to consider 0.3% concentration is that at lower concentrations the abrasion resistance was comparatively higher. It was only at 0.3% concentration that there was drop in abrasion resistance.

**Analysis of combinations of the selected consolidant concentrations**

Taking the optimum concentrations of each consolidant, 12 combinations were formulated, shown in Table -6:-

**Table -6: Combinations formulated using optimum consolidant concentrations**

| Combination | HPMC (%) | Gelatin (%) | Klucel G (%) |
|---|---|---|---|
| C1 | 0.4 | 0.3 | - |
| C2 | 0.4 | 0.4 | - |
| C3 | 0.4 | - | 0.3 |
| C4 | 0.5 | 0.3 | - |
| C5 | 0.5 | 0.4 | - |
| C6 | 0.5 | - | 0.3 |
| C7 | - | 0.3 | 0.3 |
| C8 | - | 0.4 | 0.3 |
| C9 | 0.4 | 0.3 | 0.3 |
| C10 | 0.4 | 0.4 | 0.3 |
| C11 | 0.5 | 0.3 | 0.3 |
| C12 | 0.5 | 0.4 | 0.3 |

After the application of the combinations, the various tests were carried out for all the combinations.

From Table -7 and graphs -12, 13, 14, 15, 16 and 17, it can be seen that not all combinations resulted in an increase in the desirable properties. HPMC + Gelatin mixtures gave a high tensile strength when compared to HPMC + Klucel G, and Gelatin + Klucel G.

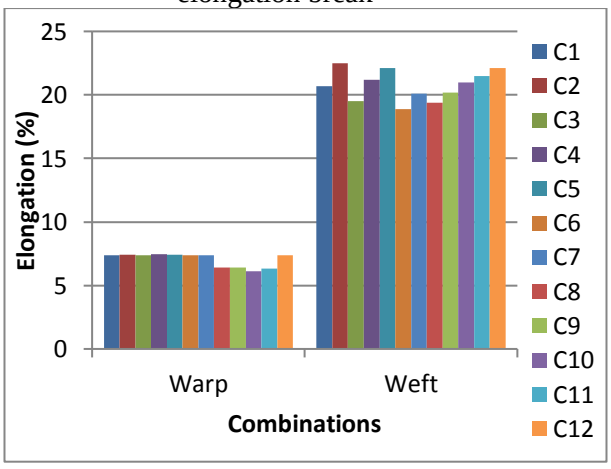
Among the combinations involving all the three chemicals, the combinations of HPMC+Gelatin+Klucel G (0.5%+0.3%+0.3%) and HPMC+Gelatin+Klucel G (0.5%+0.4%+0.3%)

gave results in which the tensile strength was higher than that of the combinations involving only two chemicals.

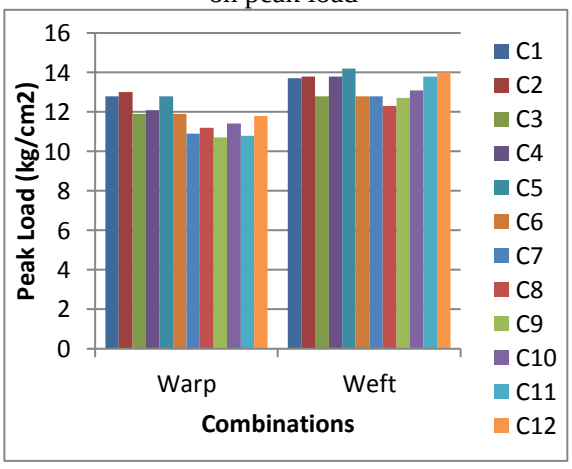
**Table -7: Tensile strength, abrasion resistance, bending length, whiteness index and yellowness index among various combinations**

| Comb. | Consolidants H: HPMC G: Gelatin K: Klucel G | | | Tensile strength E-elongation (%) P-peak load (kg/cm$^2$) | | | | Abrasion (%) | Bending length (cm) | | Whiteness index | Yellowness index |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | H | G | K | Warp | | Weft | | | Warp | Weft | | |
| | | | | E | P | E | P | | | | | |
| C1 | 0.4 | 0.3 | - | 7.37 | 12.8 | 20.7 | 13.7 | 0.00 | 5.2 | 3.8 | 93.06 | 2.03 |
| C2 | 0.4 | 0.4 | - | 7.42 | 13 | 22.5 | 13.8 | 0.00 | 6.7 | 4.8 | 93.77 | 2.31 |
| C3 | 0.4 | - | 0.3 | 7.37 | 11.9 | 19.5 | 12.8 | 68.24 | 3.2 | 3.5 | 94.46 | 1.36 |
| C4 | 0.5 | 0.3 | - | 7.45 | 12.1 | 21.2 | 13.8 | 0.00 | 5.4 | 4.0 | 93.39 | 1.88 |
| C5 | 0.5 | 0.4 | - | 7.42 | 12.8 | 22.1 | 14.2 | 0.00 | 6.5 | 4.2 | 92.06 | 2.46 |
| C6 | 0.5 | - | 0.3 | 7.37 | 11.9 | 18.9 | 12.8 | 69.32 | 4.3 | 3.4 | 94.05 | 1.80 |
| C7 | - | 0.3 | 0.3 | 7.37 | 10.9 | 20.1 | 12.8 | 69.32 | 4.2 | 3.8 | 94.48 | 1.45 |
| C8 | - | 0.4 | 0.3 | 6.42 | 11.2 | 19.4 | 12.3 | 69.32 | 4.7 | 3.6 | 94.61 | 2.22 |
| C9 | 0.4 | 0.3 | 0.3 | 6.42 | 10.7 | 20.2 | 12.7 | 69.82 | 3.9 | 4.0 | 93.44 | 2.42 |
| C10 | 0.4 | 0.4 | 0.3 | 6.13 | 11.4 | 21.0 | 13.1 | 67.21 | 4.3 | 4.1 | 93.89 | 2.17 |
| C11 | 0.5 | 0.3 | 0.3 | 6.32 | 10.8 | 21.5 | 13.8 | 68.76 | 5.3 | 4.2 | 93.06 | 2.23 |
| C12 | 0.5 | 0.4 | - | 7.37 | 12.8 | 20.7 | 13.7 | 0.00 | 5.2 | 3.8 | 93.06 | 2.03 |

Graph-12: Effect of the 12 combinations on elongation break

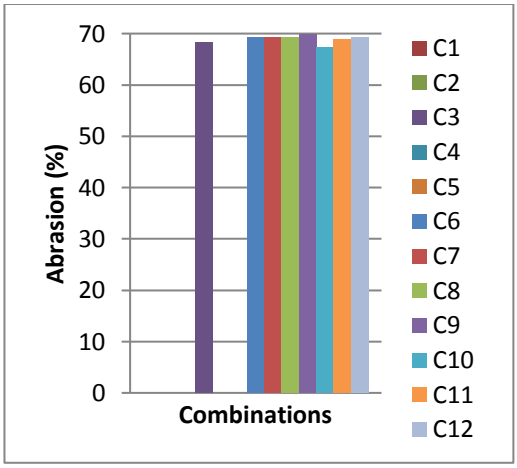



Graph-13: Effect of the 12 combinations on on peak load

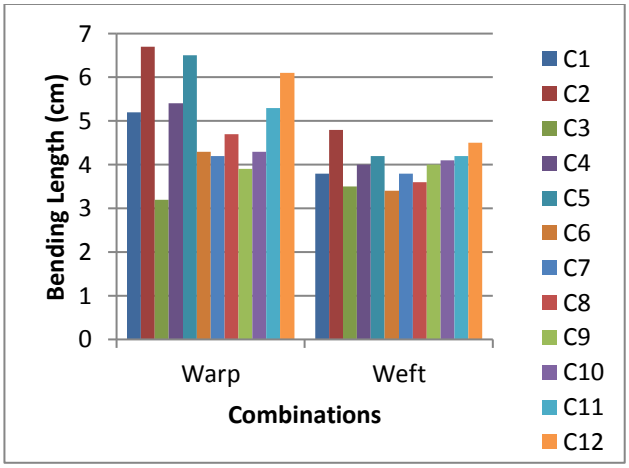



Combinations with Klucel G had the least bending length, with maximum stiffness imparted by the combinations of HPMC and Gelatin. Thus, ideally combinations of Klucel G should be considered based on the bending length since they have imparted the least amount of stiffness.

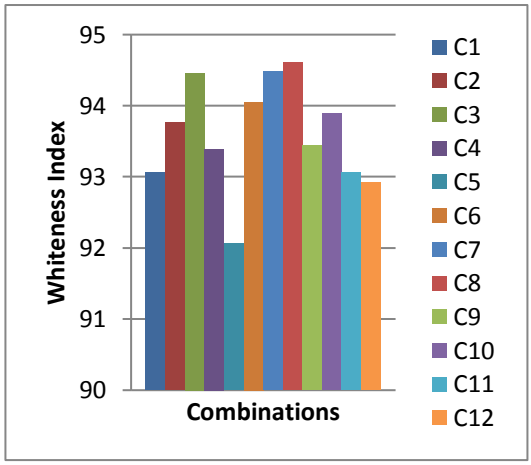
For all the combinations containing Klucel G, the samples completely abraded. Thus, Klucel G was not of significance with respect to increasing the desirable properties of increased strength and abrasion resistance.



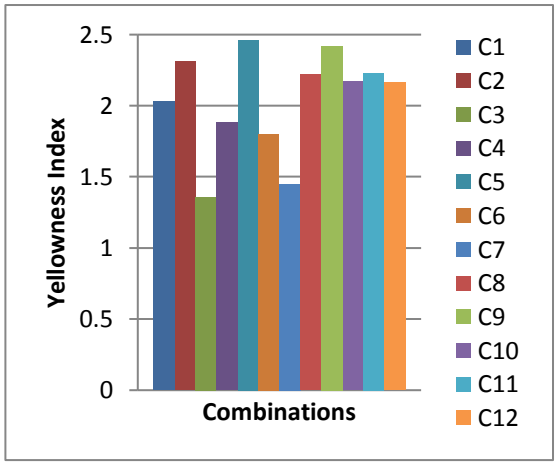

Graph-14: Effect of the 12 combinations on abrasion resistance




Graph-15: Effect of the 12 combinations on bending length




Graph-16: Effect of the 12 combinations On whiteness index




Graph-17: Effect of the 12 combinations on yellowness index

Combinations had little effect on the whiteness and yellowness indices. Maximum yellowness was seen in combinations involving all the three chemicals and the least amount of yellowing was seen for combinations involving Klucel G.

Based on all the tests, if any optimum combination/s has to be chosen, then combinations involving Klucel G would have to be eliminated since the samples completely abraded along with the base yarns.

## CONCLUSION

On comparison of HPMC and Gelatin combinations, the results seem to have a marginally insignificant difference, thus HPMC and Gelatin may be used for consolidation in the concentration combinations of respectively 0.4%+0.3%, 0.4%+0.4%, 0.5%+0.3% and 0.5%+0.4%.

The selection of only one combination would depend on the condition of the artifact and the type of treatment it requires. For an extremely fragile and brittle object varying concentrations may be required to impart sturdiness to the object vis-à-vis a more stable object.

The consolidants successfully dealt with the problem of pile detachment which is seen as the increase abrasion resistance of the samples to the point of no abrasion. Combinations of chemicals show that a higher degree of strength can be imparted by combining the chemicals without resulting in a marginal increase in the yellowing of the fabric.

## SCOPE FOR FURTHER WORK

The present study was designed to deal with the problem of loss of pile for cotton velvet. Further work can be explored as follows:-

i. Similar study on any other variety of velvet fabric
ii. Scientifically study the composition and behaviour of Klucel G
iii. Combination of the three chemicals with other consolidant/s
iv. Developing methods and techniques to treat velvets containing other materials such as metallic threads
v. Exploring other ways of application of consolidants for velvets with weaker pile
vi. To study the effect of other consolidants on velvet
vii. To study the effect of ageing on HPMC, Gelatin and Klucel G

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# A STUDY ON COPPER NANO COLLOIDS FOR ITS USE AS MORDANT FOR NATURAL DYES

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## ABSTRACT

Nanotechnology is gaining attention worldwide because of its wide range of offerings which has a huge potential range of end uses. It is the activities at the level of atoms and molecules that have applications in the real world. In textiles it has been incorporated since the beginning of dyeing fibers and fabrics, which dates back to 2600 BC in China.

In the area of textiles, nanotechnology has a huge commercial potential. Nanoparticles are of interest in textile sector because of the new properties (such as chemical reactivity and optical behaviour) that they exhibit as compared with larger particles of the same materials. For example, titanium dioxide and zinc oxide, though become transparent at the Nano scale, are able to absorb and reflect UV light, and have found application as sunscreens.

In the present research work, copper nano colloids were synthesized by chemical reduction method. This synthesized nano solution was applied to bleached jute fabric samples at different stages of its dyeing using two natural dyes namely turmeric and sappan wood with and without alum as mordant in the system. The samples were evaluated for colour strength in terms of K/S values, colour fastness and characteristics by SEM techniques in comparison with controlled sample. The copper nano colloids treatment was found to improve both K/S and colour fastnesses.

**KEYWORDS:** Nano colloids, Natural dyes, Color strength, Color fastness

## INTRODUCTION

Nanotechnology (NT) is the application of scientific knowledge to control and utilise matter at the Nano scale, where size related properties and phenomenon can emerge. It deals with materials 1 to 100 nm in length (Bhattacharya et.al.1998). This new science of the 'small' presents greater challenges and opportunities. It has virtually unlimited future potential to produce and improve new and existing products (Jhala et.al). The fundamentals of nanotechnology lie in the fact that the properties of materials drastically change when their dimensions are reduced to manometer scale. Moreover, a small amount of nano size particle can interfere with matrix polymer that is usually in similar size range, bringing up the performance of resultant system to an unprecedented level (Chattopathyay,2006). For last a few years the textile industry has discovered the possibilities of nanotechnology.

Nanotech-textiles are on the way of becoming the most popular textiles. The unique properties of metal nano particles are well known and many researches have been carried out for their synthesis.

Bhattacharya (1998), Chattopadhyay (2006), Chattopadhyah & Patel (2009) have already reported the effect of different metal nano particles on various properties of textiles.

Nanotechnology research in textiles has three main objectives:

1) Upgrading of both present function and performance of textile materials.

2) Introduction of innovative functionalities like antibacterial, self-cleaning, UV-blocking, conductivity, etc, and

3) Development of smart / intelligent textiles. Nanotechnology is a growing interdisciplinary technology often seen as a new industrial revolution.

## OBJECTIVE

The present study was aimed at investigating the effect of copper nano colloids on the dyeing behaviour of jute using natural dyes.

## MATERIALS AND EXPERIMENTAL METHODS

- ***Fabric***

100% raw jute fabric was procured from the Department of Jute and Fibre Technology, Kolkata with following specifications:

Weave: Plain
Weight: 632 g/$m^2$
Ends/inch: 27
Picks/inch: 29

- ***Dyes and Chemicals***

Two natural dyes namely Turmeric and Sappan wood were used for the study. Alum was used as mordant. Copper sulphate ($CuSO_4.5H_2O$) and Sodium borohydride ($NaBH_4$) were used to synthesize copper nano colloids. Hydrogen peroxide was used as bleaching agent to bleach the raw jute fabric.

- ***Synthesis of copper nano particles***

The 100ml solution of copper sulphate in distilled water kept on constant shaking water bath, was slowly reduced by drop wise addition of very dilute cold ($2^0$C) solution of sodium borohydride in presence of nitrogen atmosphere. As the color of the solution turned to light yellow, the addition of solution of sodium borohydride was ceased.

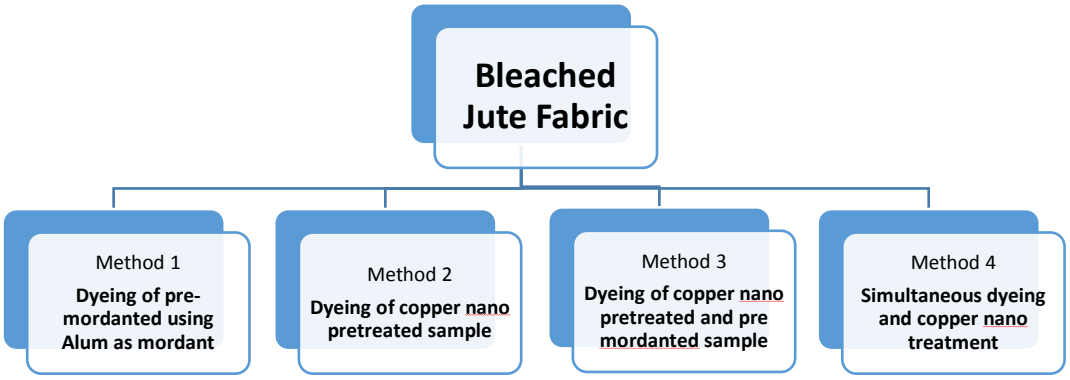
- ***Dyeing***

***Dye extraction***

As a natural dye source; turmeric and sappan wood were used in the powder form. In order to extract the dye, 10% concentrations of each dye on the weight of the material was taken and boiled for 30 minutes. The dye extract thus obtained was filtered and directly used for dyeing of the jute samples.

***Dyeing of bleached jute fabric with natural dye***

The bleached jute fabric samples were dyed using above two natural dyes keeping material-to-liquor ratio at 1:40. Four different methods used for dyeing were as follows:-




**I] Method 1: Dyeing of pre-mordanted using Alum as mordant:**

The bleached jute fabric sample was first mordanted using 10% concentration of alum (wof) for 30 minutes at room temperature keeping the material to liquor ratio 1:40. The mordanted sample was then entered in to the dye bath (Turmeric and Sappan wood). The temperature of the dye bath was increased to boiling gradually and the dyeing was continued for 1 hour. After dyeing, the dyed samples were thoroughly rinsed, soaped and dried.

**II] Method 2: Dyeing of copper nano pretreated sample:**

The bleached jute fabric sample was pretreated with synthesized copper nano colloid at $40^0$C keeping material- to -liquor ratio 1: 40. After 15 minutes, the temperature was gradually raised to $80^0$C and the treatment continued for a further period of 30 minutes. The samples were thoroughly washed, neutralized and were directly dyed with both the natural dyes separately as per the dyeing method stated above without any mordanting.

**III] Method 3: Dyeing of copper nano pretreated and pre mordanted sample:**

In this technique the samples were first treated in a bath containing copper nano colloid as discussed in method 2. These pretreated samples were further mordanted using alum as stated in method 1 and then dyed using the two natural dyes separately.

**IV] Method 4: Simultaneous dyeing and copper nano treatment:**

Here the bleached jute fabric samples were first dyed for 40 minutes in the dye bath and then copper nano colloid solution was directly introduced in to the dye bath and dyeing was continued for a further period of 20 minutes maintaining the dyeing method as described in method 1.

- ***Evaluation of colour strength of Dyed Samples***

The effect of copper nano treatment on the dye ability of jute fabric was assessed for colour strength in terms of K/S measured on Spectra Scan 5100 spectrophotometer interphase with computer colour matching system.

- ***Evaluation of Wash Fastness***

The wash fastness of the dyed samples were measured as per ISO 105-CO6 (C2S).

## RESULTS AND DISCUSSIONS

**Effect of different dyeing methods on colour strength of dyed jute:**

The Cu nano particle (method-2, 3 and 4) treated jute fabric samples were dyed with two natural dyes and compared. The K/S values of the nano copper treated samples were found to be higher (Table 1) than the corresponding samples of jute of method 1 in case of both turmeric and sappan wood (Figure 1 & 2) The improvement in color strength was observed to be better with sappan wood dye. In case of turmeric, samples of method 3 was found to be visually very bright. The samples of method 4 also showed improved K/S value with dulling of shade (Figure 1). For sappan wood, method 3 i.e. dyeing of copper nano pretreated and pre alum mordanted sample showed highest colour depth value (Figure 2). Thus, for both turmeric and sappan wood there was rise in colour depth with the nano copper introduction in the system with all the three methods.

**Table 1: Effect of copper nanoparticles on the color strength (K/S) of jute fabric with natural dyes**

| Sr. No. | Samples | Turmeric (T) | Sappan wood (S) |
|---|---|---|---|
| 1 | **Method 1:** Dyeing of pre-mordanted sample | 23.389 | 28.129 |
| 2 | **Method 2:** Dyeing of copper nano pretreated sample | 24.037 | 28.966 |
| 3 | **Method 3**: Dyeing of copper nano pretreated and pre mordanted sample | 24.073 | 34.518 |
| 4 | **Method 4**: Simultaneous dyeing and copper nano treatment | 26.139 | 28.531 |

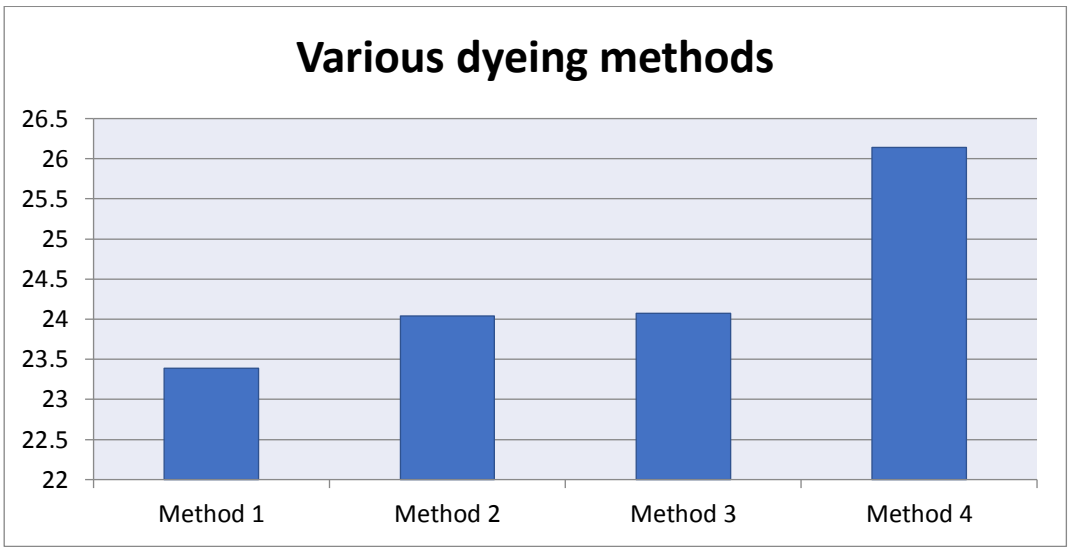



**Figure 1: Effect of Different methods of Dyeing on Colour Strength (K/S) on Jute using Turmeric**

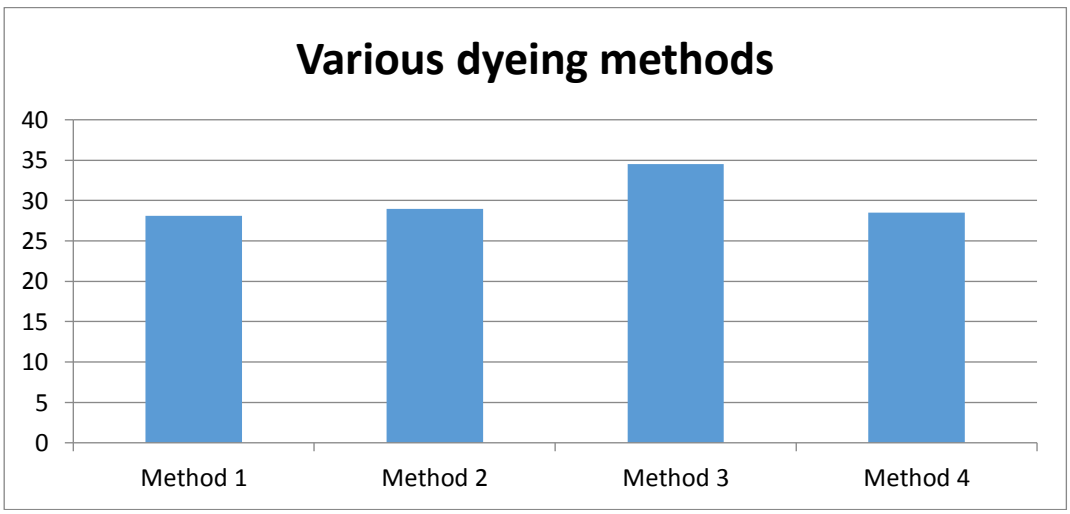
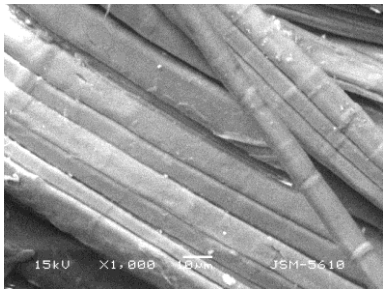
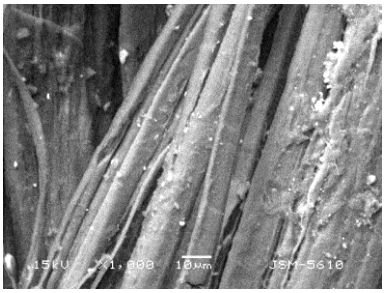



**Figure 2: Effect of Different methods of Dyeing on Colour Strength (K/S) on Jute using Sappan wood**

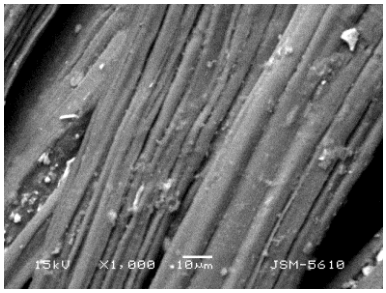
The higher K/S values higher than controlled indicated the increased absorption of dye. Here, the results showed higher K/S values for the samples where Cu nano particles were used indicating that the presence of nano metal particles increases the dye affinity towards the materials. The copper nano particles in the fabric thus acted as mordant increasing the affinity for dyeing. Better results were obtained as compared to the samples pre-treated with alum mordant. These results were supported by the SEM images. The figure 3(b) shows the copper nano particles deposition on the fibre. The size of the particles increased after dyeing, as observed from figure 3 (c). Simultaneous dyeing of nano copper treatment and dyeing resulted in bigger size particles [figure 3(d)] indicating the better absorption of dye.



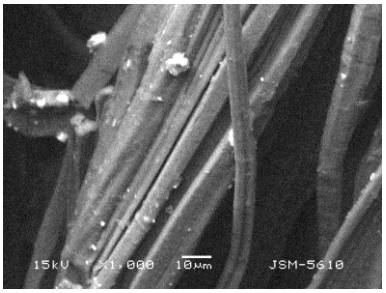

(a) Bleached jute sample




(b) Sample pretreated with copper nano colloid




(c) Copper nano pretreated and dyed




(d) Copper nano treated and dyed simultaneously

**Figure 3: Scanning electron microphotographs (SEM) of Jute Samples**

**Effect of different dyeing methods on tonal variation of the dyed jute**

There was no tonal variation in the shade of turmeric dye. This was confirmed by table 2 and from the figure 4. In case of sappanwood, there was major tonal variation as seen in figure 5 which show abrupt change in quadrant. In case of turmeric, method 3 showed the brightest yellow colour which was supported by a* and b* values from table 2 and also seen in figure 4. The samples of turmeric relatively showed bright shades except the sample of method 4 which was comparatively dull as observed from figure 4.

**Table 2: Effect of copper nano particles on the color depth of jute fabric with natural dyes**

| Sr. No. | Samples | $a^*$ | | $b^*$ | |
|---|---|---|---|---|---|
| | | D1 | D2 | D1 | D2 |
| 1 | Method 1 | 27.463 | 20.733 | 14.625 | 62.594 |
| 2 | Method 2 | 6.942 | 20.198 | -3.438 | 62.386 |
| 3 | Method 3 | 27.062 | 19.257 | 15.491 | 65.797 |
| 4 | Method 4 | 8.206 | 19.683 | 0.211 | 51.547 |

Note: D1-Turmeric; D2- Sappan wood; $a^*$ and $b^*$ - Color depth

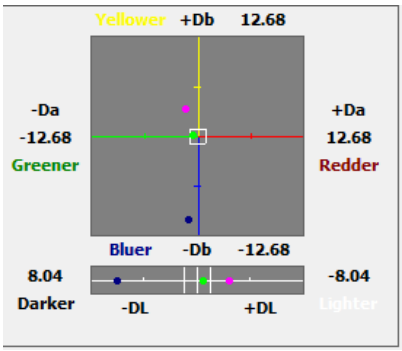



**Figure 4: Color Depth of sample dyed With Turmeric**

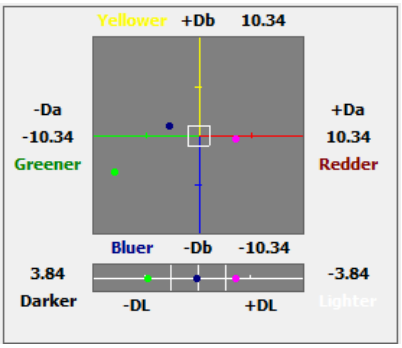



**Figure 5: Color Depth of sample dyed with Sappan wood**

Note: Red dot- Method 1, Green dot- Method 2, Pink dot- Method 3 and Blue dot- Method 4

**Effect of different dyeing methods on wash fastness properties of the dyed jute**

**Table 3: Effect of copper nano colliods on the wash fastness properties of jute fabric with natural dyes**

| Sr. No. | Samples | Wash Fastness | | | |
|---|---|---|---|---|---|
| | | Change in color | | Stain on Cotton | |
| | | D1 | D2 | D1 | D2 |
| 1 | Method 1 | 2-3 | 3 | 2-3 | 3 |
| 2 | Method 2 | 3 | 4 | 3 | 3 |
| 3 | Method 3 | 4 | 4 | 4 | 4 |
| 4 | Method 4 | 4 | 4 | 4 | 4 |

Note: D1- Turmeric; D2- Sappan wood.

The copper nano treated, untreated and dyed fabrics were washed using 2g/l non-ionic detergent and wash fastness was tested. The copper nano treated and dyed samples were almost unaffected by the washing procedure as observed from Table 3. The fastness properties between method 3 and method 4 indicated good fastness properties which is attributed to better coupling of dye and fibre. Thus, copper nano pre-treatment not only improved the color strength but also improved the color fastness property which is a major drawback in most of the natural dyes. The results obtained with the introduction of copper nano particle were of different shades and were of good fastness properties.

## CONCLUSION

From the above, it was concluded that the presence of nano copper in the dyeing of jute with natural dyes improved the results. Natural dyes are known for their duller shade. In presence of Copper nano brighter yellow shades were obtained when samples were pre-treated with copper nano colliods and pre- mordanted with alum. For sappan wood also better effect of Copper nano

particles were observed for colour depth. For sappan wood, copper nano pretreated and pre alum mordanted sample showed increase in colour depth. Thus, for both turmeric and sappan wood natural dye, introduction of copper nano in the system assisted in increase in colour depth and wash fastness. Copper nano treatment thus helped in achieving better dyeing property for Jute fabric with natural dyes. Thus, nano particles can be used to obtain better colour depth along with fastness on jute fabrics with natural dyes.

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# YOUNG WOMEN ARE LEADING THE CHANGE: AN APPRAISAL OF CONDITIONAL CASH TRANSFER SCHEME PROMOTING GIRL'S SURVIVAL AND EDUCATION

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## ABSTRACT

India recorded the second worst sex ratio and the lowest child sex ratio in the world in the Census of 2011, reflecting the societal attitude towards girl child and the state of gender inequality. The sex ratio of Delhi, the capital of the country stood at an alarmingly low of 868 and this led to the launch of a Conditional Cash Transfer (CCT) scheme 'Ladli' to reverse the distorted sex ratio at birth and promote education among girl children. This paper appraises and captures the nuances of Ladli scheme at the grassroots after a decade of its implementation. A holistic approach of enquiry was used including in- depth interviews conducted with 360 beneficiary girls studying in government schools and 180 parents to gather quantitative and qualitative information using mixed methods approach. An urgent need to disseminate information about the scheme, due to lack of knowledge among beneficiaries, was highlighted. The study reiterated the fact that gender bias exists in favour of sons and the beneficiary girls reported experiencing gender based differential treatment in their homes. However, the study shows an encouraging picture with now girls aspiring for higher education and careers to gain financial security and independence and lead the change. It further illustrates that financial incentives and schemes like 'Ladli' do play an enabling role in altering the existing gender barriers, as parents were willing to invest in their daughters' education and future employment.

**Key words:** Sex ratio, Girl Child, Gender inequality, Conditional Cash Transfer, Ladli scheme, gender discrimination, differential treatment, resource Dilution, Public policy

## INTRODUCTION

The gender-based discrimination remains the most pervasive and persistent form of inequality and reveals the underlying socio- economic and cultural patterns of the society, especially societal attitude toward girl child and state of gender relations with in our homes and work places. Since a balanced sex ratio and parity between men and women is much desired to minimize the gender gap in the Human Development indicators, the government of India is aiming to achieve gender equality through various national and state level initiatives, policy shifts and implementing pragmatic financial incentive schemes.

While the natural sex ratio at birth is 105 boys born for every 100 girls, in India the figure has risen to 112 boys. A country's CSR (child sex ratio i.e., the number of girls per 1,000 boys in the 0-6 year's age group) index is a revealing indicator of the underlying socio- economic and cultural patterns of the society, especially societal attitude toward girl child and state of gender relations. India recorded the worst decadal child sex ratio (i.e. the number of girls per 1,000 boys in the 0-6 year's age group) of 914 with three million missing girls, as per census records of 2011. Due to the marginal dip in the sex ratios from 2001 to 2011, specifically in few states of India, Haryana, Punjab and Himachal Pradesh are called as the 'Bermuda triangle'- a triangle where girls vanish (Dave et al., 2009). Thereby, there is a need for re-focusing world's attention to the dark side of India's demographic change- a low and falling ratio of girls to boys.

Extant literature on the subject has identified the 'preference for sons' as the reason for the gender bias against girls in South Asian countries, particularly India. This bias for males in the family and society has existed among the Indian parents and cuts across caste and class lines, religion, economic segments, rural/ urban divides and even the education levels. The gender preferences also influence a couple's fertility behavior with respect to the choice regarding number and sex composition of children. When there is no access to prenatal sex detection technology, parents focus on an ideal number of sons, which is regardless of the number of daughters in the family. Known variously as Differential Stopping Behavior (DSB), son targeting fertility behavior, etc. child bearing driven by a strong desire to have sons occurs when the couple continue to progress to higher parities, within a maximum limit, until they have the desired number of sons or when they hit the ceiling for the maximum number of children they think to be feasible, given the resource constraints. The fertility is completed as soon as the couple has their ideal number of sons (Arnold et al. 2002; Clark 2000). This manifests the role of fertility behavior as an alternative mechanism for generating sex inequality and the resultant aversion to daughters. Bhardwaj and Lakdawala (2013) suggested that along with the increasing skewed sex ratios; the diffusion of sex selection technologies and their easy accessibility has also been associated with the preferential treatment for boys (before and after birth). As a result of such gender-based discrimination, girls have to bear multiple burdens of inequality manifested in various forms and at various levels, which is also reflected in all human development indicators.

Thereby, parity between men and women is much desired in order to minimize the gender gap at the level of family and society for the overall development of the nation. The systematic analysis of census data and the forthright recognition of the severity of the issue of genocide of unborn girls have led the Centre and state governments of India to launch various interventions at different times to tackle the problem of imbalanced sex ratio and protect the girl child such as legislation to enhance gender equality in civil code (MTP Act, PNDT and PC & PNDT Act), sponsoring women's organizations and financial incentives to parents to raise daughters.

The basic objective of the Conditional Cash Transfer (CCT) schemes is aimed at reducing extreme poverty in the short-run while protecting the formation of human capabilities in the long run. Conditional cash transfers provide money to poor families contingent upon certain behavior or action, usually investments in human capital such as sending children to school or bringing them to health centers on a regular basis. The implementation of such schemes is a new emerging concept. In India, the state of Haryana pioneered the implementation of CCT scheme and has shown an improvement of 11 points i.e. 819 in 2001 to 830 in 2011 in CSR pointing towards the success of efforts and interventions taken for girl child. The Government of NCT of Delhi also initiated Ladli

scheme to promote the birth of girl child and gender equality. Various financial incentives schemes were launched across states of India and were linked to marriage, terminal method of family planning adopted by parents, or limited to number of girls in the family, thereby reinforcing stereotypes that daughters are liabilities. Compared to the schemes initiated in the year 2008 or before, Ladli scheme stands apart as it is linked to creating assets in the name of daughters and bring about investment in education.

As a reflection of momentum generated around the issue of girl child, assessing the effectiveness of such efforts was thought to be important and formed the basic research question. The study intended to assess the knowledge and perceptions of the beneficiaries about the Ladli scheme and gain insights into the aspirations of the beneficiary girls about their education and career and the expected contribution of the Ladli scheme in shaping them. The study also tried to comprehend the perceptions of the beneficiary girls regarding gender differentials in their families and examines the ways and means by which a scheme can trigger processes of change towards family composition and promote survival and education of the girl child.

## OBJECTIVES

1. To assess the knowledge of the beneficiaries about the Ladli scheme
2. To study Perception of beneficiary regarding educational and career aspirations
3. To study the perceptions of the beneficiary girls regarding gender differentials in their families

## METHODS

For the purpose of the study, all the schools run through Directorate of Education (DoE) were included. Under each district, one each of 'Rajkiya Pratibha Vikas Vidyalaya' (RPVV) and 'Government Girls Senior Secondary School' (GGSSS) were purposely chosen across the selected nine (9) districts in Delhi, making a total of 18 selected schools.

Being directly or ultimately affected by an intervention either positively or negatively (Mikkelson, 2005), the primary stakeholders were the beneficiaries enrolled under the scheme. From each school, 20 beneficiary girls were selected for in depth interviews through random sampling. The information garnered was supplemented with observations and comments received during FGDs. Also, we selected 10 beneficiary parents for in-depth interviews through purposive sampling for a more holistic view regarding the scheme. However, due to study limitations, in-depth interviews (IDIs) were conducted with a total of 335 beneficiary girls and 160 parents

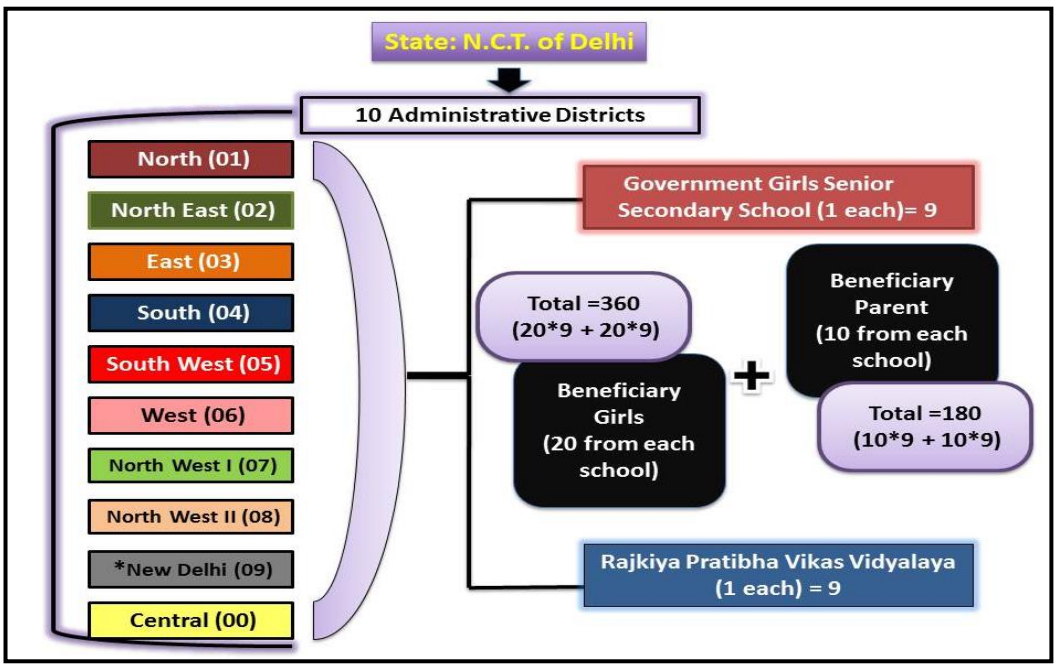


*Figure 1: Sampling plan for the study*

Appropriate statistical tools were applied for quantitative analysis and the data was analyzed for percentages and proportions using SPSS 16 version 11.5. All the descriptive statistics was done using mean, standard deviation and frequency. Comparison of categorical data was done using Chi-square. Comparison of numeric data in two categories was done by t-test and for more than two categories one-way ANOVA was used. For post hoc analysis, Scheffe's test was used. All the results were concluded as significant with $p< 0.05$ and highly significant with $p<0.01$.

## FINDINGS

**Beneficiaries' Profile:** Out of 360 beneficiary girls, a total of 335 beneficiary girl students were included in the study due to certain limitations. It was found that majority of the beneficiary girls belonged to general category. 81% of the total respondents lived in nuclear families and had medium sized family with five to seven members, with mostly one earning member. This made their economic conditions difficult as they had lesser resources to meet their needs. 84% of the girls had at least one brother suggesting that the sex composition in the families under study had preponderance of male children, since every family believes that there should be at least one boy in the family for it to be complete. Only 32% of the families belonged to Delhi while 68% hailed from other states in search of a livelihood and got settled in Delhi. 52% of the respondents were studying in RPVV while 48% were from GGSSS. 59% of the beneficiary girls got enrolled at the third milestone of class VI into the Ladli scheme since the scheme was launched in 2008. 31% were enrolled at 4$^{th}$ milestone of class IX while very few were enrolled at later stages. The daughters of 24% of the mothers and 9% of the fathers were the first generation learners while others had their parents studied up to primary or secondary classes. It was found that mothers of 91% of the beneficiary girls were housewives. 45% of the fathers were employed in a private or a government job and rest were either self-employed or wage laborers. Among the 160 parents that were interviewed, 90 parents were from RPVV schools and 70 parents from GGSS schools. A total of 93 fathers and 67 mothers visited the school and were interviewed.

**Knowledge about the Ladli scheme**

Knowledge is an important aspect of availing the benefits to their full potential. Based on the outlined procedures of Ladli scheme, a total of 33 statements were made, validated and then were scored independently for beneficiary girls and their parents to analyze the overall knowledge about Ladli scheme.

The *enrolment specific knowledge* statements (n=17) were regarding awareness about the objectives of Ladli scheme, eligibility criteria, Ladli coordinator in school, milestones of enrolling into the scheme, application form, etc. 98% of girls and 97% of parents were aware of class VI and class IX as stages of enrolment. Around 72% of the beneficiary girls and 51% of parents knew that only two girls from a family could enroll under the scheme and avail its benefits. 60% of the beneficiary girls and 31% of parents had a perception that if the girl was studying in a government schools, then only she was eligible to avail the scheme benefits. Very few were completely aware of enrolment related procedures of the scheme.

The *renewal specific knowledge* statements (n=7) were regarding understanding of renewal, its importance, the stages of renewal, amount deposited and how the money gets invested. 58% of the beneficiary girls and 73% parents were completely unaware about the term 'renewals', its meaning, procedures and its requirement for continuation of financial investments by the government at various lock-in-periods. Only 13% of beneficiary girls were aware that the state government deposits an amount of Rs.5000 in their bank accounts upon a timely renewal. None of the girls or parents were cognizant of the investment plan of the money deposited at renewal milestone, how it multiplies and matures to become one lakh rupees at maturity.

The *maturity specific knowledge* statements (n=9) were regarding the bank requirements to claim maturity, conditions to be fulfilled to claim maturity, and how maturity amount differs for every beneficiary girl enrolled under the scheme. 83% beneficiary girls knew that the girl herself is the one who can claim the money entitled under Ladli scheme on maturity. 91% girls and 87% parents knew about the primary conditions that were required to claim maturity i.e. passing class XII and attaining 18 years of age. Majority of the girls and their parents remained ignorant about the dependency of maturity amount upon the stage of enrolment and subsequent timely renewals planed under the scheme at various milestones.

The study found that stage of enrolment, type of school and socio-economic status made a difference to the knowledge scores of the beneficiary girls and their parents respectively at 5% level of significance.

**Table 1: Effect of stage of enrolment on the knowledge scores of beneficiary girls**

| *Stage of enrolment* | *N* | *Mean* | *Std. Deviation* |
|---|---|---|---|
| Class VI | 197 | 21.3503 | 3.36764 |
| Class IX | 105 | 20.2762 | 3.29188 |
| Class XI & XII | 33 | 19.4545 | 3.73406 |
| Total | 335 | 20.8269 | 3.43631 |

F= 6.470, df = 2,332, p=0.002 (which is <0.05)

**Table 2: Effect of type of school on knowledge scores of beneficiary girls**

| *Type of school* | *N* | *Mean* | *Std. Deviation* |
|---|---|---|---|
| RPVV Schools | 175 | 22.1429 | 2.99562 |
| GGSS Schools | 160 | 19.3875 | 3.31565 |
| Total | 335 | 20.8269 | 3.43631 |

T= 7.99, df= 333, p=0.00 (which is <0.05)

**Table 3: Effect of type of school on knowledge scores of the beneficiary's parents**

| *Type of School* | *N* | *Mean* | *Std. Deviation* |
|---|---|---|---|
| RPVV Schools | 90 | 20.6333 | 4.23323 |
| GGSS Schools | 70 | 17.0571 | 2.88367 |
| Total | 160 | 19.0688 | 4.09958 |

T= 6.057, df=158, p=0.00 (which is <0.05)

**Table 4: Effect of socio-economic status on knowledge scores of beneficiary girls**

| *Socio- economic Status* | *N* | *Mean* | *Std. Deviation* |
|---|---|---|---|
| Low SES (Lowest to 10) | 88 | 19.9205 | 3.14851 |
| Medium SES (11 to 13) | 135 | 21.0148 | 3.67725 |
| High SES (14 to Highest) | 107 | 21.3832 | 3.14626 |
| Total | 330 | 20.8424 | 3.41364 |

F= 4.834, df= 2,327, p=0.009 (which is <0.05)

**Table 5: Effect of socio-economic status on knowledge scores of beneficiary parents**

| *Socio-economic Status* | *N* | *Mean* | *Std. Deviation* |
|---|---|---|---|
| Low SES (Lowest to 10) | 43 | 17.0000 | 3.33095 |
| Medium SES (11 to 13) | 57 | 20.3333 | 4.22295 |
| High SES (14 to Highest) | 58 | 19.3276 | 3.96205 |
| Total | 158 | 19.0570 | 4.09947 |

F= 9.166, df= 2, 155, p=0.00 (which is <0.05)

**Challenges faced in availing the Ladli scheme:** The lack of information about the scheme and its procedures was the biggest challenge faced by beneficiaries in availing the scheme benefits. Due to non-delivery of the letter acknowledging the confirmation of the enrolment of the girl into the scheme from Department of Women and Child Development (implementing agency), they faced problems during renewal at various milestones. The other problems were related to procurement of birth certificate and proof of residence in Delhi required for enrolment under the scheme.

**Perceptions regarding educational and career aspirations**

*Aspirations regarding education:* 92% of beneficiaries had aspirations to pursue higher education after school. They wanted to pursue a diploma/degree course to become competent and develop skills and secure a job in future. 60% of them wanted to pursue graduation while 32% aspired to pursue masters and become specialists. Others wanted to start earning directly or after pursuing a short-term course - JBT (Junior Basic Training), DIET (District Institutes of Education and Training) etc. As vocational courses are directed at a particular occupation or employment and its skills, many beneficiary girls wanted to opt for 'English speaking' and 'computer learning' courses. The socio-economic status, stage of enrolment into the Ladli scheme, type of school and presence of computer at home had a significant impact on their educational aspirations.

**Table 6: Association of stage of enrolment with beneficiaries' educational aspirations**

| | | | Educational Aspirations after XII | | | Total |
|---|---|---|---|---|---|---|
| | | | Job | Graduation | Post- Grad | |
| Stage of Enrolment | Class VI | Count | 12 | 119 | 66 | 197 |
| | | % of Total | 3.6% | 35.5% | 19.7% | 58.8% |
| | Class IX | Count | 9 | 61 | 35 | 105 |
| | | % of Total | 2.7% | 18.2% | 10.4% | 31.3% |
| | XI & XII | Count | 8 | 20 | 5 | 33 |
| | | % of Total | 2.4% | 6.0% | 1.5% | 9.9% |
| Total | | Count | 29 | 200 | 106 | 335 |
| | | % of Total | 8.7% | 59.7% | 31.6% | 100.0% |

$\chi^2 = 13.97$, df= 4, p=0.007 ($p < 0.05$)

**Table 7: Association of type of school with beneficiaries' educational aspirations**

| | | | Educational Aspirations after XII | | | Total |
|---|---|---|---|---|---|---|
| | | | Job | Graduation | Post-Grad | |
| Type of School | RPVV | Count | 4 | 99 | 72 | 175 |
| | | % of Total | 1.2% | 29.6% | 21.5% | 52.2% |
| | GGSSS | Count | 25 | 101 | 34 | 160 |
| | | % of Total | 7.5% | 30.1% | 10.1% | 47.8% |
| Total | | Count | 29 | 200 | 106 | 335 |
| | | % of Total | 8.7% | 59.7% | 31.6% | 100.0% |

$\chi 2 = 28.23$, df= 2, p=0.00 ($p < 0.05$)

**Table 8: Association of presence of computer with beneficiaries' educational aspirations**

| | | | Educational Aspirations after XII | | | Total |
|---|---|---|---|---|---|---|
| | | | Job | Graduation | Post-Grad | |
| Electronic goods in house- Computer/ Laptop | Yes | Count | 4 | 47 | 44 | 95 |
| | | % of Total | 1.2% | 14.0% | 13.1% | 28.4% |
| | No | Count | 25 | 153 | 62 | 240 |
| | | % of Total | 7.5% | 45.7% | 18.5% | 71.6% |
| Total | | Count | 29 | 200 | 106 | 335 |
| | | % of Total | 8.7% | 59.7% | 31.6% | 100.0% |

$\chi 2 = 14.38$, df= 2, p=0.001 ($p < 0.05$)

*Aspirations regarding career:* 47% of beneficiaries were inclined towards gender-atypical job as teachers in schools. Their mothers (89%) also wanted them to opt for teaching jobs. On the contrary, their fathers wanted them to pursue and aspire for a career of their own choice. The second most opted career choice was to join police/ army, aspired by 15% of them. Banking sector was the third most preferred choice; opted by 11% of them.

As many as 96% wanted to settle in their jobs and start earning before tying the nuptial knot and wanted to continue working post marriage. The leading factors that gravitated them to make a career were to become financially independent, to make their parents proud, to make decisions independently and to be able to take care of parents in their old age like sons, thereby leading the change. The study highlights that the mother's education, stage of enrolment and type of school strongly influenced the career aspirations of the beneficiary girls.

**Table 9: Association of mother's education with beneficiaries' career aspirations**

| | | | Career aspirations of beneficiary girls | | | | Total |
|---|---|---|---|---|---|---|---|
| | | | Academic Teaching | Govt. Services | Professional (Nurse/CA/ Engineer) | Others | |
| Mother's Education | Illiterate | Count | 38 | 19 | 11 | 13 | 81 |
| | | % of Total | 11.3% | 5.7% | 3.3% | 3.9% | 24.2% |
| | Primary (I to V) | Count | 29 | 21 | 3 | 7 | 60 |
| | | % of Total | 8.7% | 6.3% | 0.9% | 2.1% | 17.9% |
| | Secondary (VI to X) | Count | 63 | 30 | 11 | 12 | 116 |
| | | % of Total | 18.8% | 9.0% | 3.3% | 3.6% | 34.6% |
| | Senior Secondary or higher | Count | 29 | 25 | 20 | 4 | 78 |
| | | % of Total | 8.7% | 7.5% | 6.0% | 1.2% | 23.3% |
| Total | | Count | 159 | 95 | 45 | 36 | 335 |
| | | % of Total | 47.5% | 28.4% | 13.4% | 10.7% | 100% |

$\chi 2 = 22.80$, df= 9, p=0.007 ($p < 0.05$)

**Table 10: Association of stage of enrolment with beneficiaries' career aspirations**

| | | | Career aspirations of beneficiary girls | | | | Total |
|---|---|---|---|---|---|---|---|
| | | | Academic Teaching | *Govt. Service* | *Professional* (Nurse/CA/ Engineer) | Others | |
| Stage of Enrolment | Class VI | Count | 88 | 63 | 31 | 15 | 197 |
| | | % of Total | 26.3% | 18.8% | 9.3% | 4.5% | 58.8% |
| | Class IX | Count | 58 | 20 | 9 | 18 | 105 |
| | | % of Total | 17.3% | 6.0% | 2.7% | 5.4% | 31.3% |
| | Class XI & XII | Count | 13 | 12 | 5 | 3 | 33 |
| | | % of Total | 3.9% | 3.6% | 1.5% | 0.9% | 9.9% |
| Total | | Count | 159 | 95 | 45 | 36 | 335 |
| | | % of Total | 47.5% | 28.4% | 13.4% | 10.7% | 100% |

$\chi 2 = 15.56$, df= 6, p=0.016 ($p < 0.05$)

**Table 11: Association of type of school with beneficiaries' career aspirations**

| | | | Career aspirations of beneficiary girls | | | | Total |
|---|---|---|---|---|---|---|---|
| | | | Academic Teaching | Govt. Services | *Professional* (Nurse/ CA/ Engineer) | Others | |
| Type of School | RPVV | Count | 92 | 51 | 29 | 3 | 175 |
| | | % of Total | 27.5% | 15.2% | 8.7% | 0.9% | 52.2% |
| | GGSSS | Count | 67 | 44 | 16 | 33 | 160 |
| | | % of Total | 20.0% | 13.1% | 4.8% | 9.9% | 47.8% |
| Total | | Count | 159 | 95 | 45 | 36 | 335 |
| | | % of Total | 47.5% | 28.4% | 13.4% | 10.7% | 100.0% |

$\chi 2 = 32.59$, df= 3, p=0.000 ($p< 0.05$)

**Tailor made sex composition of children: Differential Stopping Behavior**

Gender preferences can influence a couple's fertility behavior affecting the family size and composition. The undesirability of the girl child gets manifested in the sex ratio of children within a family and ultimately impacts the national demographic scenario. In order to appraise the differential stopping behavior (DSB) of the parents of beneficiary girls, if practiced by them, the parity progression of children in the respondent's family in relation with the family size was analyzed. Out of a total of 335 respondents, the data of 280 respondent families, who had at least one son, was studied to understand the fertility behavior pattern of their parents and discern the existence and extent of gender bias.

It was found that 69% of the families had more than two children and more boys were born at higher parities. Only 17 girls were born at third parity relative to birth of 70 boys pointing towards the birth of 53 more boys and 35 more boys were born at fourth parity. The study, thus, highlights the decrease in the number of daughters with the increase in parity suggesting that girls were born as relatively older children within families [defined as the 'birth-order effect' (Basu & Jong, 2010)] as an implication of son targeting fertility behavior or DSB. The gender inequality observed at the family level is strongly indicative of deeply rooted preference for sons.

**Table 12: Ascertaining the DSB based on gender composition and parity progression of children in relation with family size**

| Total number of families as per number of children | | Birth order | | | |
|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 or beyond |
| No. of families with 2 children (N= 70) | Son | 26 | 44 | 0 | 0 |
| | Daughter | 44 | 26 | 0 | 0 |
| No. of families with 3 children (N= 110) | Son | 35 | 42 | 70 | 0 |
| | Daughter | 47 | 46 | 17 | 0 |
| No. of families with 4 children (N= 65) | Son | 29 | 19 | 27 | 44 |
| | Daughter | 17 | 22 | 17 | 9 |
| No. of families with 5 or more children (N= 35) | Son | 16 | 8 | 11 | 35 |
| | Daughter | 5 | 9 | 7 | 14 |

**Perceptions of the beneficiary girls regarding gender differentials in upbringing of children in their families**

Parents' and family interactions, attitudes and practices with the children play an important role in gender socialization. According to Ruth Hartley (Bhasin, 2000), socialization of a child takes place through four processes i.e. manipulation, canalization, verbal appellation and activity exposure that are central to the development of gender roles and are normally differentiated by sex. Due to their differential treatment and exposure, children establish the gender identities, develop and elaborate their concepts of boys and girls and their associated value in the society.

The experiences of gender-based disparities faced by beneficiary girls during the socialization process, in their own families or neighborhood were examined. Around 89% of them mentioned about strong son preference in their families and community. Some even called it 'son mania'. They all shared several experiences of differences in the cultural, religious, and social practices for a girl and a boy.

A large share of beneficiary girls experienced differences in rituals performed on the birth of a girl as compared to a boy in their community. Around 86% of GGSSS girls and 58% of RPVV girls experienced that the birthday of a girl is generally not celebrated in their families while the birthday of a boy is always celebrated. They remarked that different toys are selected and bought by parents for girls and boys. Generally, a girl is told to play with the toys of elder siblings or toys related with household roles or nurturing behavior such as a doll, kitchen set, doctor set, grooming kits, etc. While for boys, expensive and technical toys such as remote-controlled racing cars and video games are preferred. 62% of the girls pointed out that boys are given almonds, fruits, energy boosters and milk supplements to become strong and powerful, while the diet and nutrition for girls is not given much importance. Majority of them remarked that girls are generally enrolled in government schools while boys in private English medium schools. The education is focused upon

for boys and parents dream big for their sons. However, girls are stressed to learn cooking and household chores and are always reminded to be polite and humble, talk less and laugh softly.

**Table 12: Experience of beneficiary girls regarding gender-based differential treatment**

| S. No. | Differential treatment pertaining to | | RPVV (N=175) | GGSSS (N= 160) | Total (N= 335) |
|---|---|---|---|---|---|
| 1 | Birth of a child | Count | 144 | 146 | 290 |
| | | **% of Total** | **82.28** | **91.25** | **86.56** |
| 2 | Birthday celebrations | Count | 101 | 137 | 238 |
| | | **% of Total** | **57.71** | **85.62** | **71.04** |
| 3 | Toys | Count | 125 | 117 | 242 |
| | | **% of Total** | **71.43** | **73.12** | **72.24** |
| 4 | Food | Count | 94 | 116 | 210 |
| | | **% of Total** | **53.71** | **72.5** | **62.68** |
| 5 | Education | Count | 101 | 119 | 220 |
| | | **% of Total** | **57.71** | **74.37** | **65.67** |
| 6 | Clothes | Count | 106 | 130 | 236 |
| | | **% of Total** | **60.57** | **81.25** | **70.45** |
| 7 | Mobility | Count | 112 | 139 | 251 |
| | | **% of Total** | **64.0** | **86.87** | **74.92** |
| 8 | Language | Count | 102 | 124 | 226 |
| | | **% of Total** | **58.28** | **77.5** | **67.46** |
| 9 | Upbringing | Count | 61 | 88 | 149 |
| | | **% of Total** | **34.86** | **55.0** | **44.47** |

The findings highlight that parents pass on their own beliefs to children, both overtly and covertly. The reinforcement of desired behaviors by parents and their approval or disapproval becomes a reference for children, influencing the gender role development and guiding them the gender linked conduct throughout the life course.

## CONCLUSION

Almost after a decade of the implementation of Ladli scheme, lack of knowledge about the scheme and its procedures was reflected through the knowledge scores of the beneficiary girls and their parents, pointing towards the urgent need to disseminate information by the implementing agency. However, the overall picture is encouraging, as majority of the beneficiary girls wanted to continue their education due to financial support offered by Ladli scheme. They had high career aspirations and were determined to make a space for themselves in the professional world and lead the change by challenging the stereotypes.

The study clearly asserts gender bias towards having a son, irrespective of the number of daughters in the family and become more intense with no son at low parities in the family composition. Further, the experiences of the beneficiary girls pertaining to gender-based differential treatment necessitates revisiting the prevailing socio-cultural norms that lowers the status of girls and cause gender inequality, which in turn increases the vulnerability of the surviving girl child.The study illustrates that financial incentives do play an enabling role in altering the existing gender barriers as was evident

in parents' willingness to invest in their daughters' education and future employment. Daughters are beginning to be seen as contributors to natal and conjugal households and as contributing to the care of parents in old age. Redistribution of gender roles is imperative in such a scenario, where girls aspire and are expected to contribute to the economic development of the country.

Thus, building capacities of the girls are important so that they are able to make informed decisions, so that they don't demean themselves and their daughters in future and therefore not perpetuate gender differentials in treatment in their own parenting responsibilities.

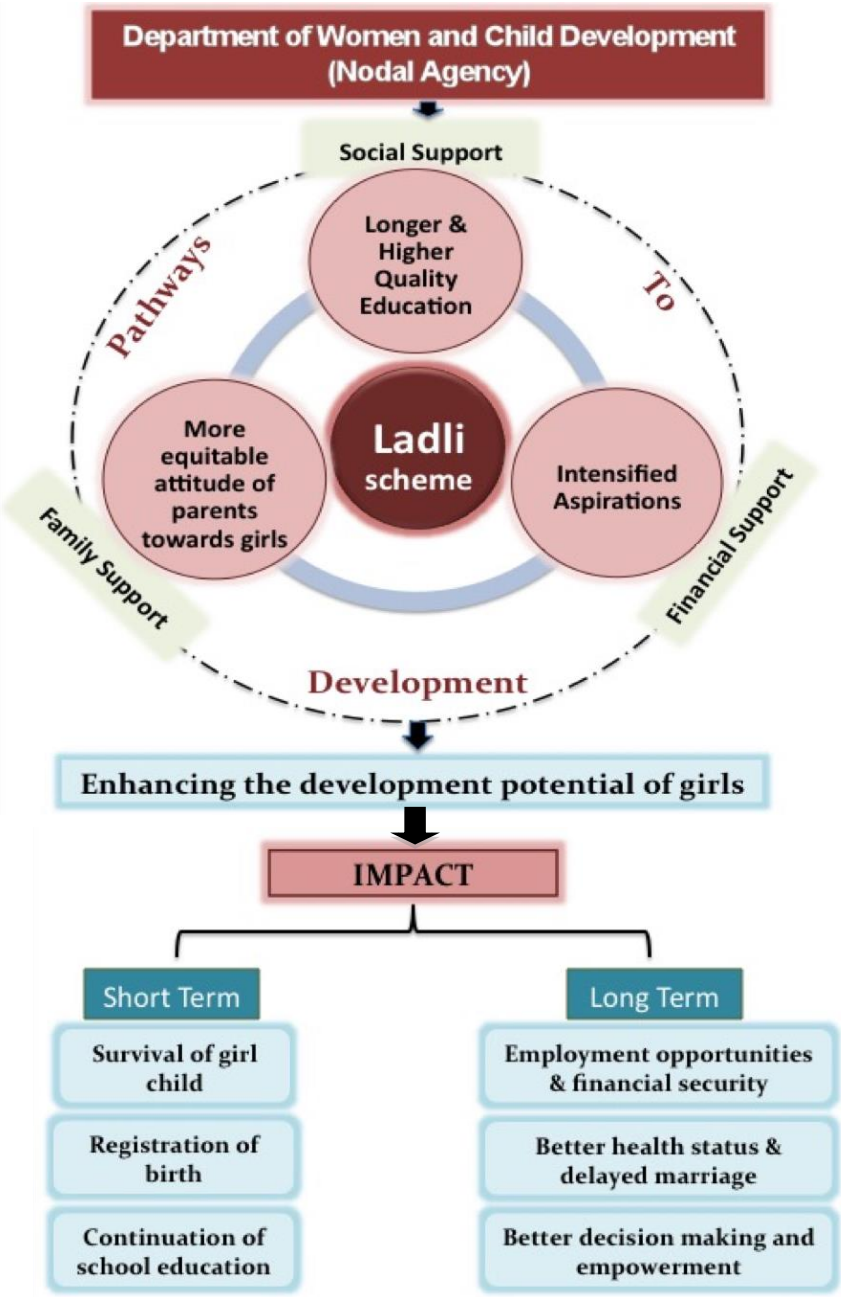


**Figure 2: Ladli scheme promoting survival and education among girl children**

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# ICT USAGE BY THE FACULTY MEMBERS OF THE MAHARAJA SAYAJIRAO UNIVERSITY OF BARODA, VADODARA

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## ABSTRACT

ICTs have developed as powerful tools for the diffusion of knowledge and information. The growing use of ICTs as an instructional medium is changing and will likely continue to change the strategies employed by educators in the teaching and learning process. In line with this, the present study was carried out to study the usage of ICT amongst the faculty members of the Maharaja Sayajirao University of Baroda, Vadodara. A total of 290 faculty members were selected through purposive convenient sampling from 14 faculties of the university. The questionnaire was used as a tool for data collection. Frequency, percentage, t-test, and ANOVA were used to analyze the collected data. The findings of the study revealed that faculty members use ICT in their teaching, research, and administrative work. The faculty members use the computer daily and for 2-4 hours per day. The majority of them have access to university Wi-Fi and computer with an internet connection. The use of e-resources was found less amongst them. There was a significant difference in the usage of ICT by the faculty members concerning their age, discipline, and competency in using ICT. It can be expected that if the faculty members were provided with the training in ICT, they were more likely to have higher ICT usage for their professional work.

**Key Words**: ICT, higher education, technology, teaching

## INTRODUCTION

ICT is an electronic means of capturing, processing, storing, communicating information. The use of ICT in classroom teaching-learning is very important as it provides opportunities for teachers and students. It operates stores, manipulates, and retrieves information. ICT encourages independent and active learning, such as distance learning. It also motivates teachers and students to continue using learning outside the university (Ali, Haolader, & Muhammad 2013). For many years, the three R's of reading, writing, and arithmetic were considered the foundation of the education needed to function in society. Today, Information, Communication Technology (ICT) has, however, assumed a very important role in education and society at large. As a result, it was predicted that knowing how to use a computer will in the new future be as important as reading and writing. (Edumadze & Owusu 2013)

Information and Communication Technology (ICT) is an umbrella term which describes technologically advanced communication devices or application of devices such as computers and the internet, as well as the various services and application that are associated with them. As a strategy, ICT can play important roles in addressing issues of teaching and learning only if considerable effort is put into its implementation and in an appropriate context. (Lawal & Oloyede 2013)

ICTs have developed as powerful tools for the diffusion of knowledge and information. The growing use of ICTs as an instructional medium is changing and will possibly continue to change the strategies employed by educators in the teaching and learning process. ICT is a force that has changed many aspects of the way we live. As we move into the 21st century, these factors and many others are bringing strong forces to bear on the adoption of ICTs in education and contemporary trends suggest we will soon see large scale changes in the way education is planned and delivered as a consequence of the opportunities and affordances of ICT. It has no doubt brought about tremendous change in education, but we are yet to achieve the desired level of IT adoption in higher education in the country. The optimal utilization of opportunities arising due to the diffusion of ICTs in the higher education system presents an enormous challenge (Oliver, 2002).

Nonetheless, it has become an indispensable support system for higher education as it could address some of the challenges facing the higher education system in the country. It can provide access to education regardless of time and geographical barriers. Wider availability of course material in education which can be shared using ICT can foster better teaching. While technology can influence the way students are taught, it would also enable the development of collaborative skills as well as knowledge creation skills. ICT enabled education will ultimately lead to the democratization of education and it has the potential for transforming higher education in India (Pegu, 2014).

India's internationally renowned The Maharaja Sayajirao University of Baroda is one of the oldest centres of learning in Western India. It has 1200 well-qualified faculty members to facilitate the learning of more than 35,000 students having cosmopolitan life on campus (www.msubaroda.ac.in). A perusal of available literature on the ICT in higher education and referred reviewed literature by researcher did not find any investigation on the access and usage of ICT among the faculty members of The Maharaja University of Baroda, Vadodara, Gujarat state. Hence, it was decided to study the usage of ICT amongst faculty members of The Maharaja Sayajirao University of Baroda, Vadodara.

The present study was carried out to examine ICT use, in academic activities among the faculty members. It also intended to investigate the relationship between ICT use by faculty members and the level of academic activities. This study benefits the educational administrators, teachers, parents, students, and social scientists in particular and the society in general. The increased dependence on the Internet among college teachers and educational workers is also one of the factors that needs to be studied. Further, the present study can also serve as a data bank for scholars and authorities of the various universities for further reference and also to design strategies and plans to develop the university libraries following the modem times whereby the faculty members, as well as the students /scholars, could become efficient in teaching as well as make their works more creative, productive and world standard ones.

## OBJECTIVES OF THE STUDY

1. To study the profile of the faculty members of the Maharaja Sayajirao University of Baroda, Vadodara.

2. To study the usage of ICT by the faculty members of the Maharaja Sayajirao University of Baroda, Vadodara.

3. To study the differences in the usage of ICT by the faculty members of the Maharaja Sayajirao University of Baroda, Vadodara in relation to their
    a) Age
    b) Designation
    c) Discipline
    d) ICT competency
    e) Opinions towards ICTs
    f) Technological infrastructure

## NULL HYPOTHESIS

- There will be no significant differences in the usage of ICT by the faculty members of the Maharaja Sayajirao University of Baroda, Vadodara in relation to their age, discipline, designation, competency in using ICT, opinions towards ICT and technological infrastructure.

## REVIEW OF LITERATURE

Researcher conducted a literature search using a subject heading and free-text searching.

**Table 1: Reviewed Research Studies**

| **Author & Year** | **Study Design** | **Sample and Sample Size** | **Sampling Technique & Tool for Data Collection** | **Outcomes** |
|---|---|---|---|---|
| Gracebell 2017 | Survey | 220 from 15 different colleges of education from Madurai district | *Stratified Random Sampling *ICT integration inventory | Average integration of ICT. Female teachers integrate more ICT |
| Das, Kharbuli and Rynjah 2017 | Survey | 475 Teachers | *Simple Random Sampling *Questionnaire | Use M. S. Office, internet. And Acquired knowledge of ICT by self-instruction. |
| Gazi and Arikan 2015 | Descriptive Study | 112 Instructors | *Convenience sampling *Questionnaire | Search engines, e-mails, and social network sites were the most frequently used tools. Word processing, presentation software, and instant messaging were used with high proficiency. |

| | | | | |
|---|---|---|---|---|
| Reilly 2014 | Descriptive Study | 186 - part-time faculty of U.S. colleges and universities | *Random sampling *Questionnaire | Often use productivity tools, multimedia presentations, internet and web applications, computer projection, and e-mail. |
| Ali et.al. 2013 | Empirical Study | 90 teachers and 75 administrators from five selected higher institutions | *Stratified Random Sampling *Questionnaire | Use computers for teaching-learning mostly to prepare a lesson plan. ICT has reduced the burden of keeping hardcopy. |
| Lawal and Oloyede 2013 | Survey | 56 Teachers Nigeria | *Simple random sampling *Questionnaire | Use multimedia, Word processors, and presentation software frequently. |

The reviewed literature shows that the use of ICT was found amongst the faculty members. The results from most of the reviewed studies highlighted that university teachers use a word processor and PowerPoint presentation to prepare their class notes and for teaching. Further, the studies revealed that university teachers were using productivity tools, multimedia presentations, Internet and web applications, e-mail, and other Internet tools in their teaching. The reviewed studies also indicated the heavy usage of e-resources by teachers for their teaching and research purposes. They opined that Web 2.0 tools make teaching more interesting and increases student motivation in learning. The analysis presented above shows that there is a reasonable interest among faculty members in the use of ICT and its resources.

## METHODOLOGY

The purpose of the present study was to understand the use of ICT by faculty members of The Maharaja Sayajirao University of Baroda, Vadodara. The survey method was used in this study with a quantitative method for data collection.

### Population and sample of the study

The population of the study comprised of all the faculty members of The Maharaja Sayajirao University of Baroda, Vadodara. The Maharaja Sayajirao University has a total of 14 faculties. All the faculties of the university were purposively categorized into three categories that are Science and Technology, Humanities, and Social Science. In total, two hundred and ninety faculty members were selected conveniently from all the three disciplines by using a purposive convenient sampling method to collect the data.

### Tool for data collection

A questionnaire, rating scales were designed and used to collect the data. The content validity was checked for the developed research tool. To check the reliability of the research tool, the test-retest method was used and it was found reliable at 0.958 levels.

### Procedure for data collection

The data was personally collected by the investigator by administering the questionnaire from November 2018- May 2019. The questionnaire was distributed amongst the faculty members of each department and they were requested to fill the questionnaire. Google form was also created and a web link was shared via email and WhatsApp with faculty members to collect the data. The response rate through online mode was very low. Nearly 575 forms were distributed amongst the faculty members for the data collection. Out of which 298 questionnaires were received back. Later 290 questionnaires were selected as data-generating questionnaires with a 50.43% response rate.

### Plan of statistical analysis

Different statistical measures were used to analyze the collected data. The data were coded and analyzed using computer software namely M. S. Excel and SPSS. Frequency, percentage, t-test, and ANOVA were used to measure the collected data.

## FINDINGS AND DISCUSSION

### Profile of the faculty members

The findings of the study reveal that more than one third (34.8%) of the faculty members were young teachers whereas 31% of the faculty members were in their middle age. Senior teachers (33.8%) were also the respondents for the present study. This revealed that nearly equal percentage of the faculty members from all the three different age groups constituted the sample of the study. Nearly 59% of the faculty members were female whereas 41% of the faculty members were male. This shows that as respondents, female members were more in number than male members from the faculty as sample of the study.

The findings revealed that nearly 50% of the samples were Temporary Teaching Assistant and Temporary Assistant Professor; 29% were Assistant Professors and 14.5% were professors. It reveals that as respondents the percentage of Assistant Professor and Temporary Assistant Professor were more in number which shows their interest and sincerity towards the study. The data also indicate that 37% of the faculty members had 5-15 years of experience in teaching and 40% had 3-10 years of experience in research.

**Table 2: Distribution of the Faculty Members According to the Availability of ICT Resources in their Department**

(n=290)

| ICT Resources | In the Cabin/Staff Room | | In the Classroom | | In the Common area | |
|---|---|---|---|---|---|---|
| | f | % | f | % | f | % |
| A desktop computer without an internet connection | 58 | 20.0 | 26 | 9.0 | 61 | 21.0 |
| A Desktop Computer with an internet connection | 186 | 64.1 | 41 | 14.1 | 130 | 44.8 |
| Scanner and Printer | 144 | 49.7 | 19 | 6.6 | 118 | 40.7 |
| Interactive whiteboard | 23 | 7.9 | 97 | 33.4 | 46 | 15.9 |
| LCD Projectors | 24 | 8.3 | 171 | 59.0 | 81 | 27.9 |
| Smart TV | 6 | 2.1 | 19 | 6.6 | 22 | 7.6 |
| University Wi-Fi | 202 | 69.7 | 189 | 65.2 | 193 | 66.6 |

*Multiple Choices

The Maharaja Sayajirao University provides a Wi-Fi facility to its staff and students. The findings of the study revealed that the majority (69%) of the faculty members had access to university Wi-Fi on the campus. Cabin/staff rooms of faculty members also had a University Wi-fi facility (69.7%) and a computer with an internet connection (64.1%). About majority (59.0%) reported that LCD projectors were available in the classrooms. The data, therefore, reveals that cabins and classrooms in the Maharaja Sayajirao University are equipped with technology like computers, LCD projector, and W-Fi connectivity. It reveals that more than 40% of faculty members had access to the computer with an internet connection, scanner, and printer in the common area. They also reported the availability of the LCD projector (27.9%), computer without internet connection (21%), and interactive whiteboard (15.9%) in the common area. This shows that the faculty members can have access to technology in the common area if they don't have it in their cabins or classrooms.

Majority (77.2%) of the faculty members had not attended any formal courses related to computers whereas twenty-two percent of the faculty members attended the course related to computers like CCC, CCC+, Java Scripting, Basics of Computer. Half of them had attended workshops/ seminars on the use and integration of ICT in education whereas 23% of the faculty members attended the workshop on the use of e-resource.

**Usage of ICT by the faculty members**

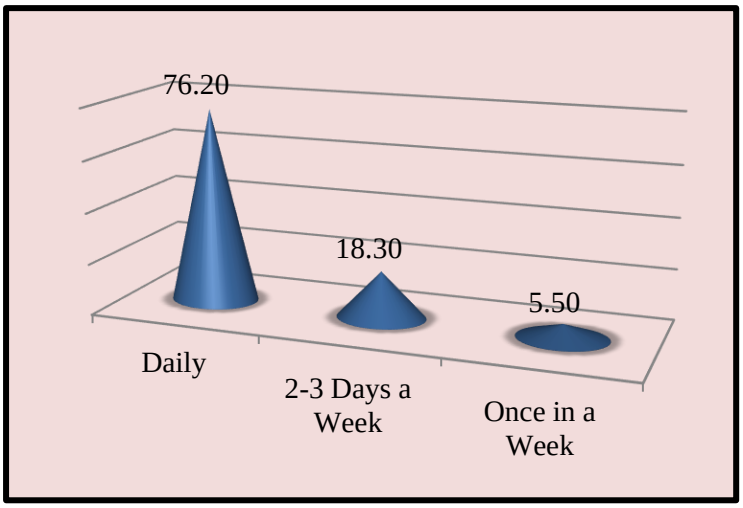


**Figure 1: Percentage Distribution of Faculty Members According to their Frequency of Using Desktop/Laptop**

The data indicate that the frequency of using a computer is high amongst the faculty members of the university. Today majority of the work related to teaching, research, and administration are done through technology. Therefore, this may be the reason that majority (76.2%) of the faculty members were using their computers daily.

It was revealed that 47.2% of the faculty members were spending 2 to 4 hours per day on desktop/laptop. A majority of them were using University Wi-Fi (67.9%) and mobile data (64.5%) to access the internet on the campus. A higher percentage (57.2%) of the faculty members was spending 2 to 3 hours per day on the internet for their professional work.

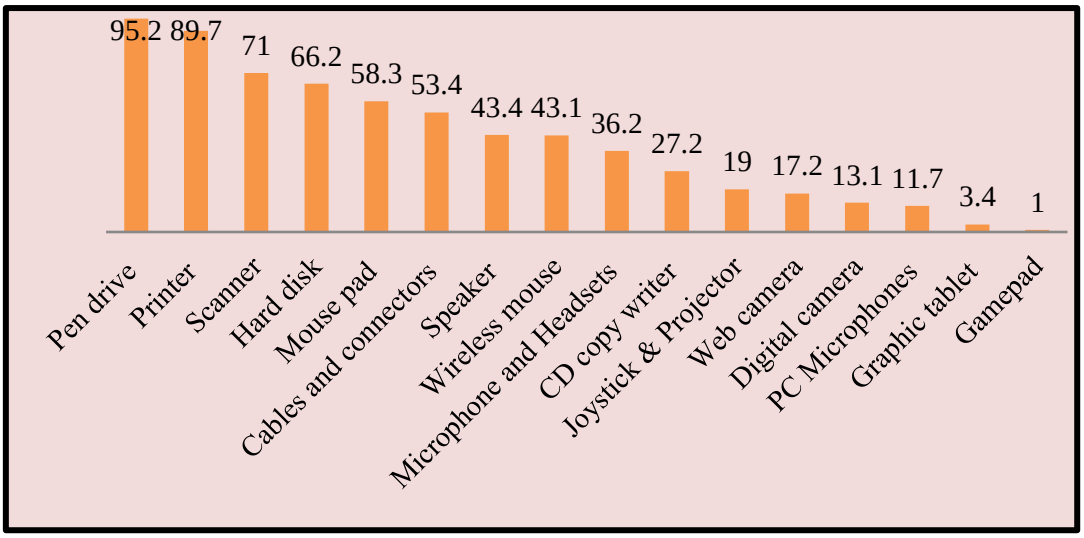


**Figure 2: Percentage Distribution of Faculty Members According to the Computer Accessories Used by them**

Different computer accessories are available to perform different tasks on a computer. Figure 2 highlights the use of computer accessories by faculty members. The result shows that a high majority of the faculty members were using Pen Drive (95.2%), Printer (89.7%), Scanner (71%) and Hard Disk (66.2%). It is also evident from the above figure that equal percent (43%) of the faculty members were using Speakers and Wireless Mouse whereas very few of them were using Graphic Tablet (3.4%), PC Microphones (11.7%), and Gamepad (1%).

It was also revealed that a high majority of the faculty members were rarely/never used the resources available on Hansa Mehta Library Portal. More than one fourth (29%) of the faculty members were using e-resources sometimes for teaching whereas 21% of them were using science magazine sometime for teaching. Nearly half (49%) of them were using desktop/laptop most of the time for teaching, research, and administrative work whereas 24% of them were using an LCD projector either sometimes or most of the time for teaching. A majority of the faculty members were using M. S. Word most of the time in teaching whereas 40% of them were using PPT for teaching and research work. The data also reveal that a higher percentage of the faculty members were using e-journals (44%) and online journal articles (42%) most of the time for their research work. Almost equal percent and of the faculty members were using Google Drive most of the time for teaching (41%) and research work (40%).

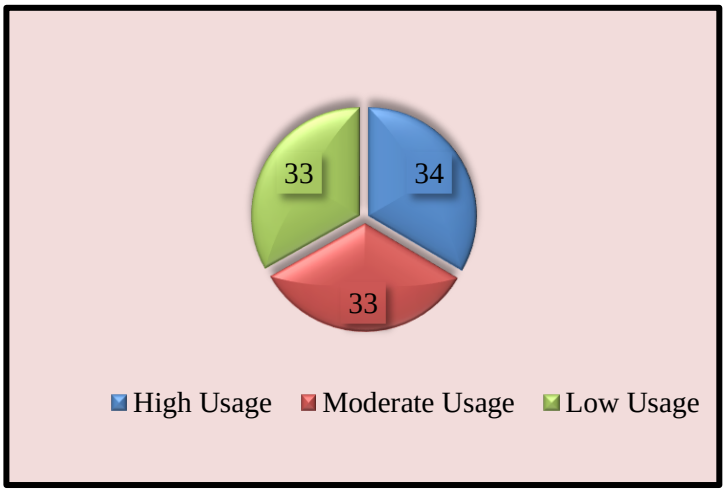


**Figure 3: Percentage Distribution of the Faculty Members According to their Overall Usage of ICT**

Figure 3 presents the frequency and percentage for the overall usage of ICT. It shows that equal percent (33%) of the faculty members had high, moderate, and low ICT usage. The probable reason for such a finding could be some of the faculties use ICT frequently as well as their subjects might be such which allows them to use ICT at a maximum level such as Science and Technology. On the other hand disciplines like Performing Arts, Mathematics, and Fine Arts where they had more practical and hand-on work experiences, and therefore the use of technology is found less.

**Table 3: Differences Calculated through t-ratio of the Usage of ICT by the Faculty Members in Relation to Selected Variables**

(n=290)

| Variables | Categories | n | Mean | S.D. | t – Value |
|---|---|---|---|---|---|
| Opinions towards ICT | Favourable | 157 | 220.39 | 42.08 | - 0.95 |
| | Unfavourable | 133 | 225.01 | 40.09 | |
| Technological Infrastructure | Good | 144 | 236.19 | 43.10 | -5.92** |
| | Poor | 146 | 209.01 | 34.62 | |

*Significant at 0.01 level

It can be seen from table 3 that concerning faculty members' opinions towards ICT there was no significant difference in the overall usage of ICT. It indicates that there was not much difference among faculty members' opinions concerning the usage of ICT. Thus, the null hypothesis stating that there will be no significant difference in the usage of ICT in relation to their opinions towards ICT was accepted. The table further indicates that in relation to technological infrastructure there was a significant difference. The difference was found between poor infrastructure and good infrastructure. It reveals that the faculty members with poor technological infrastructure had more usage of ICT. Thus, the null hypothesis stating that there will be no significant difference in the usage of ICT concerning technological infrastructure was not accepted. A similar finding was also found by Peeraer and Petegem (2010) in their study that access to technology is not a barrier to the use of ICT for teaching practice. Personal access to a computer in the institute results in lower use of ICT for teaching practice.

**Table 4: Analysis of Variance (ANOVA) Indicating Usage of ICT by Faculty Members in Relation to Selected Variables**

(n=290)

| Variables | Source of Variance | DF | Sum of Square | Mean Square | F Value | Sig. |
|---|---|---|---|---|---|---|
| Discipline | Between Groups | 2 | 52355.490 | 26177.745 | 17.05 | 0.01 |
| | Within Groups | 287 | 440676.979 | 1535.460 | | |
| Age | Between Groups | 2 | 14697.162 | 7348.581 | 4.409 | 0.01 |
| | Within Groups | 287 | 478335.307 | 1666.674 | | |
| Designation | Between Groups | 2 | 5751.231 | 1437.808 | .841 | .500 |
| | Within Groups | 287 | 487281.238 | 1709.759 | | |
| Competency in Using ICT | Between Groups | 2 | 78123.818 | 39061.909 | 27.020 | .000 |

*Significant at 0.01, **Significant at 0.05

Table 4 reveals that there was no significant difference in the overall usage of ICT in relation to the designation of the faculty members. Therefore, the null hypothesis stating that there will be no significant difference in the usage of ICT in relation to designation was accepted. There were significant differences in the usage of ICT concerning to their discipline, age and competency in using ICT. In order to know which group's ICT usage differs significantly the data were further analyzed through post – hoc test.

**Table 5: Tukey's HSD Comparison for Usage of ICT by Faculty Members in Relation to Selected Variables**

| Variable | I | Mean (I) | J | Mean (J) | Mean DF (I – J) | SE | Sig. |
|---|---|---|---|---|---|---|---|
| Discipline | Social Science | 251.27 | Science and Technology | 220.73 | 30.54* | 6.579 | .001 |
| | | | Humanities | 211.77 | 39.50* | 6.817 | .001 |
| Age | Young | 230.74 | Senior | 213.57 | 17.17* | 5.789 | .001 |
| Competency in Using ICT | Moderately | 231.41 | Less | 200.82 | 30.60* | 5.474 | .001 |
| | Highly | 237.67 | | | 36.85* | 5.381 | .001 |

*Significant at 0.01, ** Significant at 0.05

Table 5 shows that those faculty members who were from Social Science had more usage of ICT than faculty members from Science and Technology as well as from Humanities. This is a surprising finding that faculty members belonging to Science and Technology had less usage than Social Science. Further, the data reveals that faculty members belonging to the young age group had more usage of ICT than those were senior teachers. Young teachers are born in the age of technology, they might be more techno-savvy and might have more confidence in using ICT compare to senior teachers. The findings also reveal that highly and moderately competent faculty members had more usage of ICT than the less competent faculty members. High and moderate competency levels may give more confidence in the use of ICT and therefore they may use more ICT.

## CONCLUSION AND RECOMMENDATION

Today, a variety of Information and Communication Technology (ICTs) can facilitate not only the delivery of instruction but also the learning process itself. It can promote international collaboration and networking in education and professional development (Sagar 2007).

The findings of the present study throw light on ICT usage by the faculty members in their teaching, research, and administrative work. It was found that a high majority of faculty members use ICT daily for 2-4 hours. Almost equal number of faculty members were using ICT in their teaching, research, and administrative work. The findings also indicate that the use of online resources amongst the faculty embers was low and they also insisted on training for this.

The statistical analysis indicates no significant differences in the usage of ICT by the faculty members in relation to their opinions towards ICT, and their designation. The significant differences were observed in usage of ICT by them in relation to their age, discipline, competency in using ICT and technological infrastructure in the department. Young faculty members belonging from Social Science discipline with high and moderate competency had high usage of ICT. It indicates competency in using ICT positively affects the usage of ICT. Hence, it can be expected that if the faculty members were provided with the training in ICT, they were more likely to have higher ICT usage for their professional work. It is recommended that an enabling environment that will encourage the usage of ICT by faculty members in the university should be created. Faculty

members should be encouraged to acquire more ICT skills and knowledge. ICT infrastructure should be provided to meet up with the present educational challenges.

A similar study with other variables such as years of experience, gender, attitude towards can be carried out. A similar study with similar objectives can be carried out in other universities. A comparative study of the usage of ICT in government and private universities also can be carried out. In the COVID 19 pandemic ICT proves its importance to the use of ICT by teachers during and after COVID 19 also can be carried out.

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# A STUDY ON PERCEPTION OF HIGH SCHOOL STUDENTS TOWARDS HOME/ COMMUNITY AND AGRICULTURE SCIENCES

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## ABSTRACT

Home/ Community Science is not only capable of preparing the youth and adults for self-employment but also contributes effectively in development of family and society. It is a very important subject in course curriculum in schools and universities but due to the social stigma and its name, it has become a subject that has lowest enrolment in universities and other tertiary institutes. These factors, low enrolment and social stigma may force wrong perception of the subject amongst adolescents. To identify the perception of home/community and agricultural science among high school students and its underlying factors, the present research (conducted under the ICAR funded extramural project) was carried out purposively in Jaipur city of Rajasthan state where perception of high school students was gathered through a structured interview schedule. The total sample size for the study was of 280 high school students, randomly selected from the city.The results showed that they know that it is not an arts stream based subject but still perceive that it's limited to one's gender. Most of them were not satisfied with the Nomenclature of Home Science and wouldn't agree to opt it in future as they were lacking the knowledge about its respective departments. The respondents also had no knowledge about the skill education aspect of Home/Community and Agriculture Sciences.

**Keywords:** Perception, Knowledge, Nomenclature, Home/Community and Agriculture Sciences

## INTRODUCTION

Home/ Community and Agriculture Sciences are the education that relates to both home and family. These are the educational streams that provide basic knowledge and assist human to attain more self-reliant and fulfilled living. Home/ Community Science deals with all aspects of family living variables as it unifies the knowledge from all disciplines of biology, physics, arts, humanities for effective home management. Home/ Community Science is not only capable of preparing the youth and adults for self-employment but also contributes effectively in development of family and society. It is a very important subject in course curriculum in schools and universities but due to the social stigma and its name, it is the subject that has lowest enrolment in universities and other tertiary institutes. In addition to its low enrolment, it has wide gender disparity as most students think it as a gender-based subject. These factors, low enrolment and social stigma may have forced the subject towards wrong perception amongst the adolescents. It is therefore of

paramount importance to find out the influencing factors leading to negative perception of the subject, causes and suggestions to retain the students in Home Science Education.

With a booming education sector in the country, India has the largest student population in the world; over 350 million students. To ensure that this young upcoming generation gets itself involved in fields requiring most consideration, efforts will have to be put to provide that direction, right from schools. As per the **All India Survey on Higher Education (2015-16)** conducted by Ministry of Human Resource Development, Department of Higher Education (New Delhi), there are only 9970 students enrolled in higher education under home science, only 98876 students are enrolled in B.Sc. (Agriculture) as compared to 5,09,031 students in Bachelor of Sciences and 13,80,583 in Bachelor of Arts. The Gross Enrolment Ratio in higher education of Rajasthan is only 18.50 percent for females; which is sadly lower than Chandigarh (70.40%), Delhi (48.20%), Tamil Nadu (42.40%) and Himachal Pradesh (35.50%) along with other sates of India.Home Science is a vast and varied field and agriculture is the backbone of India.

For any individual, two of the most important goals in life are family and career. Home Science empowers the person to handle both efficiently. Home Science is the only subject which prepares young learners for the two most important goals in their lives - looking after their home and family and preparing for a career or vocation in life. But for any subject to thrive and prosper, it requires constant inflow of talented students. However, with the lack of awareness regarding home science and agriculture as a profession, rigorous marketing practices of educational institutes concerning non-agricultural education and numerous other reasons, there is a constant decline in students opting for home science and agricultural sciences in higher education (NEP, 2019).

There is a need to change the perception and popularize the subject among adolescent students for socio-economic development of the society. There is a need for focussed campaigns for the youth about the importance of the subject and its career prospects. This could be done through seminars, workshops, mass media campaigns or development of digital solutions for attracting and retaining the students towards Home Science and Agriculture. Study conducted on cognizance about Home Science in Kerala (Fatima, 2015) found a monumental difference between the awareness level of students on the basis of rural and urban backgrounds and also state and CBSE syllabus. Analysis study of the perception of students on agriculture concluded that about one-third of the respondents have a negative perception that farming occupation is meant for the less privileged in the society.

Hence, the present study was conducted with an aim to ascertain the perception of high school students towards Home/ Community and Agriculture Sciences. The knowledge of this perception will further help in listing the key points that can be addressed via awareness, educational and digital strategies to deal with the issue of low enrolment and ensuring inflow of better students towards these dynamic fields of education. This research can be monumental in devising strategies that can rejuvenate these fields facing decline in popularity.

## OBJECTIVE

To ascertain the perception of high school students towards Home/ Community and Agriculture Sciences

## METHODOLOGY

The present research (conducted under the ICAR funded extramural project) is focussed on perception of Home/ Community and Agriculture Sciences among High-School students in Jaipur. The study was carried out purposively in Jaipur city of Rajasthan state. Information pertaining to perception of high school students and their suggestions regarding the education system was gathered through a structured interview schedule. The total sample size for the study was of 280 students and was taken from random selection of schools. The Statistical methods applied for data analysis were frequency and percentage method.

## RESULTS AND DISCUSSION

### 1. Socio-economic profile of respondents

**Age**

Most of the students (table 1) were from high (57.14%) to medium (23.93%) age group, old enough to understand the concept of choosing the right stream according to their personality and considering varied career options.

**Gender**

There wasn't much difference between the number of male and female respondents in the study. Nearly 45 percent respondents were male and 54 percent were females.

**Father's Occupation**

Results related to father's occupation showed that most (33.57%) of the respondent's fathers were in service. This was followed by self-employment (26.07%), Labour (22.85%) and Farming (17.50%).

**Mother's Occupation**

The data with regard to Mother's occupation showed that approximately majority (59.64%) of them were home-makers. This was followed by farming/Labour (16.43%), Self-employment (16.07%) and Service (7.86%).

**Monthly family Income**

Data further reveals that most of them had low (41.79%) to medium (37.50%) monthly family income and only 37.5 per cent of the respondents had high family income.

**Table 1: Socio-Economic distribution of respondents**

**(N=280)**

| S.No. | Variables | f(%) |
|---|---|---|
| **1.** | **Age (In years)** | |
| | Low (Below13) | 53 (18.93) |
| | Medium (14-16) | 67 (23.93) |
| | **High (Above 16)** | **160 (57.14)** |
| **2.** | **Gender** | |
| | Male | 127 (45.35) |
| | **Female** | **153 (54.64)** |

| | | |
|---|---|---|
| **3.** | **Father's Occupation** | |
| | Labour | 64 (22.85) |
| | Farming | 49 (17.50) |
| | Self-employment | 73 (26.07) |
| | **Service** | **94 (33.57)** |
| **4.** | **Mother's Occupation** | |
| | **Home maker** | **167 (59.64)** |
| | Farming/labour | 46 (16.43) |
| | Self-employment | 45 (16.07) |
| | Service | 22 (7.86) |
| **5.** | **Monthly Family Income** | |
| | **Low (₹ 50,000-10,0000)** | **117 (41.79)** |
| | Middle (₹ 10,0001-20,0000) | 105 (37.50) |
| | High (Above ₹ 20,0001) | 58 (20.71) |

*Note: Figures in parentheses indicate percentages.*

So overall, the socio-economic profile of the subject group portrayed a gender neutral group of adolescents having service class fathers and home maker mothers and belonging to a low monthly income category. The importance of socio-economic profile of young students was studies by Murray and Pujar (2017). Their research concluded that, "socioeconomic status (SES) negatively effects the career decision making of undergraduate emerging adults such that individuals from lower SES have more difficulties in terms of lack of readiness, lack of information, inconsistent information and overall career decision making difficulties".

**Perception about Home/ Community and Agriculture Sciences**

Data presented in Table 2 depicts the perception of High school students towards Home/ Community and Agriculture Sciences. It is evident from the table that more than half of the respondents (54.64%) believe that Home/ Community and Agriculture Sciences is not arts stream based subject, while 45.36 per cent still consider it as a arts-stream based subject.

Results in the Table also showed that more than one-fourth of the respondents (27.86%) had an opinion about degree in Home/ Community and Agriculture Sciences as it is for girls only. This is followed by the opinion that it has no professional career (22.14%), only has skill-based knowledge (19.29%) and for students who are weak in academics and have poor grades (18.21%) respectively. Nearly 12.5 per cent of the respondents had the opinion that Home/ Community science is for sewing and cooking and learning to be good home-makers.

**Table 2: Perception about Home/ Community and Agriculture Sciences**

**(N=280)**

| S.No. | Variables | f(%) |
|---|---|---|
| **1.** | **Arts stream based subject** | |
| | i. Yes | 127 (45.36) |
| | ii. No | **153 (54.64)** |
| **2.** | **Opinion about degree in Home/ Community and Agriculture Sciences** | |
| | i. For girls only | **78 (27.86)** |
| | ii. Skill-based knowledge | 54 (19.29) |

| | | |
|---|---|---|
| | iii. No professional career | 62 (22.14) |
| | iv. For students who are weak in academics | 51 (18.21) |
| | v. For sewing and cooking learning | 35 (12.50) |
| **3.** | **Home Science/ Community Science and Agriculture subjects limited to one's gender** | |
| | i. Yes | **178 (63.57)** |
| | ii. No | 102 (36.43) |
| **4.** | **Satisfied with the nomenclature of Home Science** | |
| | i. Yes | 74 (26.43) |
| | ii. No | **206 (73.57)** |
| **5.** | **Chosen Home Science if it would have had some other name** | |
| | i. Yes | 104 (37.14) |
| | ii. No | **176 (62.86)** |
| **6.** | **Profession in Home Science/ Community Science and Agriculture can be successful** | |
| | i. Yes | 98 (35.00) |
| | ii. No | **182 (65.00)** |
| **7.** | **Knowledge about Home Science and Agriculture that it provides skills that can directly be useful for generating self- employment** | |
| | i. Yes | 134 (47.86) |
| | ii. No | **146 (52.14)** |

*Note: Figures in parentheses indicate percentages.*

Further revelation of the results shows that majority of the respondents (63.57%) think of Home/ Community and Agriculture science subjects that it is limited to one's gender only assuming Home/ Community science is for girls and Agriculture science for boys, while 36.43 per cent of them disagree with this point.

Results in the Table 2 also showed that majority of the respondents (73.57%) were not satisfied with the nomenclature of Home Science and 37.14 per cent would have chosen it if it would have had other name, while 26.43 per cent of the respondents were satisfied with the nomenclature of Home Science and 62.86 per cent never had chosen it if it would have the name other than Home Science.

It is evident from the Table 2 that majority of the respondents (65.00%) believed that profession and career in Home/ Community and Agriculture science can never be successful as doesn't give Job Security, because of its name, subjects are not updated, gender-specific image and is not a professional course. While only 35 per cent of them disagree with this statement as it provides ccommunication skills, personality development, encourages for self employment, effective household management, related to everyone's lifestyle, links the real world and work at grass root level.

Results further showed that more than half of the respondents (52.14%) believe that Home/ Community and Agriculture science cannot be useful in generating self-employment directly. While 47.86 per cent still believes that knowledge about Home/ Community and Agriculture science can provide the skills that is useful in directly generating self-employment as it provides Communication skills, Inter-personal skills, Self-management skills, Learning skills, Intellectual skills, Management and career development skills.

So overall, the respondents perceived home/community and agriculture science as gender partisan subject, with dissatisfaction over the nomenclature of Home Science, and distrust over the success after pursuing home/community and agriculture science either as a profession or in generating self employment.

**Information regarding influence and pursuance of Home/ Community and Agriculture Sciences**

Table 3 depicts whether the respondents experience any sort of influence to opt for Home/community science and agricultural science. Only 15 percent of the subjects were influenced by Family members, teachers, peers and relatives for enrolling in Home/ Community and Agriculture Sciences. As high as 85 percent of the respondents showed that 'they were not influenced by anyone for opting these subjects.

Further, table revealed that only less than a quarter of the respondents wanted to pursue the subject streams under study whereas 77.50 percent respondents had no interest in pursuing Home/ Community and Agriculture Sciences. The respondents believed these subjects to be having comparatively less job opportunities, are not very glamorous, has social stigma and is only for girls or for rural community background people. Further, only 5 percent of the respondents felt some pressure in opting for these subjects for higher studies.

Data in the table paints a very alarming picture. The students interested in Home/ Community and Agriculture Sciences are quite low in number. Further, the number of students being influenced by family members and teachers to take up these subjects is also very low. This depicts that the streams of Home/ Community and Agriculture Sciences are losing popularity not just among the students but among the older generation as well. This will further aggravate the problem of lower enrolments in these fields of education. This finding also present a key area needing focus, which is, changing the perception of not just the students but teachers and family member towards Home/ Community and Agriculture Sciences as well.

**Table 3: Information regarding influence and pursuance of Home/ Community and Agriculture Sciences**

(N=280)

| S.No. | General questions | f(%) |
|---|---|---|
| **1.** | Influenced for enrolment in Home/Community and Agriculture Sciences | |
| | Yes | 42 (15.0) |
| | No | **238 (85.0)** |
| **2.** | Pursue Home/Community and Agriculture Sciences as vocational course | |
| | Yes | 63 (22.50) |
| | No | **217 (77.5)** |
| **3.** | Pressure in choosing Home/Community and Agriculture Sciences | |
| | Yes | 14 (5.0) |
| | No | **266 (95.0)** |

*Note: Figures in parentheses indicate percentages.*

## CONCLUSION

The data collected from the capital state of the largest state of India presents a very grim picture for higher education in Agriculture and allied fields like Home/Community Sciences. Like any other stream of education, Agriculture education also needs constant inflow of good students for this field to thrive and progress. However, with such negative perception of school student's regarding the concepts, subject content and scope of Home/Community and Agricultural Sciences, it is no wonder that the enrolment levels are struggling in Agriculture Education. The present study has three major conclusions. Firstly, results showed that these fields of education are perceived as being gender limited with clear cut dissatisfaction towards the nomenclature of Home Science. Secondly, students do not agree to opt for these subjects in future because of lack of knowledge about its respective departments and social stigma surrounding the subjects. And thirdly, poor perception was not only found among students but family members and teachers as well because they are no longer influencing the children towards these dynamic fields of education.

The need of the hour is to focus on enhancing enrolments in Home/ Community and Agriculture Sciences. Otherwise, these crucial fields will suffer greatly. In order to devise strategies for enrolment enhancement and attracting students towards these fields, we need to know the key areas demanding awareness and changes. This study offers such key areas which if addressed, can help in reviving these fields of education. Similar studies, if conducted on a wider scale, can help to draw strong conclusions and frame appropriate strategies.

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# A STUDY ON NEIGHBOURHOOD GROUPS (NHGS) EFFICIENCY FOR EMPOWERING RURAL WOMEN IN DEVIKULAM BLOCK

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## ABSTRACT

Kudumbashree women empowerment programme in Kerala has a three-tier structure with Neighbour hood Groups (NHGs) at the lowest level, Area Development Societies (ADS) at the middle level, and Community Development Societies (CDS) at the Panchayat level. As per Kudumbashree report on 31th March 2019, a total of 2.91 lahk NHGs were functioning all over the state. The overall objective of the present study is to evaluate the NHGs efficiency in Devikulam Block and how the NHGs are functioning at grass root level. The structured questionnaire was used to collect the data from randomly selected 120 sample NHGs. The collected data were coded, analysed and presented in frequency tables by using descriptive and inferential statistics through SPSS package v.23. The study concluded that, NHGs plays a vital role in rural women empowerment. The success of NHGs depends on several factors such as group cohesion, team spirit, group leadership, group interaction, group transparency and equity between the group members. In the study found that all the factors are highly reliable and influence the group efficiency.

**Keywords:** Neighbourhood Groups (NHGs), Efficiency, Devikulam Block, Kudumbashree

## INTRODUCTION

Kudumbashree is the poverty eradication and women empowerment programme implemented by the State Poverty Eradication Mission (SPEM) of the Government of Kerala. The name Kudumbashree in Malayalam language means ‘prosperity of the family’. It consists of a three tier structure with Neighbourhood Groups (NHGs) as primary level, Area Development Societies (ADS) at the ward level, and Community Development Societies (CDS) at the panchayat level. As per Kudumbashree report on 31th March 2019, the total number of families were benefitted under the programme is around 43, 93,579. Nearly 2.91 lakh NHGs were affiliated to 19,489 ADSs and 1064 CDSs. Kudumbashree membership is open to all adult women, limited to one membership per family (Kudumbashree Mission, 2020).

## OBJECTIVES

The overall objective of the present study is to evaluate the NHGs efficiency in Devikulam Block.

The specific objectives are as follows:

1. To understand the functions of NHGs at grass root level
2. To elicit the personal profile of the NHG leaders
3. To evaluate the group efficiency of NHGs in Devikulam Block

## METHODOLOGY

Methodology is the general research strategy that outlines the way in which a research project is to be undertaken and, among other things, identifies the methods to be used in it (Igwenagu, 2016).

### Design and Locale of the study

The design of the study is descriptive in nature. According to Krishnaswamy (2009), descriptive study is one which describes, records, analyses and interprets the condition that exists. It is a fact-finding investigation with adequate information and it focuses on particular aspects or dimensions of the problem under study. The present study aims at studying the efficiency of NHGs in Devikulam block in Idukki District of Kerala.

The locale selected for the present study is high range mountain landscape of Devikulam Block, which is located on the eastern slopes of Western Ghats. The study area stretches between the latitudes of $9^0$56'56''N to $10^0$21'29''N and longitudes of $77^0$ 48' 31''E to $77^0$16'14''E. Geographical area covered by Devikulam 1140 $Km^2$ which comprising 11 Village Panchayat with population of 1, 77,621 persons in 2011 census.

### Sampling technique

Convenient random sampling technique was used by the researcher to select the sample. In Devikulam block four gram pachayats namely **Munnar, Vattavada, Chinnakanal and Mattupatti panchayat** were randomly selected. There were 767 NHGs functioning in the four grama panchayat, from that 120 NHG were selected randomly as sample to evaluate the group efficiency.

### Data collection procedure

Prior to commencement of the study, the researcher visited and permission was obtained from Kudumbashree Head Office. The addresses of Kudumbashree units in Devikulam block were obtained from the concerned Community Development Society (CDS) and Area Development Society (ADS) offices, and also from the websites. Area wise lists of NHGs were obtained from the CDS office. From the list best performing NHGs were selected randomly for assessing the group efficiency. One of the criteria followed for selecting the NHG is that they must be the age of the group (year) at least three or five years in order to get valid and reliable information. Efforts were made to establish rapport with the officials concerned to ensure their cooperation for eliciting the data.

### Tools used for data collection

On the basis of appropriateness and practicability, the researcher adopted the survey method for this study. To facilitate ease in data collection, a structured questionnaire was prepared in by the researcher for collecting the data. The questionnaire comprised two parts, first part had two portions covering socio-economic background of the respondent and the general functions of the NHGs. The second part of the questionnaire had a group efficiency scale developed by the researcher to analyse the group efficiency of selected NHGs.

**Survey period**

The data were collected from November to December 2018.

**Data Analysis**

The data were coded, analysed and presented in frequency tables by using descriptive and inferential statistics through SPSS package version 23 to give clear picture of the background information of the sample and the group efficiency of the NHGs. The percentages were computed for describing the personal profile of the NHG leaders.

The Cronbach's alpha (α) reliability test is the most commonly used test to measure the internal consistency of the scale or instrument. The Cronbach's alpha (α) test gives the result between the number of zero and one, the acceptable value of alpha is ranging from 0.70 to 0.90 The internal consistency of items within each factor is determined through Cronbanch's alpha and it is generally accepted by researcher to have a coefficient of above 0.6 as appropriate, above 0.7 as good, above 0.8 as very good and above 0.9 as excellent. The mean, standard deviation, correlation coefficient were computed for describing the group efficiency.

## RESULTS AND DISCUSSION

**1. Functions of NHGs**

The Kudumbashree Community Based Organisations **(**CBOs) are built on a three-tier structure at the Panchayath/Municipality level, which has democratically elected governance systems under the new Panchayath Raj. At the primary level, there are the Neighbourhood Groups (NHGs) with 10 to 204 members, where eligible women can enroll themselves as members. These NHGs are then affiliated to an Area Development Society (ADS) at the ward level. All the ADSs in a Panchayat/Municipality are then affiliated to a Community Development Society (CDS). The membership of Kudumbashree is through its NHG and opens to women belonging to both 'poor' and 'non-poor' households, commonly referred to as BPL and APL households (Devi, 2019).

**Neighbourhood Group (NHG)**

Neighbourhood Groups (NHGs) are the primary units of the Kudumbashree community organization with ten to twenty women members selected from different economically backward families (John, 2009).

- **Membership:** Membership is given only one woman in a family who desiring membership in a NHG subject to agreeing to work with the NHG, accepting the byelaws. Once a woman gets membership, she signs in the Membership Register of the NHGs (Kudumbashree Mission, 2020).

- **Meetings:** Meetings are convened on a weekly basis in the houses of NHG members or common place. In the weekly meeting all members bring their thrift, which will be collected and recycled, to the system by way of sanctioning loans.

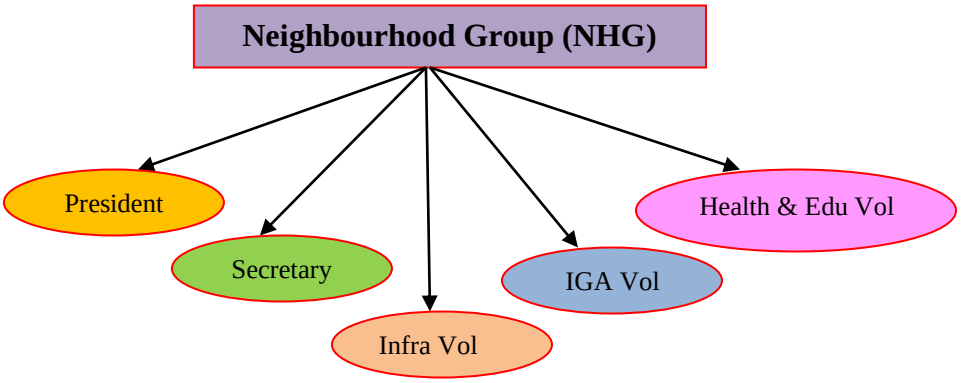
- **Structure of NHGs:** Micro plans are prepared by the members in the group meeting. As shown in figure 1, each NHG from among the poor women five volunteers are selected for undertaking various functional activities.
  - **Community Health Volunteer** --She looks after various health- related aspects of the group members including children, women and the aged. Convergence of

various programmes undertaken by Health and Social Welfare Departments are also carried out under the leadership of the Community Health Volunteer.

- **Income Generation Activities Volunteer** --Income Generation Activities Volunteer (IGA volunteer) carry out the collection, consolidation and maintenance of books of accounts and registers in connection with thrift mobilisation is looked after by this volunteer. Necessary training is imparted by NABARD for increasing their capability.
- **Infrastructure Volunteer**---Infrastructure volunteer takes the lead in tackling the Infrastructural backwardness of the group with the help of various ongoing governmental programmes. She will liaison with the local bodies and acts as a catalyst for local development.
- **Secretary** --Secretary records the proceedings of the meeting and make necessary follow up including team building.
- **President**

The president chairs the weekly meetings and imparts necessary leadership and guidelines to the group members (Kudumbashree Annual report, 2010).

**Fig: 1 Structure of NHG**




Source: Compiled from Kudumbashree Mission (2020).

**2. Personal profile of the president**

The personal information was gathered from the presidents of the NHGs. It includes the age, religion, community, education, occupation and monthly income. The personal profile of the NHGs presidents has been shown in table 1.

**Table 1: Personal Profile of the NHG Presidents**

| Variables | Number | Percentage |
|---|---|---|
| **Age** | | |
| 20-30 | 19 | 15.8 |
| 31-40 | 73 | 60.8 |
| 41-50 | 20 | 16.7 |
| Above 50 | 08 | 06.7 |
| **Total** | **120** | **100.0** |

| | | |
|---|---|---|
| **Educational qualification** | | |
| Primary school | 37 | 30.8 |
| Middle school | 27 | 22.5 |
| High school | 23 | 19.2 |
| Post high school | 14 | 11.7 |
| Graduate | 19 | 15.8 |
| **Total** | **120** | **100.0** |
| **Occupation** | | |
| Home maker | 10 | 8.3 |
| Tea plantation worker | 44 | 36.7 |
| Private employee | 31 | 25.8 |
| Wage employee | 23 | 19.2 |
| Own business | 12 | 10.0 |
| **Total** | **120** | **100.0** |
| **Monthly Income (in Rs.)** | | |
| Below 4000 | 10 | 8.3 |
| 4001-7000 | 26 | 21.7 |
| 7001-10000 | 55 | 45.8 |
| Above 10001 | 29 | 24.2 |
| **Total** | **120** | **100.0** |

More than half (60.8 %) of respondents belonged to the age group of 31-40 years, 16.8 % of the members belonged to the age group of 41-50 years and followed by 15.8 % belonged to 20-3years and only 6.7 % belonged to the age group of above 50 years. Thus, the analysis revealed that most of the respondents belonged to the age group of 31-40 years at the time of survey.

Out of 120 respondents 30.8 % had studied up to primary level education, 22.5 % and 19.2 % of the members studied up to middle school and high school level, 15.8 % of them were graduate and very few 11.7 % of then studied up to post high school. It was interesting to note that all were educated. Regarding the type of occupation, 36.7 % of the respondents were tea plantation employees, 25.8 % of them were doing private job, 19.2 % of the respondents were doing daily wage work and only 8.3 % of them had no occupation at the time survey.

It was found that 45.8 % of the respondents had an income between Rs.7001-10000/--per month, 24.2 % percent of them had an income of Rs. 10000/- above, 21.7 % of them earning between Rs. 4000-7000/- and only 8.3 % of them had an income below Rs. 4000/- per month. Thus, the analysis reveals that, all the respondents were earning from different source, nearly half of the respondents (48.8 %) had income between Rs.7000-10000/-.

### 3. Analysis of Group Efficiency

The NHGs group efficiency has been studied under seven factors, viz. group cohesion, team spirit, group interaction, group leadership, group transparency and equity between the groups.

The level of agreement of the respondents on a five-point Likert type Scale, 1 being the lowest level through 5 being the highest level of agreement on the statements under each of the factors, is presented in this section. The reliability and validity of the items were also tested to confirm the scale of the items selected for the study. The mean value of each statement has the ranges between the values of 1 to 5. Tables 2 to 7 discuss the analysis of group efficiency.

i. **Group Cohesion:** Group cohesion is a social process where the members have been interacting with each other's to influence the group efficiency

**Table 2: Group Cohesion**

| Group cohesion | Mean | Standard Deviation | Correlation | Reliability coefficient |
|---|---|---|---|---|
| The group exhibits high 'we-feeling' in group activities | 3.725 | 1.111 | .784 | 0.844 |
| The group has informal friendly relationship among themselves | 3.950 | 1.148 | .769 | |
| Ready to forgot personal difference to arrive at common consensus in group programme | 3.675 | .867 | .633 | |
| In spite of difference in opinion, members would like to remain together in the group | 3.517 | .698 | .507 | |

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The table 2 depicts the descriptive statistics of the level of agreement of respondents on group cohesion. The respondents have expressed highest level of agreement (3.950) on the statement 'The group has informal friendly relationship among themselves' followed by low level 'In spite of different opinions, members would like to remain together in the group' (3.517). Therefore it is clear that the members have good relationship with group members. The internal consistency of items within each factor is determined through Cronbanch's alpha test. Therefore reliability co-efficient of 0.844 verifies that the statements taken under the study is highly reliable. It is also found that there is a high positive correlation between the statements. It has been inferred from the results, the group cohesion has encouraged the organizational innovations and growth of the NHGs.

ii. **Team Spirit:** According to Cambridge dictionary 'team spirit is a feeling of belonging together that the members of a group have towards others in the group'.

**Table 3: Team Spirit**

| Team Spirit | Mean | Standard Deviation | Correlation | Reliability coefficient |
|---|---|---|---|---|
| More progress can be achieved by working as a team | 4.075 | 1.247 | .821 | 0.817 |
| Activity entrusted to a single member will be carried out well than entrusting same to sub-group | 3.900 | 1.115 | .638 | |
| Co-ordination and support of members are usually executed the activities very successfully | 2.069 | .932 | .539 | |
| Members are ready to forgot their personal interests/inconveniences while working in the group | 3.100 | 1.037 | .776 | |

The table 3 shows the descriptive statistics of the level of agreement of respondents on team spirit**.** The respondents have expressed highest level of agreement (4.075) on the statement 'More progress can be achieved by a team' followed by low level on 'Co-ordination and support of members are usually executed the activities very successfully' (2.069). The reliability co-efficient of 0.817 verify that the statements taken under the study is highly reliable. It was found that there is a high positive correlation between the statements. Thus, the analysis inferred that, team spirit is the key to success, it has led to the group accountability between the members.

**iii. Group Interaction:** According to Sociologist, group interaction is the process of defining and responding to various actions and relations of individuals in social situations.

**Table 4: Group Interaction**

| Group Interaction | Mean | Standard Deviation | Correlation | Reliability coefficient |
|---|---|---|---|---|
| The members of our group exchange their ideas freely | 3.867 | 1.119 | .687 | 0.840 |
| The members of our group give information to others without any fault | 3.825 | 1.112 | .638 | |
| The members mingle with other members of the group freely | 3.117 | 1.106 | .532 | |

The table 4 indicates the descriptive statistics of the level of agreement of respondents on group interaction. In the present study the respondents have expressed their highest level of agreement (3.867) on the statement 'the members of our group exchange their ideas freely' followed by low level 'the members mingle with other members of the group freely' (3.117). The reliability co-efficient of 0.840 verify that the statements taken under the study is highly reliable. It was found that there is a high positive correlation between the

statements. Thus the analysis revealed that the NHG members have exchanged their ideas freely regarding economic, social and political development of the group members.

iv. **Group Leadership:** Leadership is one of the most important functions of any organization.

**Table 5: Group Leadership**

| Group Leadership | Mean | Standard Deviation | Correlation | Reliability coefficient |
|---|---|---|---|---|
| Leader of the group motivates the members to implement the decisions which the group has taken | 4.075 | 1.247 | .821 | 0.817 |
| Leader creates interest among the members to participate in various group activities | 3.100 | 1.037 | .776 | |
| The members of the group accept leader's opinion | 3.325 | 1.090 | .804 | |
| The leader takes active part in solving the problems of your group | 2.675 | 1.043 | .606 | |

The table 5 shows the descriptive statistics of the level of agreement of respondents on group leadership. The respondents have expressed highest level of agreement (4.075) on the statement on 'Leader of the group motivates the members to implement the decisions which the group has taken' followed by low level 'The leader takes active part in solving the problems of your group' (2.675). The reliability co-efficient of 0.817 verify that the statements taken under the study is highly reliable. It found that there is a high positive correlation between the statements. Thus the analysis revealed that, the group leader should motivate the members for taking enough bold decision in the family and societal issues. Also encourage the members to solv their problems in the group and the family.

v. **Group Transparency:** Group transparency is highly relevant in all group activities.

**Table 6: Group Transparency**

| Group Transparency | Mean | Standard Deviation | Correlation | Reliability coefficient |
|---|---|---|---|---|
| The members have a clear idea about the activities of the group | 3.383 | 1.248 | .822 | 0.830 |
| The group members have the full access over the records, reports, and accounts of the group | 3.217 | 1.227 | .854 | |

| | | | | |
|---|---|---|---|---|
| The group shows the item wise details of the income and expenditure | 2.067 | .739 | .445 | |
| The members have full knowledge regarding the procedure followed in planning, execution, monitoring and evaluation of the group activities | 3.367 | 1.219 | .849 | |

The table 6 shows the descriptive statistics of the level of agreement of respondents on group transparency. The respondents have expressed highest level of agreement (3.383) on the statement 'The members have a clear idea about the activities of the group' followed by low level 'The group shows the item wise details of the income and expenditure' (2.067). The reliability co-efficient of 0.830 verify that the statements taken under the study is highly reliable. The result shows that, all the group members have clear idea of their group activities regarding planning, execution, monitoring and evaluation. They have full freedom to accessing the records and registers maintained by the group. The economic transparencies between the members are highly relevant and it can reduce the group conflicts.

vi. **Group Equality:** This means that the members of the group have equal opportunity in planning decisions and financial matters.

**Table 7: Group Equality**

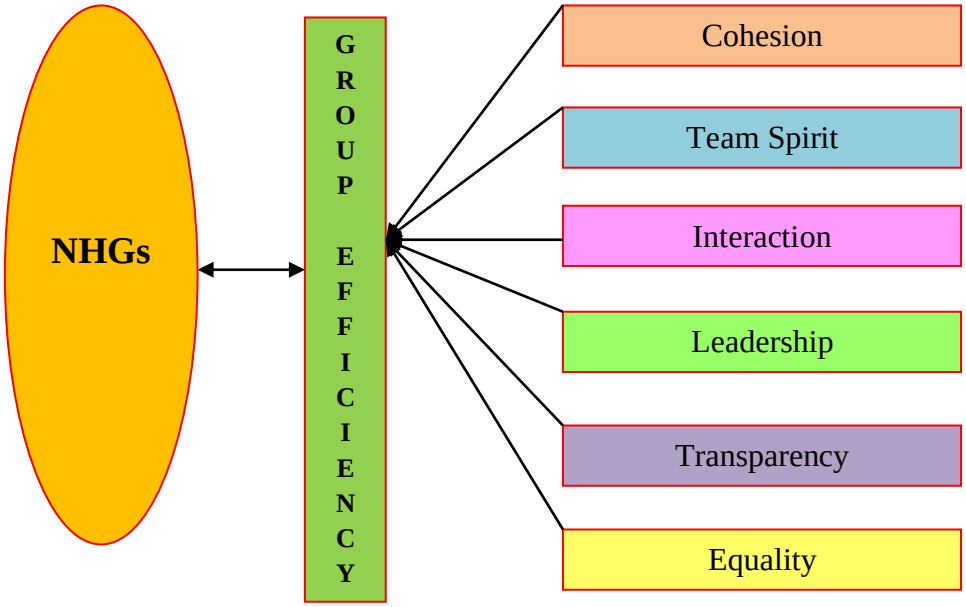
| Group Equality | Mean | Standard Deviation | Correlation | Reliability coefficient |
|---|---|---|---|---|
| The members of the group have equal opportunity in planning | 3.867 | 1.285 | .784 | **0.731** |
| The decisions made are highly influenced by the representatives | 1.800 | .641 | .282 | |
| The profit is equally shared by all the members of the group | 3.842 | 1.462 | .823 | |
| The major portion of the financial assistance received is grabbed by influential members or representatives of group. | 1.833 | .472 | .003 | |

The table 7 depicts the descriptive statistics of the level of agreement of respondents on group equality. The respondents have expressed highest level of agreement (3.867) on the statement 'The members of the group have equal opportunity in planning' followed by low level 'The decisions made are highly influenced by the representatives' (1.800). It was found that there is a high positive correlation between the statements. The reliability co-efficient of 0.731 verifies that the statements taken under the study is highly reliable. Thus the analysis inferred that, all the members were given equal opportunity to participating in planning and execution, the profit has been distributed equally by the group members. It has been strengthening the group's unity.

**Conceptual Framework of the study**

Based on the results, the researcher concluded that six factors of group efficiency were highly correlated with the statement. The diagrammatic representation of conceptual framework is given in Fig.2.

**Figure 2**: **Conceptual Framework of the study**




The conceptual frame work of the study indicates that, the success of NHGs depends on factors of group efficiency i.e., group cohesion, team spirit, group leadership, group interaction, group transparency and equity between the group members. The changes between the factors may leads to success or failure of the NHGs.

**Conclusion**

Kudumbashree NHG in Kerala has been recognized as an effective strategy for the empowerment of women in rural as well as urban areas. Bringing women together from all spheres of life to fight for their rights is a basic motto of Kudumbashree. The overall success of the programme is closely linked with the NHGs efficiency and empowering rural women.

The study could conclud that, NHGs plays a vital role in rural women empowerment. The success of NHGs depends on several factors such as group cohesion, team spirit, group leadership, group interaction, group transparency and equity between the group members. In the study found that all the factors are highly reliable and influence the group efficiency. The co-ordination and healthy relationship between the members has been motivating them to move long way toward their sustainability.

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# SATISFACTION LEVEL OF THE MOTHERS/GUARDIANS REGARDING SERVICES RENDERED IN THE CHILD MALNUTRITION TREATMENT CENTRE (CMTCs) OF VADODARA DISTRICT, GUJARAT-2019-20

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## ABSTRACT

Public Healthcare system run by Government of India comprises of primary, secondary and tertiary care institutions focusing on providing basic healthcare facilities in rural peripheries and key city areas of the districts and corporations. Today, health systems have changed the way of thinking and delivering care and patient became the center of the overall process. National Quality Assurance Standards in India is primarily meant for service providers of public health institutes. Hence, Present study is an attempt to understand the satisfaction level of the mothers/ guardian regarding services rendered in the Child Malnutrition Treatment Centre (CMTCs) of Vadodara district of Gujarat. Purposive sampling method was used. Data were collected using questionnaire from all eight blocks of 7 CMTCs and 95 mother /guardians of the SAM child admitted in CMTCs of Vadodara district of Gujarat .Major findings revealed that, Vadodara district CMTCs which are run by the state are well established and functioning according to state government guidelines and also found them well equipped in terms of its human and non-human resources. Further, findings also revealed that, with regard to CMTCs infrastructure facilities which includes availability and functionality of resources, appearance of facility, signage, availability of equipment and others, majority of the mother/ guardians were satisfied for the CMTCs of Vadodara district. However, with regard to facility based clinical services as well facility based non-clinical services, majority of the mother/guardians were partially satisfied with and expressed their concerns on different issues for dissatisfaction. In nutshell, study implies that, though much has been done by the government to improve nutritional services in the CMTCs in Gujarat, still long way to go to address this issue with due consideration of user's perspectives in further health related plans for the state and nation.

**Key Words:** Public Health Institutes, Nutrition, Child Malnutrition Treatment Centre, Health Services, Quality of care in health

# INTRODUCTION

## Health care system in India

According to World Health Organization (WHO), health is a fundamental human right. This right to health includes access to appropriate and satisfactory health services for every individual. The health care systemin India is primarily administered by the states. To meet this human basic right requirement, Indian healthcare delivery system is categorized into two major components - public and private. Public Healthcare system run by Government of India comprises of primary, secondary and tertiary care institutions focusing on providing basic healthcare facilities in rural peripheries and key city areas, whereas the private health care sector provides majority of secondary and tertiary care institutions with a major concentration in metros and urban areas. Public health system in India has been organized at multiple setup in rural and urban areas which includes Sub-Centers (SCs), Primary Health Centers (PHCs), Community Health Centers (CHCs), Sub-District Hospitals (SDHs), District Hospitals (DHs) and Medical Colleges (MCs).

Delivery of effective healthcare stating norms for different levels of the Public Health System are guided by the Indian Pubic Health Standards (IPHS, 2007), which focus on developing infrastructure and deploying recommended Human Resources. National Quality Assurance Standards (NQAS, 2014) by Government of India has been conceptualized as a quality initiative that envisage sustained improvement in service quality, with focus on implementation of evidence-based protocols to improve the quality of patient care and safety. The focus is not only on delivery of quality services but also on being perceived so by the users. It has been developed keeping in the specific requirements for public health facilities as well global best practices. (http://qi.nhsrcindia.org/national-quality-assurance-standards)

## Quality of health care services in India

National Quality Assurance Standards (NQAS) in India is primarily meant for service providers of public health institutes emphasis on following two main approaches.

(i) **Technical Quality** –pertains to those which usually are service providers (doctors, nurses & para-medical staff) who are more concerned and has bearing on outcome or end-result of services delivered.

(ii) **Service Quality**: Pertains to those aspects of facility-based care and services, which patients are often more concerned and has bearing on patient satisfaction.

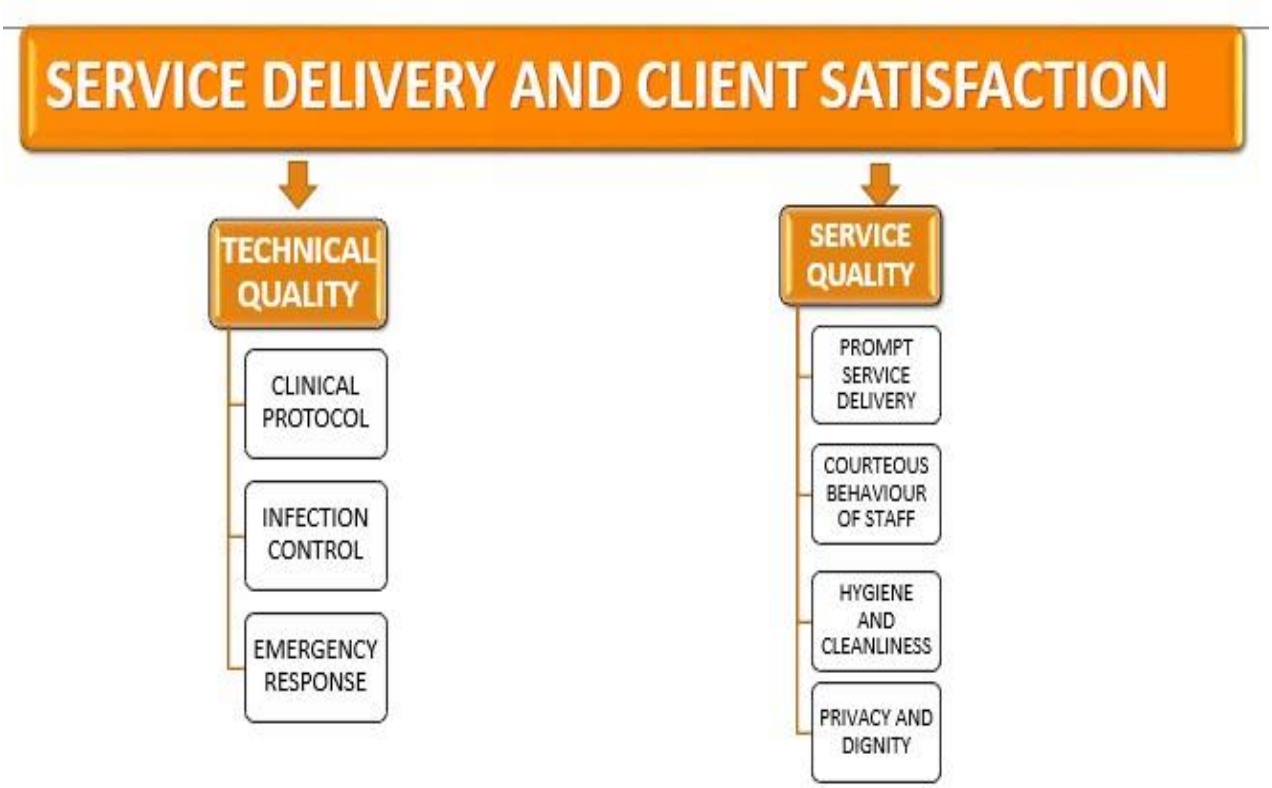


**Fig. 1 - Approaches of National Quality Assurance Standards (NQAS)**
*(Source: Operational Guidelines for Quality Assurances in Public Health Facilities, India,2013)*

Further, usual expectations of patients described in National Quality Assurance Standards are as follows:

**Table-1 Patients expectations from PHIs while seeking health treatment**

| Care | Cure |
|---|---|
| 1. Clean and inviting atmosphere | 1. Correct, speedy, low cost & lasting treatment |
| 2. Courteous behavior | 2. Emergency response |
| 3. Personalized approach | 3. No new diseases |
| 4. Psychological well-being | 4. No harmful procedure/complication |

***Source: Operational Guidelines for Quality Assurances in Public Health Facilities, India 2013***

Besides, all these well-defined norms and parameters regarding quality of health care services and user's perspectives significances still there are growing concerns regarding health care services provided from PHIs to the patients in India.

**Kruk and et.al (2018)** stated that, "Almost 122 Indians per 100,000 die due to poor quality of care each year than that of Brazil (74), Russia (91), China (46) and South Africa (93) and even its neighbors Pakistan (119), Nepal (93), Bangladesh (57) and Sri Lanka (51).

The importance of clients' perception of quality was also demonstrated by Akin and Hutchinson, in their research, who found that ill and poor people by-passed free or subsidized services in facilities they perceived to be offering low quality **(Akin and Hutchinson, 1999).**

Following is the data from the fourth cycle of the District Level Household and Facility Survey done by the International Institute of Population Sciences from 2012 to 2014, in 21 states of India.

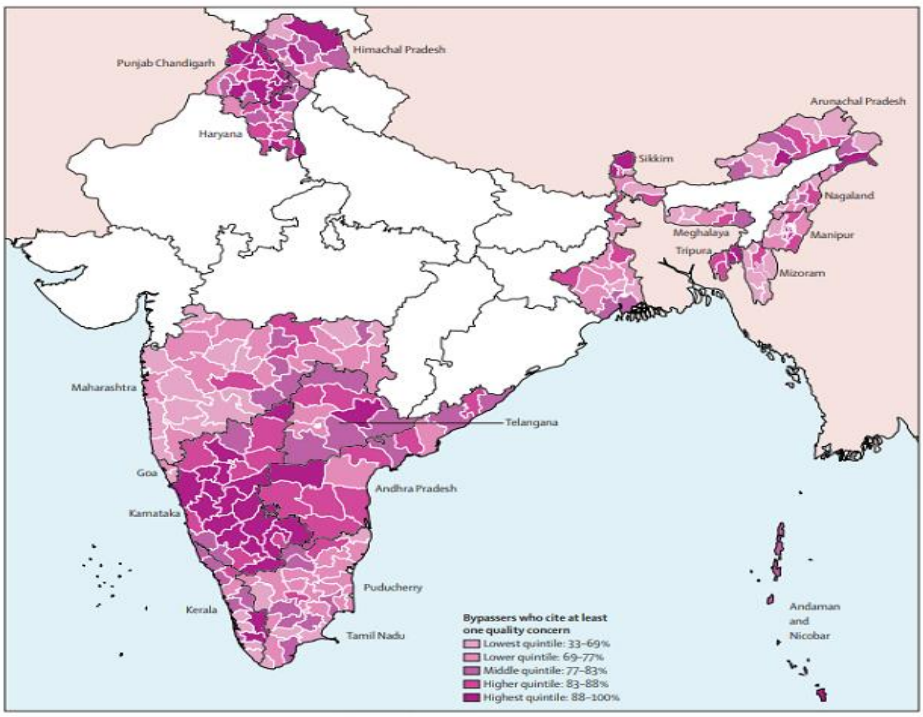


**Fig.2- Proportion of households that report quality concerns as reason for bypassing public facilities in 21 states of India**

(*Source:https://www.indiaspend.com/more-indians-die-of-poor-quality-care-than-due-to-lack-ofaccess-to-healthcare-1-6-million-64432/2012-14)*

In above data analysis from 21 states of India a quality concern was mentioned in any of the following as a reason for bypassing government facilities:

- inadequate infrastructure
- drugs not available
- doctor not available
- inconvenient hours
- * absent health workers
- * long waiting time
- * poor quality
- * distrust

This and such evidences support that patient satisfaction when meet their expectations it is one of the influencing factors to increase demand generation of health services in Public Health Institutes.

Nutrition programs in India are running since 1960s to combat malnutrition, however, childhood malnutrition is still biggest challenge in India. According to Food and Nutrition Security Analysis, India 2019 release, almost one in three Indian children under five years, will still be

stunted by 2022 going by current trends. This slow declining trend in malnutrition in India could be a major cause of concern regarding quality of care provided at management of SAM facilities. This slow declining trend of malnutrition in economically prosperous Gujarat state and its progressive district of Vadodara reveal equally worrisome picture and raised concerns whether facility-based nutrition care / public health institutes meet only technical aspects and ignore community expectations? It also raises concerns on measuring availability and functionality of services in terms of its human and non-human resources of PHIs.To seek the answers to the research questions, researcher decided to conduct research study on the "Satisfaction level of the mothers/ guardians regarding services rendered in the Child Malnutrition Treatment Centers (CMTCs) of Vadodara district, Gujarat".

## OBJECTIVES

1) To prepare demographic profile of –
   i) Child Malnutrition Treatment Centre (CMTCs) of Vadodara district of Gujarat, India.
   ii) Selected children/family admitted in Child Malnutrition Treatment Centre's (CMTCs) of Vadodara district of Gujarat, India.
2) To study the overall satisfaction level of mother/guardians in receiving health services from CMTCs of Vadodara district of Gujarat, India
3) To study the satisfaction level of mother/guardians regarding services from Child Malnutrition Treatment Centre's (CMTCs) of Vadodara district of Gujarat in the following selected aspects with reference to:
   a. Infrastructure
   b. Facility based clinical services
   c. Facility based non-clinical services

4) To study the differences in the overall and aspect viz infrastructure, facility based clinical services
and facility based non-clinical services related satisfaction level of mother/guardians regarding health services rendered from Child Malnutrition Treatment Centre's (CMTCs) of Vadodara district of Gujarat in relation to following variables:
   i. Age of the mother/guardians
   ii. Educational qualification of mother/guardians
   iii. Number of times SAM child admitted in CMTC
   iv. Treatment duration period
   v. Proximity of CMTC from CMTC inmates' residence

5) To obtain suggestions of mother/guardians regarding the improvement needed in CMTC services.

## HYPOTHESES

- There will be no significant difference in the overall and aspects viz Infrastructure, facility based clinical services and facility based non-clinical services related satisfaction level of mother/guardian regarding health services rendered from Child Malnutrition Treatment Centre of Vadodara district of Gujarat, in relation to following variables:

- Age of the mother/guardian
- Educational qualification of mother/guardian
- Number of times SAM child admitted in CMTC
- Treatment duration period
- Proximity of CMTC from CMTC inmates' residence

## METHODOLGY

The population of the study comprised of two segments:

1. Child Malnutrition Treatment Centre's (CMTCs) of Vadodara district, Gujarat which are run by department of Health and Family Welfare, Government of Gujarat 2019-20.
2. Mothers/guardians of Severely Acute Malnourished (SAM) Children admitted in theCMTCs of Vadodara district of Gujarat during period of 2019-20.

**Sample of the Study**

Two sets of samples were drawn for the present study using purposive sampling method.

1. Child Malnutrition Treatment Centre of Vadodara district, Gujarat in the year 2019-20.
2. Mothers/guardians of SAM child admitted in CMTCs of Vadodara district, Gujaratin the year Nov, 2019 to Jan,2020).

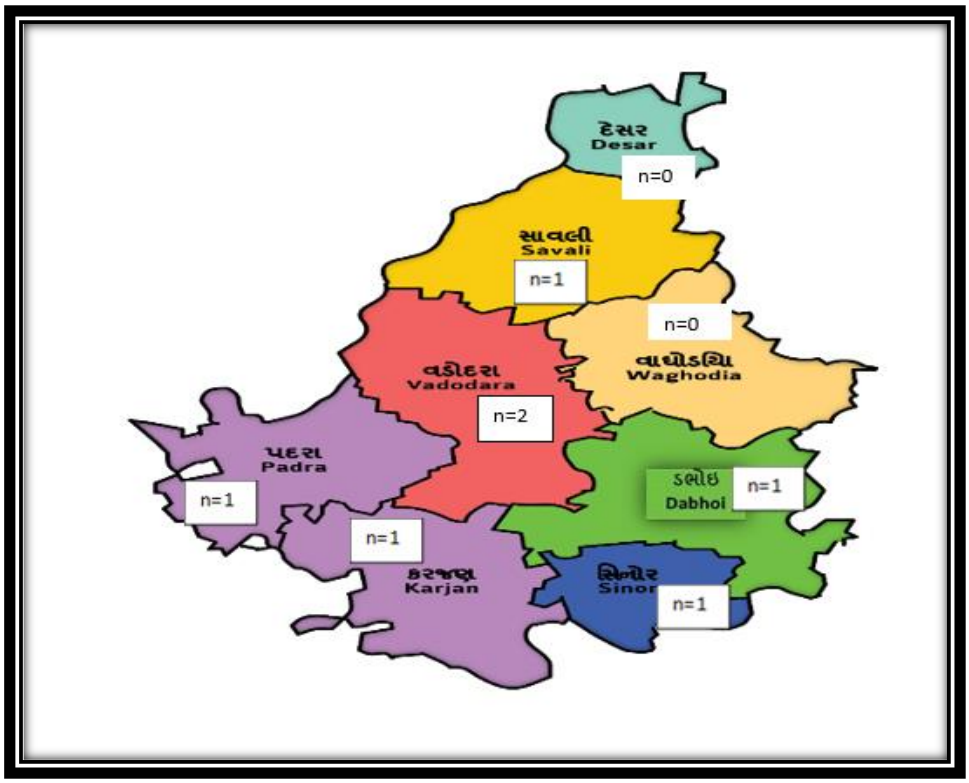


**Fig. 3- CMTCs in Blocks of Vadodara district**

**Sample size**

- In the present study samples of CMTCs were drawn from all eight blocks viz Savli, Karjan, Dabhoi, Padra, Sinor and Vadodara, Desar and Waghodia of Vadodara district as shown in map (2019). However, in blocks of Desar and Waghodia CMTC did not exist. Further, Vadodara rural has 2 CMTCs viz. Bajwa and Por, which makes total seven CMTCs in Vadodara district. In all total seven CMTCs which were existing during study period have been considered for the sample.
- Mothers/guardians of all the SAM child admitted in the six CMTCs of Vadodara district in the period of November- January 2019-20 were taken as a sample for the study. However, Bajwa Child Malnutrition Treatment Centre had no SAM child admitted at the time of study and was found non-functional as reported by the CHC staff, hence no data of mothers/guardians of this CMTC reported here. Thus, the sample size of mother/guardian of admitted SAM children from six CMTCs were ninety-five.

**Sampling Plan**

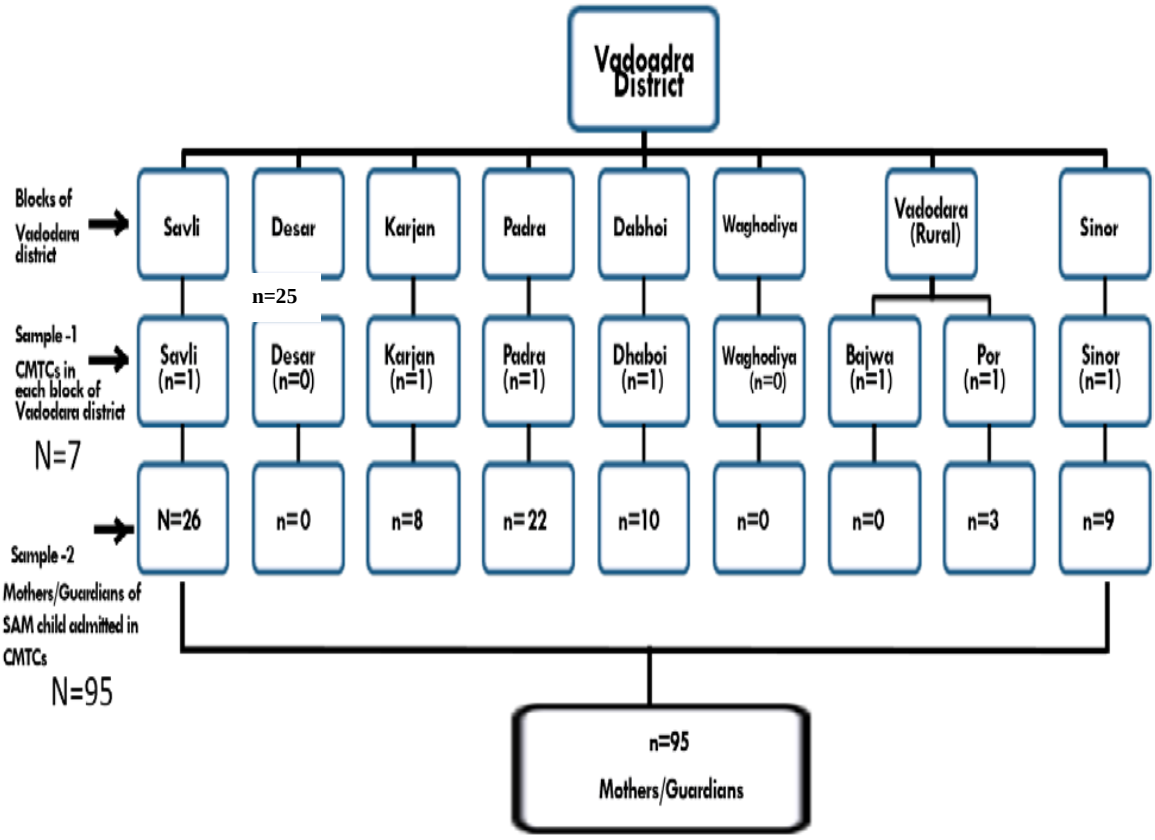


Fig.4- Sampling Plan of the study

**Selection of the Sample**

The present research study comprised sample from state government run Public Health Institutes (PHIs) of Vadodara district i.e. CMTCs under Community Health Centre (CHC). Hence, government permission from various levels was mandatory to undertake this research study. So, permission from Vadodara's District Development Officer (DDO) and Chief District Health Officer (CDHO), BHOs, CHC-Superintendents were taken for the study. This approval letter helped researcher/investigator to approach and also hold subsequent meetings with Block Heads and CMTCs head of Vadodara district of Gujarat.

**Construction of the Research Tool**

For the purpose of gathering information two tools were designed for the present study.

1) Questionnaire and 2) Observational checklist

1) **Questionnaire** –To understand perception of mothers/guardians of SAM child admitted in Child Malnutrition Treatment Centre, questionnaire was prepared to know the satisfaction level regarding CMTCs services. The questionnaire comprised of four sections viz, profile of CMTCs and mother/guardians of the admitted child in CMTCs, Validity of the tool was done for content and research purposes from PHIs experts and academicians. Reliability of the tool was done using test- retest method and result obtained showed high co-relation with value of r=0.98. Pre testing of the tool was also done prior to data collection.
2) From CMTC guideline of Department of Health and Family welfare, Government of Gujarat an observation checklist was adapted to understand profile of CMTCs.

**Data collection**

Consent and approval to carry out research as per government protocol at various levels from District head to block, institutional head was taken up for the study. Informed consent from each of the respondents i.e. mothers/guardians of the children was also taken before conducting interview with them.

## FINDINGS AND DISCUSSION OF THE STUDY

**1) Profile of the Child Malnutrition Treatment Centre of Vadodara district**

- With reference to human resources of the seven CMTCs reported and observed data revealed that, hundred per cent of CMTC had Medical Officer and Nutrition Assistant followed by 57 per cent Staff Nurse. Non-Para Medical staff availability viz, cook cum caretaker was 93 per cent followed by cleaner in 86 percent of the CMTCs. Gaps in reported and observed data were found in paramedical and other staff of CMTCs of Motafofaliya, Bajwa and Por of Vadodara district of Gujarat.
- With reference to equipment and supplies of CMTCs, the reported and observed data revealed hundred percent availability and functionality were found in all CMTCs. Further hundred percent functional and available accommodation requirements for patients with basic amenities viz. water for general usage, drinking water facility, wash basin, toilet facility, bathroom, laboratory facility and drug store was there in all CMTCs of Vadodara district.

- Reported and observed data revealed similar picture for availability of water purifier in CMTCs with hundred per cent However, it was found functional in 28 per cent CMTCs i.e. only in two CMTCs viz, Savli and Motafofaliya, and nonfunctional in majority of the CMTCs.
- Discrepancies of Reported and Observed data were also noted in following aspects.
  - ✓ Reported data revealed 100% of mattresses in good condition against only 70% as per observed data in the CMTCs of Vadodara district.
  - ✓ Reported data also revealed functional room cooler and room heater with 80% and 90% respectively against 50% in functional condition each as per observed data.

**2 Profile of the Children admitted in CMTCs of Vadodara district, Gujarat**

- High majority (87.3%) of mothers/guardians of Severely Acute Malnourished (SAM) children admitted in CMTCs, Vadodara district were young, literate and admitted her child for the first time in CMTC of Vadodara district.
- Majority (65.3%) of mothers/guardians were staying near the CMTCs in taluka, were from low income group and having child treatment duration for average period of time in CMTCs

**3. Overall and aspect wise satisfaction level of mothers/guardians of SAM child admitted in CMTCs of Vadodara district, Gujarat.**

**3.1 Overall and aspect-wise satisfaction of mothers/guardians.**

- Little more than half (51.6%) of the mothers/guardians were partially satisfied with the overall services rendered from CMTCs of Vadodara district.
- Majority (62.1%) of mothers/guardians were satisfied with the infrastructure aspect of the CMTCs of Vadodara district. In the context of present study, infrastructure aspect includes availability of resources, appearance of facility, signage, availability of equipment and so on.
- Little more than half (50.5%) of mothers/guardians were partially satisfied with the facility based clinical services namely, delay in quickly responding child's need of clinical care, not following proper protocol for measurement of weight, lack of assurance in terms of conveying trust and confidence to caretaker's to getting child cured may be lacking and so on.
- A high majority (71.6%) of mothers/guardians were partially satisfied with the non-clinical

  services viz, irregular housekeeping services like not providing fresh linens for the child, rude behavior and response of the staff, cleanliness of the washrooms and toilets, fresh food for respondents and so on from CMTCs of Vadodara district.

**4. Differences in the satisfaction level of mothers/guardians in the selected aspects in relation**

**to selected variables:**

**4.1 Differences in overall satisfaction of mothers/guardians.**

- There were significant differences found in the overall satisfaction level of mothers/guardians regarding health services from CMTCs in relation to age of mothers/guardians and number of times SAM child admitted in CMTCs. The overall

satisfaction of mothers/guardians differed significantly, where the mean of old mothers/guardians is lesser than their counterparts. The reason for this could be that old mothers/guardians may have heard/felt previous negative experiences of own/others regarding services from government health institute, which may lead them to be not satisfied with CMTC services and vice versa. Regarding the SAM children admitted for more than one time in CMTCs, the respondents were satisfied with the overall services rendered in the Child Malnutrition Treatment Centre than the child admitted for the first time. The reason could be that mothers/guardians may have faith in the doctor as well as services rendered in the CMTC by paramedical staff.

**4.2 Aspect wise differences in satisfaction of mothers/guardians in relation to variables**

**a) Infrastructure**

There were significant differences in the satisfaction level of mothers/guardians regarding infrastructure of CMTCs in relation to number of times SAM child admitted in CMTC. The satisfaction level regarding infrastructure aspect differed significantly in the variable number of times SAM child admitted in CMTCs for this present study, where the mean of SAM children admitted for more than one time is higher than their counterparts. The mothers/guardians whose SAM child is admitted for more than one time in CMTCs were more satisfied with the infrastructure facilities available in the CMTCs. It can be said that if infrastructure facilities are improved, there is a greater chance of attracting more patients towards government health institute. The reason could be that Vadodara district CMTCs are available with various basic amenity, separate beds for the in-patient child, play corner and child friendly atmosphere in CMTCs. So, mothers/guardians may like to re-visit again in the CMTCs, as each child gets individual attention and clinical care.

With reference to variable proximity of CMTC from CMTC inmates' residence, the mothers/guardians who were coming from far distance to CMTC have higher mean value than the mothers/guardians who were coming from a nearer distance. The mothers/guardians who were coming from a far distance to CMTCs were more satisfied with the infrastructure facilities available in the CMTCs. The reason for such findings could be mothers/guardians who were coming from far/remote areas may be more worried for child and may have fewer expectations from CMTCs services. However, while staying there they might have found better experiences of services and hence may be feeling satisfied towards CMTCs services.

**b) Facility based clinical service**

There were significant differences in the satisfaction level of mothers/guardians regarding clinical services of CMTCs in relation to age of mothers/guardians. The young mothers/guardians have higher mean value as compared to older mothers/guardians. The reason could be young mothers/guardians may be looking for right knowledge/information on child rearing practices, nutritious recipes or giving time to child etc. which CMTCs staff is providing may have lead them to be satisfied with clinical care of CMTCs of Vadodara district.

**c) Facility based non-clinical service**

- There were no significant differences in the satisfaction level of mothers/guardians regarding non-clinical services of CMTCs in relation to age of mothers/guardians, educational qualification of mothers/guardians, treatment duration period, proximity of

CMTC from CMTC inmate's residence and number of times SAM child admitted in CMTC.

5. **Suggestions of mothers/guardians of SAM child admitted in CMTC in relation to improvement of CMTC services:**

During the interview with mothers/guardians, the suggestions were given by the mothers/guardians for the improvement needed regarding CMTC services with reference to Infrastructure, for expressing needs of immediate attention on functionality of resources / services in CMTCs viz, repairing of overflowing/getting choked up of drainage system of CMTCs, room cooler, room heater and water purifier. For facility based clinical services aspect, respondents expect doctor's daily visit in CMTCs and also explain reason when prescribe any medical test for SAM child. Regarding facility based non-clinical services, unanimously mothers/guardians recommended them to be educated regarding child health care practices as well regular cleanliness in toilets should be maintained on daily basis.

## CONCLUSION

The present study concluded that Child Malnutrition Treatment Centers (CMTCs) of Gujarat are playing vital role in dealing with major issue of child malnutrition in society. In this context, Vadodara district CMTCs which are run by the state are well established and functioning according to state government guidelines. These centers are found well equipped in terms of its human and non-human resources. Severely Acute Malnourished (SAM) children are admitted in the CMTCs from nearby villages in each of block's CMTCs. Major findings of mother/guardians on satisfaction towards CMTC infrastructure facility. So, it can be said that various quality strengthening programs of health like National Quality Assurance Program (NQAP), Kayakalp, LaQshya, Mera Aspataal application on patient's satisfaction and others are contributing in makeover of government health facilities and thereby moving ahead positive image in people's mind, however, still there is a long way to go to meet every defined standard and protocol as per public health norms.

## IMPLICATIONS OF THE STUDY

From all the research findings of the present study, it can be implied that patient ie. SAM Child in the present study, satisfaction is impacted by clinical care, image and trustworthiness of CMTCs of Vadodara district of Gujarat while attendant i.e. mother/guardian satisfaction was influenced by infrastructure and administrative procedures. This means that government requires to understand the needs of both patient i.e of SAM child and attendant i.e. mother/guardian in order to gather a holistic view of services in case of CMTCs which are situated at block levels in the districts.

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# DESIGNING SPACE FOR CONDUCTING VIRTUAL CLASSES FROM ONE'S OWN RESIDENCES

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## ABSTRACT

COVID-19 pandemic has led a great number of employees, globally, to work from home so as to reduce social contacts to a minimum in the wake of the outbreak of the pandemic. The concept of work from home got more popularity at this point. The teaching community is no less affected from the pandemic and lockdown. Teaching needed to be continued though there is lockdown in the country. So the teachers had to prepare for the classes and conduct virtually them online from their home only. As they have to teach from their own residence, they need a proper place with minimum of noise and disturbance and with the facility of placing the computer, books, and a black/ white board at the same time having enough illumination and comfortable temperature. Hence a study was conducted with the objective to give design suggestions for incorporating a small but suitable space/ area for online teaching in their existing house. The present study was descriptive research and 147 college teachers were selected purposively as sample. 'Google forms' were selected as a tool for data collection. The questionnaire had two sections namely background information of the respondents and their family & Problems experienced by the teachers related to space during online teaching during the pandemic period. The respondents were asked to respond on a 3-point continuum scale in terms of 'Agree', 'Undecided', 'Disagree' to the statements of problems. Data were analysed using descriptive statistics. It was found that majority of the respondents were staying in small houses. It was found that 74.82 per cent had high extent of problems related to space in their residence during online teaching. Therefore, a design was suggested for the teachers which they can implement in their existing residence for virtual teaching during this critical situation.

**KEY WORDS:** Virtual Teaching, Small House, Study Room, Covid-19 Pandemic

## INTRODUCTION

Recently a crisis of outbreak of pandemic due to corona virus has disrupted the lives of Individuals. The COVID -19 due to corona virus has changed how people work, play and learn: Schools have been closed, sports leagues have been cancelled, and many people have been asked to work from home (https://www.nytimes.com/2020/03/20/learning/how-is-the-coronavirus-outbreak-affecting-yourlife.html, July 2020). In this lock down period and the time after, the only flexible work arrangement in organization is 'working from home'. The outcomes of these arrangements are both positive and negative in nature. The 'work from home' provides employees more opportunity to focus on their work tasks. The regular face to face contacts with co-workers is significantly reduced, when working away from the office. In the absence of physically monitoring, the employees have greater discretion in how, under what condition and when they complete allocated tasks. This also increases flexibility among the employees over performance of work. Work from home enables more autonomy in job, which is likely to be associated with more productivity. Decreased control by colleagues or the supervisors is an important drawback of work

from home. This is true for both the organization and the employee. Most of the IT companies included work from home in their leave policy of employees in order to increase the productivity.

Due to the Pandemic outbreak, one's home has become one's office, the school, the Coffee House, and many more, as this period has provided people with an unexpected opportunity. Because the homes are now being used for work, school, exercise, virtual socialization and all of life's other flavours, one needs to learn now how to best use the available spaces. The Corona virus (COVID-19) pandemic has led to biggest number of employees globally bound to work remotely. The citizens in many countries, including India, are required to stay at home and to reduce social contacts to a minimum in wake of the outbreak of the pandemic. The pandemic has affected each and every section of economy and society. The present situation has forced the whole world to go under lock-down situation. Many factories, government offices, private companies, shops, malls, showrooms and all the educational institutions were shut down due to the COVID-19 pandemic and many had to work from home. Whole nation was under lockdown situation. During social distancing and 'stay home' order, nobody is spared (In both senses, in-home & outside-home). Starting from small business to the Olympic Games, all are shuttered. In this situation, only not-out batsmen (excluding the medical and emergency staff) are increasing numbers of 'Webinars' and online 'learning.' Universities like Harvard, Stanford offered their MOOC (Massive Open and Online Course) free to the students (Desk, 2020).

The pandemic has affected educational institutions to a great extent, which has led to virtual online classes, webinars etc. in order to continue academic activities. Now all the other sectors have started following the same as educational institutions (Sahreena, 2020). The corona virus pandemic has caused schools, colleges and university closures for an unknown duration. This forced teachers to start something new and start teaching online. Teachers are scrambling to discover ways to support students from afar through distance and online learning. Necessity is the mother of invention – goes the saying and this is when the concepts of Smart Teaching, Digital Technology and Virtual Teaching, Online Teaching have come to the rescue. Today most of the educational institutions indulge in online teaching and also prefer this to reach a greater number of students worldwide and to complete the syllabus for the students. In such a worrying scenario, it is indeed a challenge for the teaching fraternity to conduct classes. As everyone is unaware of the certainty of the end of corona virus pandemic, the teachers are required to teach online from their own residences-may it be large or small.

In today's world owning a large space or bungalow becomes quite difficult due to over population. Especially in metro cities owning a large house is not possible. This problem leads to compromise in the space and force people to live in small space i.e. in the apartment ,where the space is very less (Patel & Pathan, 2018).

It has been observed that now-a-days many families are living in small house due to the lack of availability of large living space. Small homes are a national phenomenon. For many city dwellers, small space living is the only option. One can find plenty of stylish solutions and multipurpose pieces that make living in small space comfortable. It is important for any space to be flexible and reusable. It must be multifunctional and must possess enough strength to withhold the daily activities. Flexible and multiple uses of space is a part of designing small spaces. Flexible partitions, multipurpose furniture, flexible furniture arrangements, and the provision for ample

storage help in making space available for several uses. A small space is, in general, more useful if it is not divided into too many small rooms.

In the present time the size of the house that an average family can afford is very small resulting into congestion. Hence, it becomes essential to make judicious use of size and space along with affordable and sustainable interior design. Small spaces can be efficiently managed in a lot of innovative ways with the help of interior designers. House planning is basically space designing. A good house plan should have such simplicity and logic that it results in a well-designed space suited to use. Interior designers must be motivated with new and fresh ideas and should have proper knowledge about furniture sizes and space allowances. An exceptional skill of imagination and sense of composition helps to enhance the quality of work.

**Justification for the present study:**

Academic institutes started online meetings and classes from March 2020 and started coping-up with the condition caused due to COVID-19. Lockdown stopped the regular classes in the middle of a running semester in most schools and colleges, which led to rethinking and re-planning of teaching from 'offline' to 'online'-virtual teaching. But for many teachers conducting online classes was difficult as it was new and unexpected for them. Teachers had to learn using and adopting new tools and technology for online teaching. The online teaching process has burdened the teacher with more work to do. Since teachers are required to teach from home, they have to make lots of adjustments. The home is full of activities. All the members of family are at home due to lock down. This creates noise and congestion.

But, whether small or big, teachers need to have their personalised space for teaching where they can teach without any disturbance and noise. The personalised space requires many things such as, blackboard, bookshelf, and storage, a setup for keeping mobile or laptop for teaching, proper illumination and comfortable temperature. At present each teacher is trying to do the best somehow or the other. A need was felt to find out the problems experienced by the teachers related to space for Virtual teaching during the pandemic COVID -19 and to give design suggestions for a space for digital teaching in the existing house of the teachers.

## OBJECTIVE

To design space for the teachers to conduct Virtual Classes from one's own residences

## METHODOLOGY

For the present study the descriptive research design was used. The samples were selected purposively for the study. The data were collected across the nation through 'Google forms' which were sent to about 150 teachers. After receiving the forms, the sample was 147 college teachers. The questionnaire was divided into two sections. Section 1 dealt with the background information of the respondents and their family. Section 2 dealt with problems experienced by the teachers related to space for virtual online teaching during the pandemic COVID 19. The respondents were asked to respond on a 3-point continuum scale in terms of 'Agree', 'Undecided', 'Disagree' to the problems listed. Data were analysed using descriptive statistics.

## FINDINGS

The findings of the study are as follows:

**Section- I: Background information of the respondents:**

It was observed that more than one-half (57.67%) of the respondents were in the age group between 41years to 50 years. It was also found that remaining (42.33%) of the respondents were in the age group between 30 years to 40 years. The mean age of the respondents was found to be 44.57years. Data revealed that a little more than one-half of the respondents (56.70%) were Post Graduate and remaining had Ph.D. degree. It was found that two-third of the respondents (66.7%) lived in nuclear family and remaining respondents (33.3%) lived in joint family. Result also showed that more than half of the respondents (65%) lived in small sized family and rest of the respondents (35%) lived in large sized family.

**Section-II: Problems experienced by the respondents regarding space during virtual teaching:**

This section deals with the problems of the respondents they faced related to space due to online teaching during the pandemic. The respondents were asked to respond on 3-point scale in terms of "Agree", "Undecided" and "Disagree", for which the scores of 3,2 and 1 were assigned to positive statements and 1,2 and 3 were assigned to negative statements. The minimum possible score was 64 and maximum was 192. The range was divided into 3 categories having equal interval.

**Table 1: Extent of Problems experienced by the respondents related to space during virtual teaching**

| Sr. No | Extent of Problems | Range of score | Respondents (n=147) | |
|---|---|---|---|---|
| | | | *f* | *%* |
| 1 | Low | 64-107 | 09 | 6.14 |
| 2 | Moderate | 108-146 | 28 | 19.04 |
| 3 | High | 147-192 | 110 | 74.82 |
| | **Total** | | **147** | **100** |

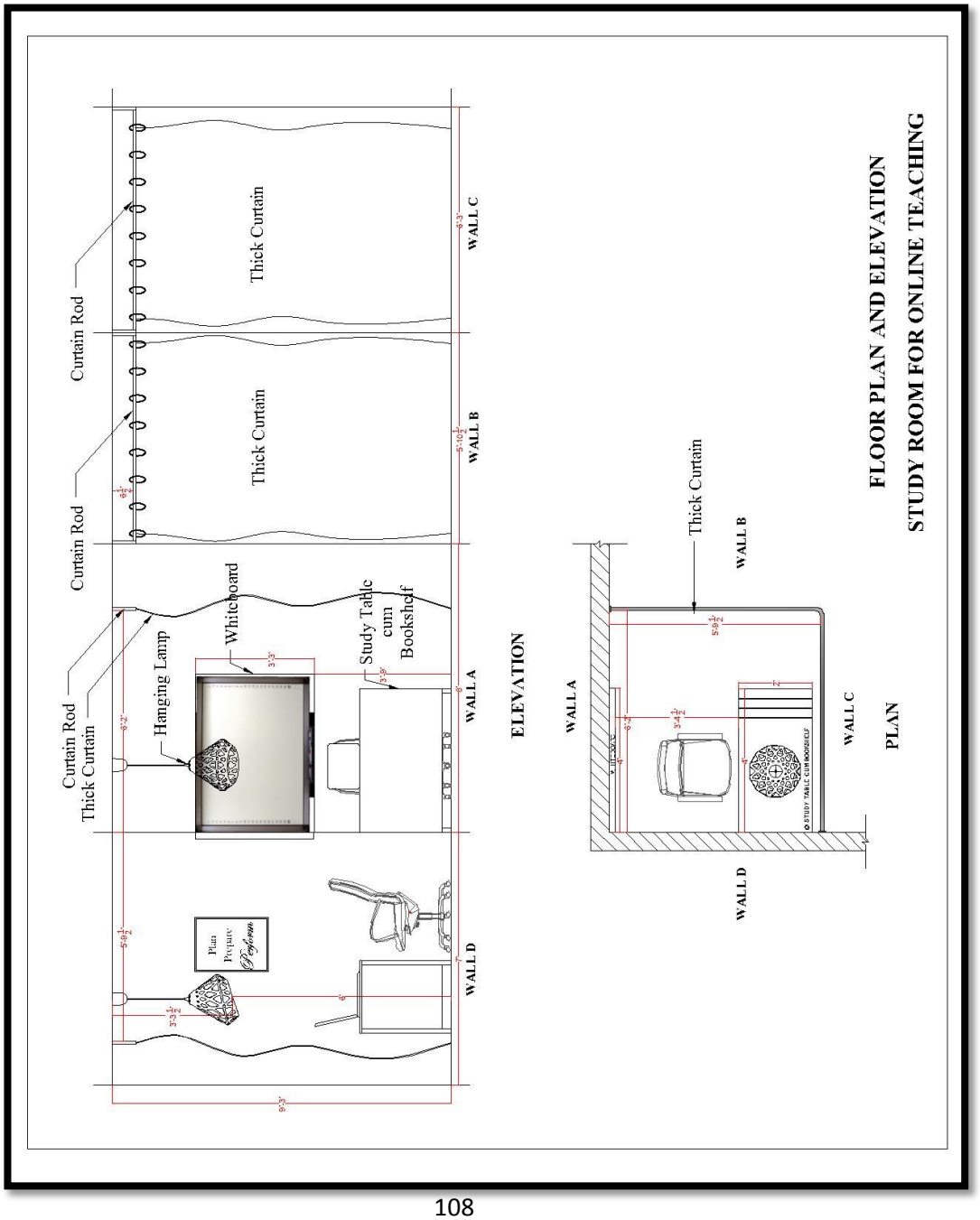
It was found that 74.82 per cent had high extent of problems related to space in their residence during online teaching whereas very few of the respondents (19.04 per cent) had moderate extent of problems and very negligible were facing low extent of problems related to space for online teaching. This signifies that the teachers experienced high extent of problems and therefore a design was suggested for the teachers which they can implement in their existing residence for online teaching during this critical situation.

During the survey, it was found that many had problems regarding having 'private noise free space' for online teaching. Many had issues of not having separate study room which can be used for online teaching. Due to small house, they had to teach from either drawing room or

bedroom. While teaching from bedroom or drawing room, they even had to face issues of proper lighting. Due to low lighting, the visibility during online class was not clear. To make major changes in the interiors of the house in this pandemic is very difficult due to lockdown. So the proposed design focuses on how they can incorporate this study area in their existing room with minimum furniture and other minor changes.

**Section-III: Suggestions for designing an area for Virtual/Online Teaching in the Existing Residence**:

For the present study, the study area is designed keeping in mind all the aspects for Virtual teaching.



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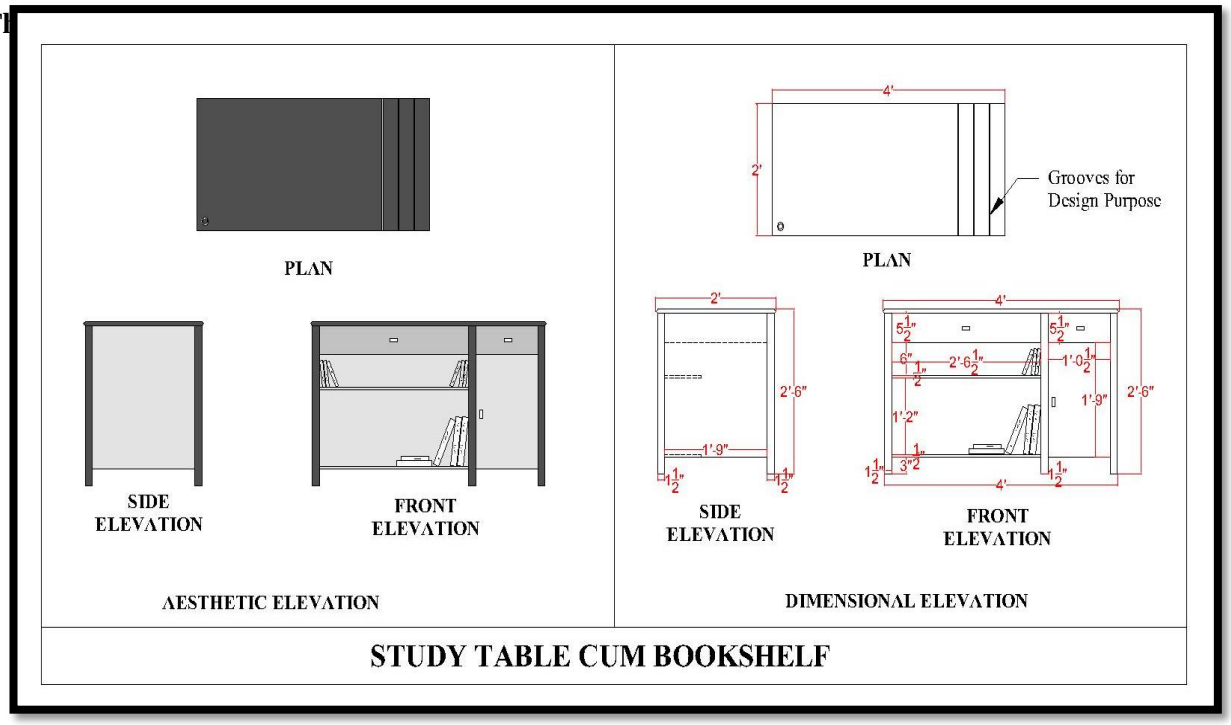


The designed area can be incorporated in any bedroom or living room or even in Verandah. The major requirement for Virtual teaching is that the room needs to be quite and noiseless. The area designed here for online teaching is 6'2"x5'9½". It contains very minimal furniture like a study table, a chair and a whiteboard on the wall. It also has hanging light above the desk for better lighting while online teaching. To cover this area, the thick curtains are used. The curtain used is made of thick vinyl to cut the noise from outside. One can use glass or plastic curtains also as they act as barrier for sound. Whiteboard is given on the back wall for teaching during the online class. Chair is given with study table which can be used to sit while preparing notes and while taking classes. The study table is designed with the bookcase. As this area can be incorporated in any other room of the house, this has multipurpose furniture. The study table is used as book case also for storing books and notes. The study table is of 4'x2'x2'6" size. It has two drawers. One drawer is 2'6"x5½" size and other is 1'x5½" size. There is a shutter cabinet of 1'x1'9" size below the small drawer. Below the big drawer, there are two ledges given for storing books. The length of the ledge is 2'6" and depth of the ledge is 9". The heights of the ledges are 6" and 1'2" respectively. The bottom ledge is not given too wide providing enough legroom for the person working on the table. The study table is made up of MDF material with white ducopaint. This area is designed keeping in mind the minimum requirements of the teacher while giving online lectures. During the online class, it is very necessary to have a quite environment and undisturbed place. This area can be used by the teachers for teaching and in other time this can be used as study room. For online teaching the basic requirements are the facilities needed like as; internet connection, lighting and computer or laptop for teaching, a table and a chair. In this designed area all necessary requirements are incorporated for a teacher.

A middle-class family is a social group that consists of people who usually have good jobs and are neither rich nor very poor. For a middle-class family space issues are always there in the house. Different rooms are used for multiple usages. The separate room allotting for only study is difficult with small houses. So, the proposed design is given keeping in mind the small space of the

house and making multiple use of the room. This design can be incorporated in the existing house by any teacher, who has minimum space in their house and have to take online classes during this pandemic. This design is space saving as well as cheap in cost also which anyone can afford. Any corner of the room with minimum of 6'x5' space can be utilised for this study area. With minimum furniture and proper lighting with closed soundproof curtains anyone can utilise their dead corner for use as study room. This area further can be utilising as study room for the children in the house. This design can also be used in any house where there is no space for creating separate study room. This design will help the students also who has online school from home, as like teacher the students also need a private noise free area to attend the classes. So, this design can be incorporated by people who do not have separate study room for their children.

## CONCLUSION

Today most of the educational institutions indulge in virtual teaching and also prefer this to reach a greater number of students worldwide. In the present situation due to the rapid spread of COVID 19 Pandemic all over the world teachers are using virtual teaching modes to complete the syllabus of the students but they are also facing many space related problems as teaching requires a noise free area, well illuminated place with all necessary equipment needed for online teaching. To cope up with this problem the researchers have suggested the way to convert a small place of the residence into a place to indulge in online teaching.

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# A STUDY ON THE COPING STRATEGIES ADOPTED TO REDUCE STRESS BY EMPLOYEES IN INFORMATION AND TECHNOLOGY (I.T.) OFFICES: SPECIAL REFERENCE TO GURUGRAM

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## ABSTRACT

The study focuses on the increasing problem of "stress "and throws light on the coping strategies adopted to reduce stress among the employees of Information Technology (I.T.) companies. Working in cubicles on computers continuously for long hours creates mental and physical fatigue that results in stress in the employees of IT sector. This unavoidable situation becomes a common problem among IT employees. Health and well-being is the paramount importance to individuals, business and society in the workplace. It is an ethical priority for businesses to have a healthy working population and also it benefits businesses materially by reducing costs linked to injuries and sickness absenteeism and through increased productivity. This paper discusses the copping strategies adopted and practiced by IT sector employees. The major strength of the study is that it will help employers to view their workplace with new aspects and also managing their employee's performance. The study is on a small scale having a sample size of 30 employee of five IT Sector organization. The employees having different demographic profile age, gender, experience etc. were selected. An online questionnaire was circulated among the employees and a data was collected by purposive random sampling. Data collected is used to find the demographic relation among employees age and their preferred coping strategy. Significant relationship has been found between the demographic profile of respondents and coping strategies adopted by the employees.

**Keywords:** Stress, Coping Strategies, Recreational Spaces, IT Offices

## INTRODUCTION

India comes under second most burned out city of the world. According to a report by WHO in Business Insider, 2019 stress has been portrayed as a silent killer in India which is considered as the most overworked country in the world. Stress has been termed as the root of workplace anxiety and depression in India. Both globally as well in Indian context, Information Technology (IT) is one of the fastest and significantly growing industry where India is the world's largest destination of Information technology. Among the well-known hubs in IT sector Gurgaon or officially renamed "Gurugram" is known as the model for India's global cities of the future. Because of rapid urbanization it has become an industrial hub. The city is also an economic center, attracting people from all over the country in various careers, especially in the field of technology. It houses some of the top IT and Fortune 500 companies making it the biggest hub of the IT sector in Delhi NCR known as the Cyber City of India. As quoted in 'Hindustan Times' the technology sector continues to drive the market with 58 per cent share of total leasing volume, by retaining a 31 per cent share followed by Delhi-NCR maximum shares goes to Gurgaon (Behl,2020).

Employers grill their employees with those target goals and deadlines to be met. This kind of monotonous and stereotypical mindset of employers has decreased the efficiency of employees. Employees working in the company have a lot of stress making the workplace a volatile stress factory and calling it the 'age of anxiety'. Life in the modern world is becoming more challenging and the burden of maintaining a work-life balance is becoming difficult day by day. Akshay Kumar (2015) concluded that the job stress problem is rapidly increasing in India. The Center for Disease Control and Prevention (CDC) notes that the type of work environment in offices, where they are expected to work long hours and to do for less pay in lean economic times, results in fear, uncertainty and stress. According to CDC, the nervous system is put on alert, hormones are released that are increasing pulse, deepen respiration, tense muscles. Humans have little or no control over it. It means that it is biologically programmed where the response is constantly activated when the stressful situations remain unresolved which leads to wear and tear of the biological system. Melchior et.al (2007) state that work stress can affect employees regardless of gender, position or type of employment. Employees are most likely to have physical ailments, anxiety, and stress which are the biggest causes of illness that they face. The statistics is worrying for businesses, because if an employee is not fit for work it will, directly and indirectly; imply the business with the drop in productivity, lost working days and results in falling profits.

Various studies on stress concluded that if stress is uncontrolled it induces physical impacts such as headache, stomach upset, raised blood pressure, sleep disturbances and cardiovascular disease or emotional fallout like irritability, anxiety and emotional deregulation. Those who worked themselves to the point of burnout can recognize symptoms like lack of motivation, loss of memory, loss of concentration, difficulty with thought process and poor decision making. The burnout of the employee impacts their wellness and health which include high absenteeism, poor time keeping, low morale, poor motivation, increase employee complaints, poor performance and productivity etc.

Few studies were carried out on coping strategies in India and abroad which are reported here. Alosaimi et.al, (2016) concluded that administrative employees have less stress level as compared to the residents. Maladaptive stress coping strategies which were similar in both groups were positively correlated with stress. It was suggested that stress management training was scarce among residents so a more focused training programs was needed for Healthcare workers.

Bhhatacharya and Basu (2018) explained that due to increased anxiety in personal lives and due to uncertainty in jobs in a highly destructive environment, the stress levels are rising among employed Indians causing depression which led to high risk of suicide. In a survey by Optum shared with Economic Times it was found that half of the employees in India suffer from some kind of stress. The survey was conducted in 70 large companies. Another survey conducted by 1to1 help.net found 8 per cent are at high risk of suicide of all counseling cases in 2018.

As per Bureau, Economic times, (2016) about 80 per cent of employees always have complains regarding their stress and their organizations for not having any effective programmed to manage stress at work. According to Times Jobs Study working professionals of all categories have felt the pressure of work-related stress at some point in their career. About half of employees thought that seniors are responsible for stress, 35 per cent employee are stressed due to low salary, 30 per cent by poor work environment. A large number of employees are ready to take part in stress management programs and 80 per cent of employees agreed that their companies are not conducting such programs.

Holton et. al, (2016), found that maladaptive coping strategies on perceived stress management are less influential then adaptive coping strategies. It was concluded that there is a greater impact of employee's stress management program if focused on adaptive coping method than those focused on decreasing use of maladaptive coping. For the success and healthier employees, it is important to facilitate the use of adaptive coping strategies by increasing the availability of resources in the workplace.

Khan (2018) studied the causes and coping Strategies for stress among employees where he found that the reasons for stress are the lack of cooperation on the part of boss and colleagues, insufficient salary, harsh attitude of Boss, unnecessary workload, lack of appreciation, and less incentives etc. The research also concluded that lack of good working atmosphere, unavailability of basic facilities, improper arrangement of recreational activities for employees were the basic causes of stress among the employees. According to him stress can be easily reduced among the employees by providing proper arrangements for recreational activities and leisure time.

Nayak (2008) studied various factors influencing stress and coping strategies and found that most teachers were stressed because of their laziness. Age was also one of the influencing factors. The majority of the teachers were found to be in low-stress categories and happy when have fewer responsibilities. Teachers adopted different strategies when physically stressed -used sleeping pills, took a balanced diet, hot water therapy etc and to reduce their mental stress, they offered prayers, listen to songs, avoiding painful reminders, working in groups, delegating the task and avoiding strenuous posture.

Nordin et.al, (2016) researched on occupational stress and coping strategies among Malaysian and found poor physical and mental health, poor recreational behaviour are the result of the occupational stress and psychological distress which can be alleviated by the coping strategies. The most significant stressors were time pressure, incompetent boss, deadlines, work pressure, performance pressure, long working hours, insufficient number of staff, lack of support from co-workers and supervisors, anxiety, depression and use of avoidance coping strategies. It was found to positively influence occupational stress by the adoption of coping strategies like by doing something recreational, positive reframing, emotional support, networking and learning more effective ways of communication.

Panigrihi (2017) concluded from the research that if stress is within a specific limit, it helps to achieve necessary objectives but when it exceeds the limit then it shows harmful effects on mind, body and behavior. To get relief from stress various coping strategies can be adopted like sports, talking to a close one, sleep, quitting of addictive products and relaxation habits. On the part of the organizations the management can provide them with platform to reduce stress like meditation, yoga, exercise and recreational activities.

Prasad et.al (2016) studied the occupational stress on employee performance at the workplace and found that various factors that affect the IT sector employees which include role overload, workload, lack of job control, organizational climate, lack of job control and job insecurity in particular. In his comparative study of stresses between the IT sector and IARI, he concluded that the stress in the IT sector is more than IARI.

From previous studies done it was concluded that there is stress on the employees of IT sector. To reduce their stress the various coping strategies were adopted like talking to close one, sleep, relaxation habits etc. It was found that various occupational stress and psychological distress can be alleviated by the coping strategies. Various coping strategies were adopted like balanced diet,

hot water therapy, sleeping pills, offering prayer, listen songs etc and recreational activities and leisure time activities.

**Justification for the present study**: - Many studies were found on the impact of stress on the employees; hence the researcher has continued the research on further findings on the coping strategies used by employees to de-stress themselves. This research will attempt to assess the fact that whether these recharging spaces help to keep the employee not only physically but also mentally relaxed. This study will help to understand the facts on the evolution being done in the office planning i.e the introduction of new areas of recreation for the employees in respective organizations. This study will expand knowledge about the recreational spaces in offices used as a coping strategy by the employees of IT companies to reduce their stress. Internationally, few researches were found on these types of recreational spaces. Any study on recreational spaces used as coping strategies was not found in India. Hence the study was carried out.

## OBJECTIVE

To study the coping strategies adopted by employees of selected IT offices to reduce the stress

## METHODOLOGY

### Research Design

The study is the descriptive type of research and to collect the information for the study questionnaire was used. The following variables are included in the study –
The independent variables: Age, Work experience, designation, gender
The dependent variables: Coping Strategies

### Population of the Study

The location selected for the study is Gurgaon, Haryana. In the present study the sample consists of 30 IT employees working in the similar work environment selected from the identified 5 IT offices. A care was taken to select those IT employees who had similar background i.e. profile, age group, working hours, sedentary type job, etc. so that a more homogenous group is prepared as possible. The small sample size of 6 employees is taken from each office of the selected area, thus making a total of 30.

### Sampling Frame

A list of IT offices situated in Gudgaon (Gurugram) was prepared by purposive sampling. Once the offices were selected, permission was obtained from the concerned authorities for selecting the employees from their office to conduct the study. The employees were selected purposively based on their willingness to participate in the study. The respondents comprised of both male and female, between the age of 25–50, having sedentary jobs and experience of at least 3-5 years or more than in the same office.

**Research Tool**

Structured questionnaires were distributed online through 'form app' and were administered through WhatsApp application on cellular phones to the respondents.

**Operational Definitions:**

**Recreation-** Recreation is enjoying oneself when one is not working. **(**Cambridge English Dictionary)

**Recreational space -**Space provided for activities done for enjoyment when one is not working.

**Coping Strategies –**Coping strategies are psychological patterns that individuals use to manage thoughts, feelings, and actions encountered during various stages of ill health and treatments.

## RESULTS AND DISCUSSION

Various strategies were taken by IT employees to reduce their stress caused due to office work. They usually prefer short breaks for relaxation and adopt various strategies to reduce their physical stress.

Recreational areas are those areas/Rooms where employees can take a few minutes of downtime to zone out, relax, stretch, nap, or even meditate, eat, play. Commonly provided recreational spaces in the IT offices were – food space, game space, Gym, Space for practicing Yoga /meditation, space for reading and space for taking a nap/ to lie down / relax/stretch oneself.

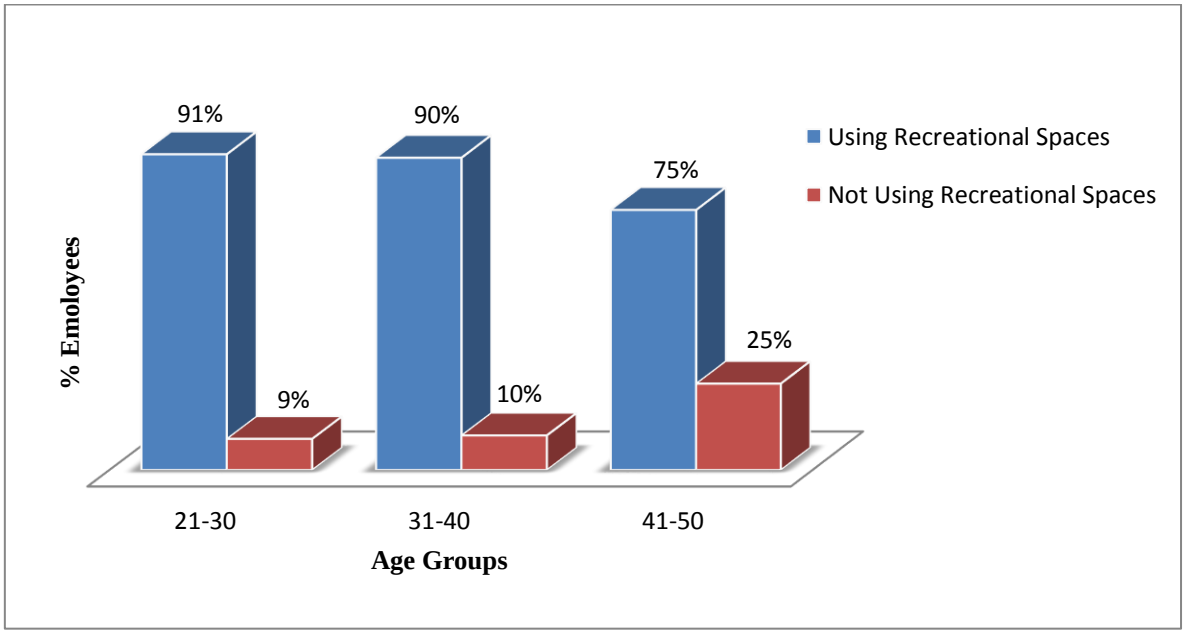


**Figure1: Use of recreational spaces by employees of IT companies to reduce stress: age category wise**

A group IT employee were selected for the study to find out whether they use Recreational spaces provided by the office to reduce their stress and it was found that 91% employees between in the age 21-30 were using the recreational spaces and 9% employees were not using it. The spaces provided by the office to reduce stress were used maximum by the youngest group of employees. Same was in the case with age group of 31-40, where 90% were using recreational space and only 10% was not using it similarly ,75% of the employees were using the recreational spaces provided by the office and 25% was not using in the age group of 41-50 (Figure1).

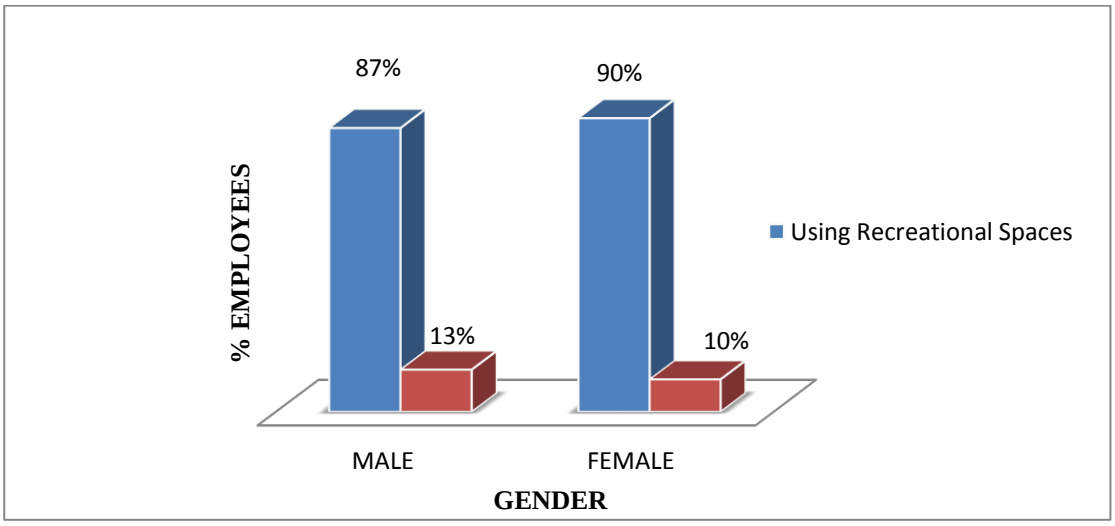


**Figure2: Use of Recreational Spaces by Male and Female Employees of IT Companies to Reduce Stress**

In the selected group 87% males and 90% females were using the recreational spaces on the other side 13% males and 10% female were not using the recreational spaces respectively provided in the office premises (Figure2).

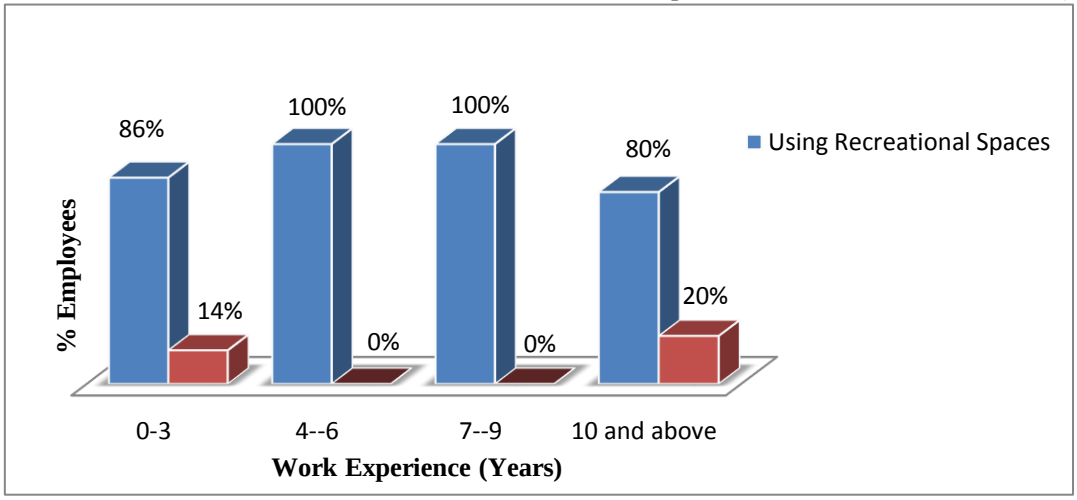


**Figure 3: Use of recreational spaces provided by IT companies to reduce stress: work experience wise**

A wide majority (86%) employees having work experience of 0-3 were using spaces but 14% were not using them. All employees with work experience of 4-6 and 7-9 years were using the spaces. Whereas 80% employees of work experience 10 years and above were using the spaces and 20% of them were not using the spaces (Figure3).

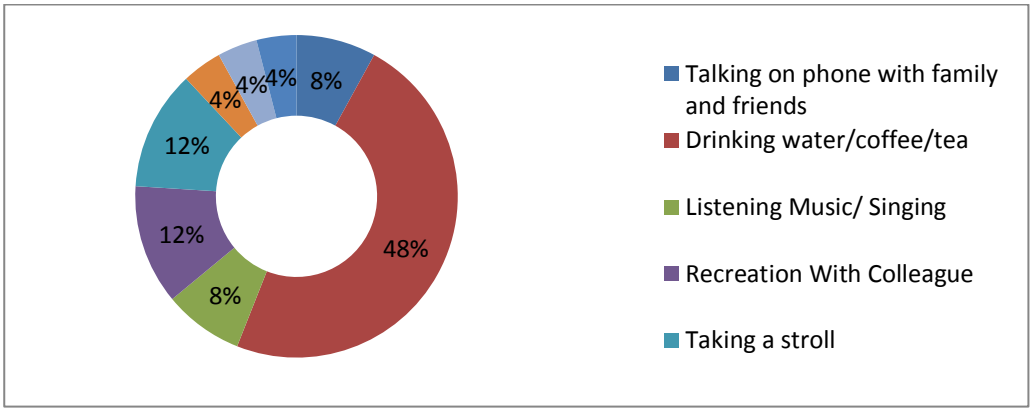


**Figure4: Preferred Short Breaks for De-stress**

**Preferred Short Breaks for Relaxation:**

Employees preferred to take short breaks for relaxation and doing some activities -

1) Data analysis shows that highest percentage i.e. 48% of the employees preferred going for drinking water, coffee or tea break.

2) Taking a stroll and recreation with colleague was the most common break taken by the employees which was 12% each.

3) Equal number of the employees talked on phone with family and friends or listened to music each (8%).

4) 4% of the employees did Net surfing and similar percentage of employees did deep breathing. 4% employees had some other method to relax which was not mentioned (Figure 4).

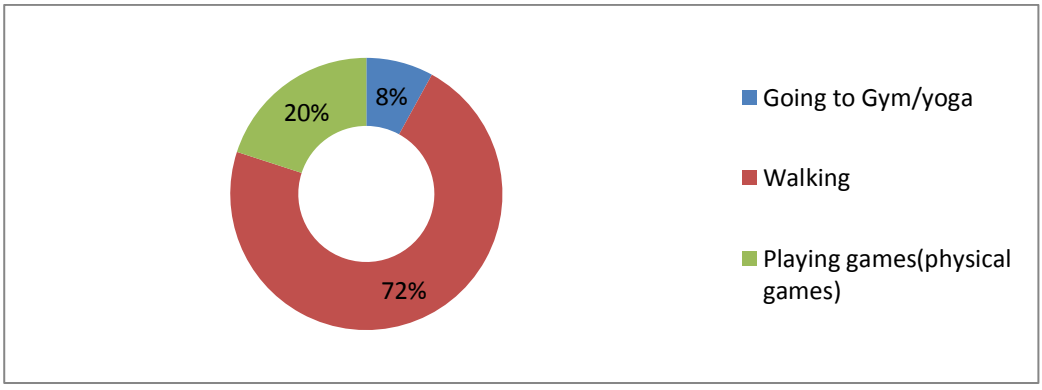


**Figure5: Physical Activity Adopted for Relaxation as a coping strategy to reduce stress**

Majority of employees i.e. 72% went for walk, 20% played games and only 8% preferred going to gym or for yoga when they were in stress (Figure 5).

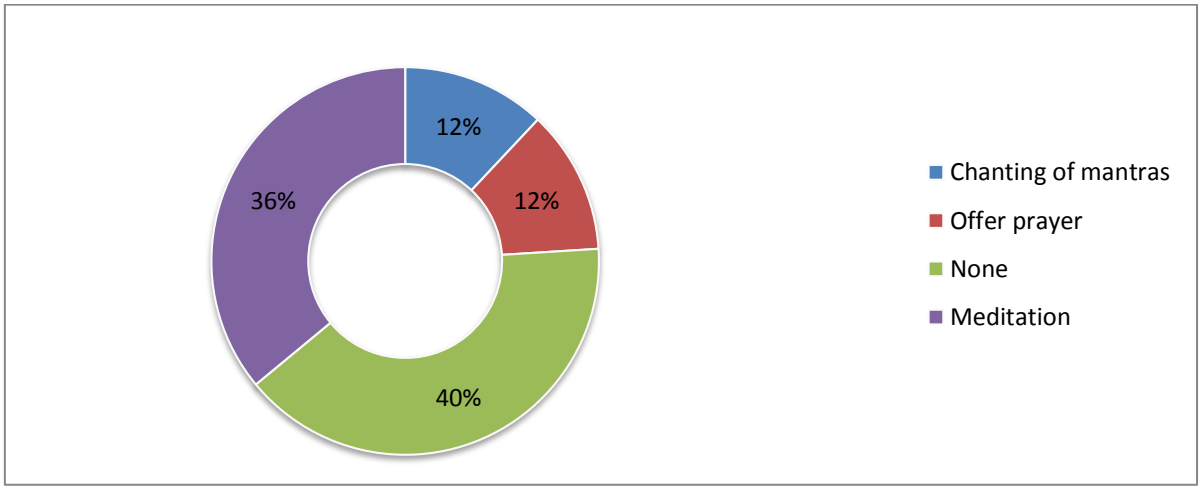


**Figure 6: Spiritual Activity to reduce stress**

Majority of the employees did not perform any spiritual activity. More than one third (36%) of the employees meditated and 12% chanted 'mantras' and another 12% offered prayer (Figure 6).

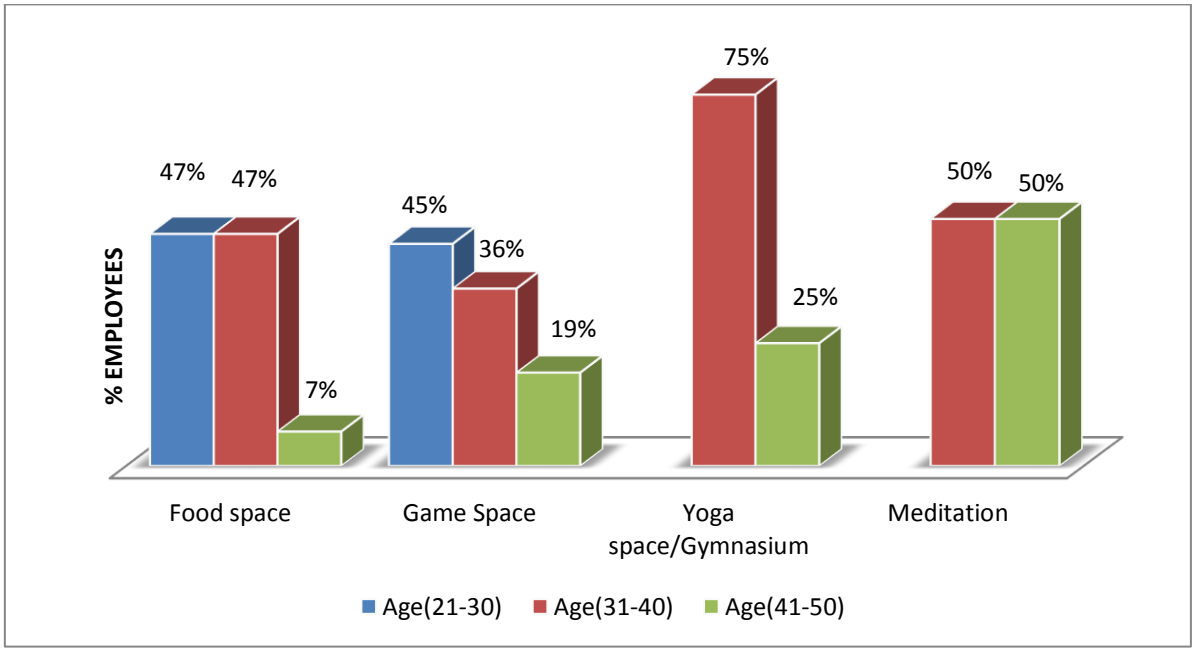


**Figure7: Recreation space utilization and age category**

Food Space was utilized by 47% employees between the age of 21-30, 47% by employees of age 31-40 and a very less percentage i.e. 7% of employees of age group 41-50. Game space was used by 45% of employees of category 21-30, 36% by employees of age group 31-40 and 19% by 41-50. Gymnasium is not used by respondents belonging to age group of 21-30 whereas 75% and 25%

were used by age group 31-40 and 41 – 50 respectively. In contrasts to food space, meditation space is not used by any employee of age 21-30. Instead meditation space is equally utilized by age group 31-40 and 41-50 except age group 21-30 (Figure 7).

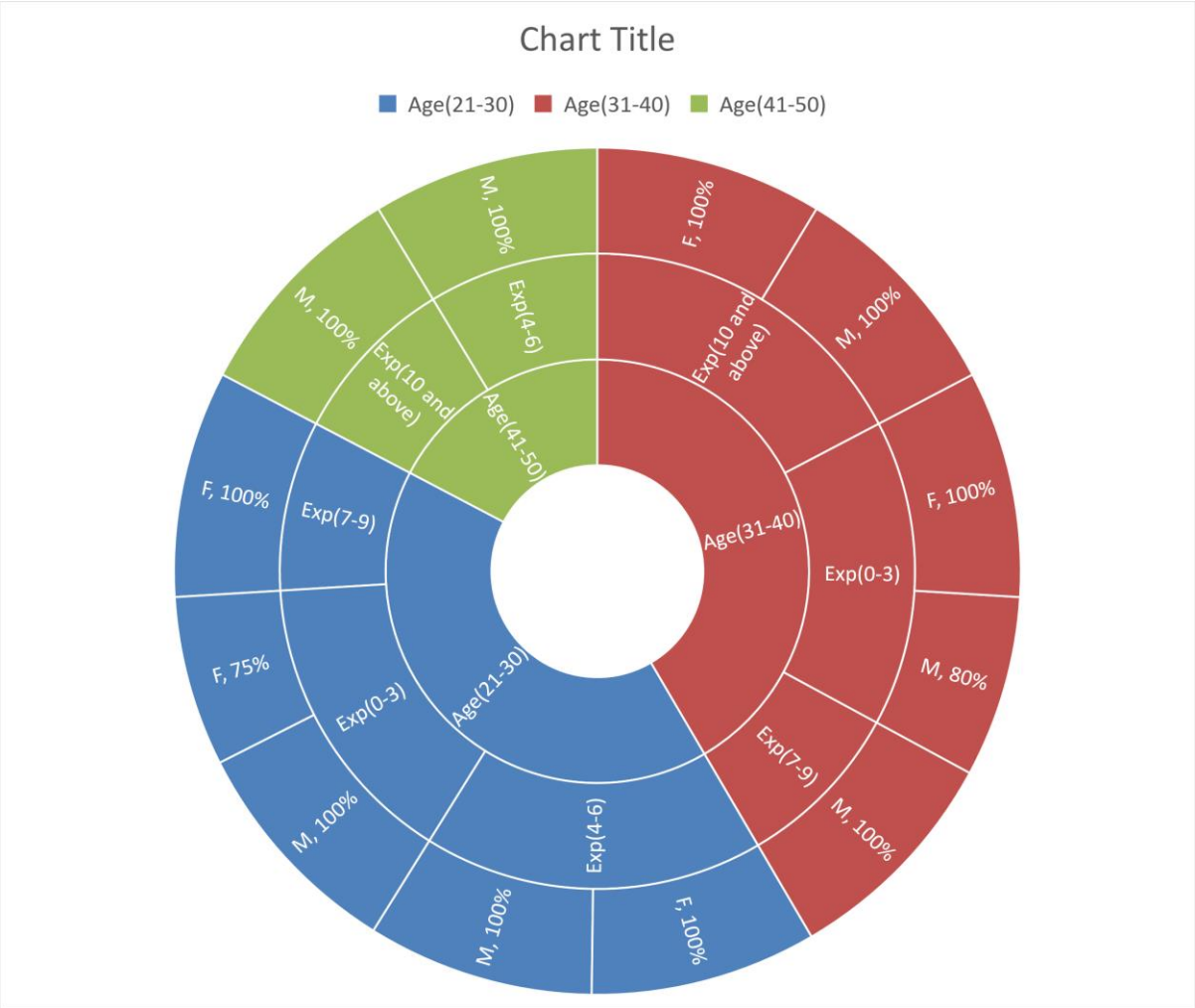


**Figure 8: Demographic profile of the IT employees and their use of recreational spaces**

Three fourth( 75 %) of females and 100 % male employees that belonged to age group 21-30 years with an experience of 0-3years were using recreational spaces, all employees both male and female with 4-6 years of experience were using recreational spaces whereas all the females only were using recreational spaces with the experience of 7-9 years. Under the category of 31- 40 years with an experience of 0-3 years 100 % female and 80% male were using recreational spaces, employees with 7-9 years of experience 100 % female employees were using recreational spaces and 100 % both male and female employees were using recreational spaces with an experience of 4-6 years. Similarly, no female employee was using recreational space whereas 100 % male in both categories with 4-6 and 10 and above in the age group of 41-50 years were using the recreational space provided in the office to reduce their stress (Figure 8).

The study shows that there is no relation between age, genders, and experience with the extent of usage of recreational spaces. The study showed that the choice of selection of recreational space has a relationship between age and the choice of recreational space used by the employees in IT offices.

## Regression Analysis:

On performing a multiple regression analysis on demographic profile (age, gender and Work experience) and extent of use of recreation spaces from data sample collected through IT employees following results has been produced.

| *Regression Statistics* | |
|---|---|
| Multiple R | 0.120681 |
| R Square | 0.014564 |
| Adjusted R Square | -0.12621 |
| Standard Error | 0.351971 |
| Observations | 25 |

The value of Multiple R is .120681 which is very far from 1 which shows that there is no significant relation among them

## CONCLUSION

The result of this study shows that majority of the IT employees follow various strategies to de-stress themselves. Both male and female employees use recreational spaces provided by the organization though majority of the users were the youngsters. Various strategies taken by the employees were playing games, spiritual activities, going to gymnasium, going to yoga, listening to music etc. It has been concluded from study that regarding the choice of recreational space employees of middle age group are using more of meditation space and employees of young age group are using only food space and Game space. Regression statistics when applied it was found that no significant relationship has been found between the extent of use of recreational spaces and demographic profile of IT employees. The present study was conducted on a small scale but it reflects a need to be conducted on a large scale to find out effectiveness of the recreation spaces provided by the companies on the employees to reduce the stress.

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# DESIGNING OUTDOOR AREAS OF SCHOOL BASED ON NECESSARY COMPONENTS

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## ABSTRACT

The environment of the school playground has a profound impact on the development and growth of the children. The school environment should be designed to help enhance the child's activity, creativity and imagination.The ideal environment of the outdoor areas of the school should so designed which reflects the presence of the child, which is fascinating, rich as well as challenging for the children, should be interesting and thought-provoking but not flashy. The present study aims to provide suggestions for designing the outdoor areas of the school playground as well as suggest designing the outdoor areas of pre-school and secondary school playground. The present study was conducted in Vadodara city. The findings would help designers to develop the play spaces according to the children's need.

**Key Words:** Playground, Outdoor Areas, designing, necessary components

## INTRODUCTION

Today childrenlack space to play outdoor games. Because of this, children becamealienated from nature, their life has becomeunqualified and intensive urbanization has limited theacts of children and caused problems on their socialdevelopments (Ozdemir, 2010). It is within play that children practice a variety of roles, learn to read intentions of others, learn to initiate and follow others leads and begin to experience acceptance from others (Nelson and Smith, 1995).

Play is a business of a child through which they learn, discover and create a suitable environment which is open for manipulation (Metin, 2003). A sophisticated playground and playground equipment directly reflect on the understanding of a child's behaviour.

Playgrounds have an important role in the modern child's world. The ideal outdoor playground should be a replica of natural outdoor environment for today's urban child. They should encourage physical, social, emotional, mental and creative play as well (Sheridan, 1999). The playgrounds should be developed in such a way that the space allows the children to experiment and control the space and environment for active learning.

Nowadays the playgrounds are designed according to a standard child by placing the same play equipment in every field like a typical project. The children get bored of the fixed structured playground and it effects upon the child's intellectual, social, emotional as well as physical needs. By the means of play children learn and develop as individual members, the developmental benefits include creativity, imagination, learning to solve problems and ability to cooperate (Metin, 2003). Mostly the outdoor play environment is considered for physical benefits as well as helping the children to form their own world.

Playground equipment should offer risk taking opportunities for children to develop their skills. The playgrounds and play structures should have open-ended activities and space that encourages the children to explore the environment on their own. It is important that the playgrounds should have such equipment which the children can move, manipulate, explore and also can be incorporated into their play. The design of a play equipment should foster independent decision making among the children.

The play area must promote and positively support the child'sinteraction with space, materials and people. When the outdoor environment supports both functionality and easy to use environment it is easier for adults to focus on children with needs.A well-developed playground and outdoor areas of the surrounding were the first things that all children wanted in their childhood which depicts the need to design an outdoor area focusing on the development and needs of the children. Designing a high-quality environment has a great impact on student behaviour, attitude as well as achievement. The design concepts in the school will create a play environment that will encourage each child to function independently and also manage the situation on their own, which will also improve their learning experiences.

## OBJECTIVES

1. To assess the requirements of outdoor areas of the school

2. To Provide suggestions regarding essential components for designing outdoor areas of schools

3. Designing outdoor areas of Pre-School and Secondary school

## METHODOLOGY

A preliminary survey of outdoor school playground was conducted in various schools of Vadodara city.The study was conducted in threephase in which the first phase comprised of surveying the outdoor areas of the school of Vadodara city, the second phase consisted of providing suggestions for designing the outdoor areas of the school according to the designer and the third phase comprised of designing the outdoor areas of pre-school and secondary school according to the requirements of the children.

## MAJOR FINDINGS OF THE STUDY

Phase I- Surveying the Outdoor Areas of the School playground of Vadodara city

According to the preliminary survey conducted on the outdoor school playground of Vadodara city, several school playgrounds lacked in various essential components which should be incorporated in the school playgrounds for the needs of children.To fulfil the needs of children on the playground the designer suggested a list on essential components which can be used by the school authorities, school principal and landscape designers while developing a school playground.

Phase II- Suggestions of Essential Components for Designing the Outdoor Areas of the School

The designer provided a list of essential components which should be incorporated in a school playground for the welfare and safety of the children. These components can be helpful as a guide in developing school playgrounds.

- Acceptable and suitable space should be provided for performing various activities.
- Storage space and lockers should be provided to store play equipment.
- Canteen should be provided with appropriate seating area.
- Adding designs and symbols of various games on surface of the pathways and walkways.
- Various flowering plants and trees with colourful leaves should be planted in the playground.
- Playhouse and sand pit should be provided in the play area for preschool children.
- The walls facing the playground area should be painted in bright colours which attracts the children.
- The play equipment should be painted in bright colours which is visible from a distance.
- The surface of the playground under or around any equipment must be of sand, recycled rubber mulch or grass.
- A suitable space for seating and gathering should be designed.
- An appropriate shelter area should be provided for protection from the weather.
- Security cabin should be placed near the entrance gate with easy access to the play area.
- Well-spaced parking area must be designed in the premises of the school.
- Dustbins should be placed at certain intervals, car-toon shaped dustbins can be used to attract children.
- Drinking water facility must be provided with proper shade and surface.
- A second exit could be designed in case of emergency.
- More landscape can be added in various forms like potting plants, hanging plants, creepers or plants placed in tyres.
- A well-equipped medical room should be provided with easy access in the outdoor areas.
- The boundary wall must be secured with fencing.
- Outdoor washrooms and changing rooms can be designed near to the play area.
- Waterbody or fountain can be added with low depth.
- Stage could be designed in the playground for organizing school functions.

Phase III- Designing the Outdoor Areas of Pre-School and Secondary school according to the requirements of the children

*Designing Outdoor Areas of Pre-School*

The design for the outdoor areas of pre-school was proposed considering the observations made during the preliminary survey. The playground had an area of 1580 sq. ft. The outdoor playground design was prepared keeping in mind the age and safety of the children. Various areas were presented in the playground for their development such as (1) Imaginative play area: play house, sand-pit area, learning alphabetical and numerical footsteps, (2) Balance Area: balance logs, pull-ups logs, balancing tyres, merry-go-round and climbing structure.

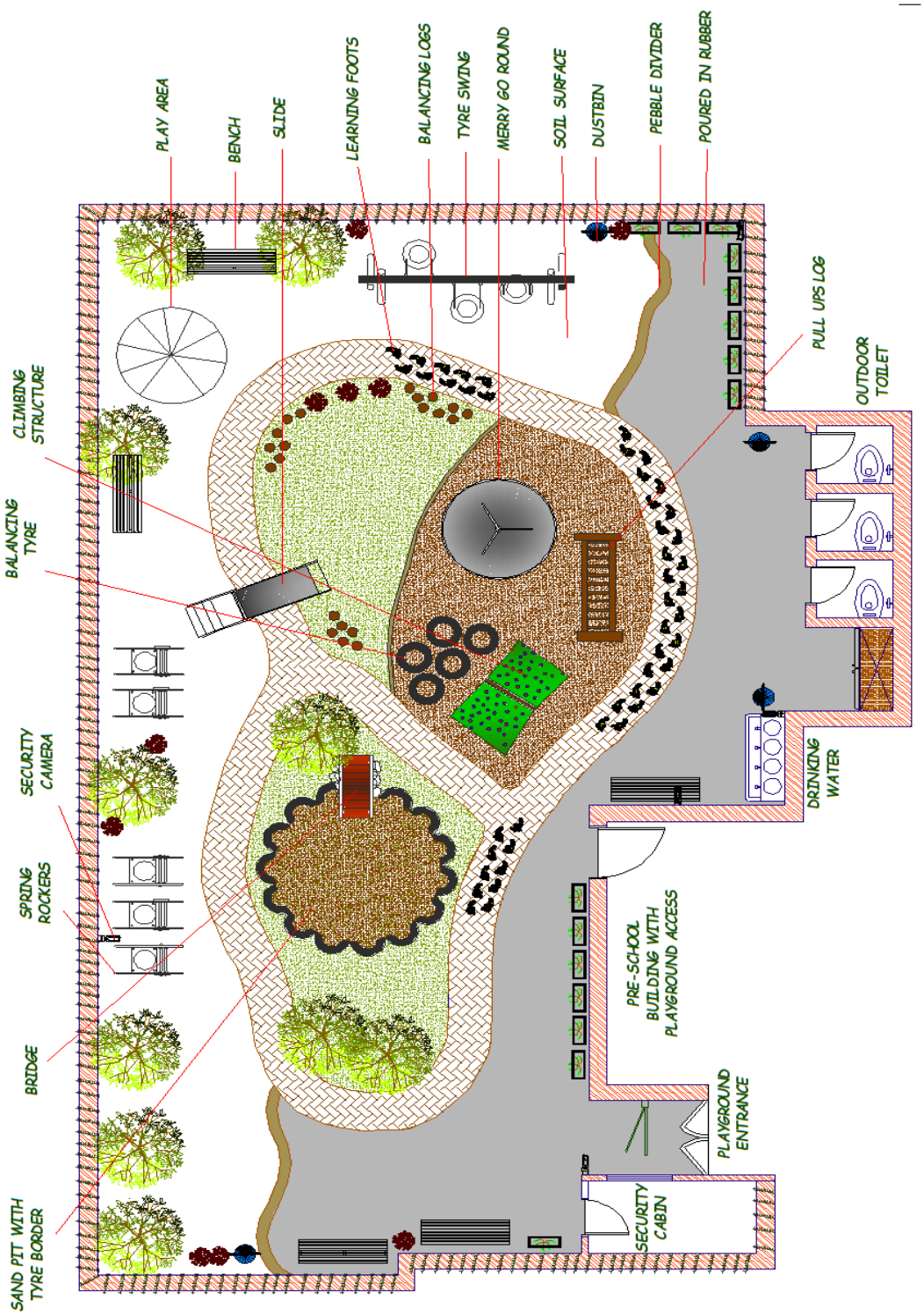


**Figure 1: Pre-School Playground**

The playground area had two access points, one from within the school premises and another from the main gate, a security cabin was set up with several security cameras beside the entrance of the playground for the safety of the children. The playground was developed with drinking water facility, outdoor toilet of 11sq.ft. area each and a storage cabinet for easy access of extra uniforms when needed.

Several dustbins were placed near each corner to teach the children to throw the waste in the bin, benches of low height were placed near every play area. The surface of the playground was made of poured in rubber and soil surface, the two surfaces were separated by pebbles fixed with cement filling.

The play areas were divided with paver pathways around, imaginative play area included a play house and a sand-pit with small bridge for access, children are free to play according to their cognitive and social development in imaginative play area, whereas in balancing area the children are learned to develop their physical abilities by the obstacle and equipment's placed in the balancing area such as balancing logs, climbing structure, pull-up logs, merry-go-round. Along with these play equipment's and play areas various play and recreational equipment such as tyre swings, spring rockers, slide and tyre were added in the playground premises.

The boundaries of the school were secured with concertina wire fencing for the security of the children from the trespassers. Green shade net was used for shade in the playground for protection from the weather.

*Designing Outdoor Areas of Secondary School*

The design for the outdoor areas of secondary school was proposed considering the observations made during the preliminary survey. The total free area considered for the playground designing, landscaping, parking and passage way was 12130 sq. ft. The outdoor playground design was prepared keeping in mind the age of secondary school children. The areas and components in the secondary school design were designed considering the age and capabilities of the children.

The boundary walls of the school playground area were secured with concertina wire fencing which is found the most suitable fencing for the protection of the children from the trespassers. The parking space was also built with concrete surface and strong boundaries. Inner boundary walls of the school playground were used to divide various play areas in the playground. The outdoor playground of secondary school was divided into two separate areas, first physical play area and the other landscape area.

The physical area of the school had various facilities such as cricket pitch, football area were the areas which had no shade above and had soil surface, basketball court and badminton court were secured with solid shade above and with adequate seating for the audience and poured in rubber surface suitable for the play. The total area physical area including parking lot space was 6129 sq. ft. An indoor game stadium of 463 sq. ft. area was also built with secured boundaries and shade with enough seats for the audience and players. A canteen of 1430 sq. ft. area was also placed near the physical play area with fenced boundaries and seating inside.

The landscape area was taken 3067 sq. ft. The landscape area of the school was designed with lush and large evergreen trees on the boundaries of the school which is also beneficial for the internal privacy, several sculpture stands were placed on the grass surface for aesthetic look, benches for students were placed at several intervals for group and private seating, pathways and walkways were developed for easy reach in the landscape area of the school. Shrubs and bushes suitable to the climate were placed on the boundaries of the pathway.

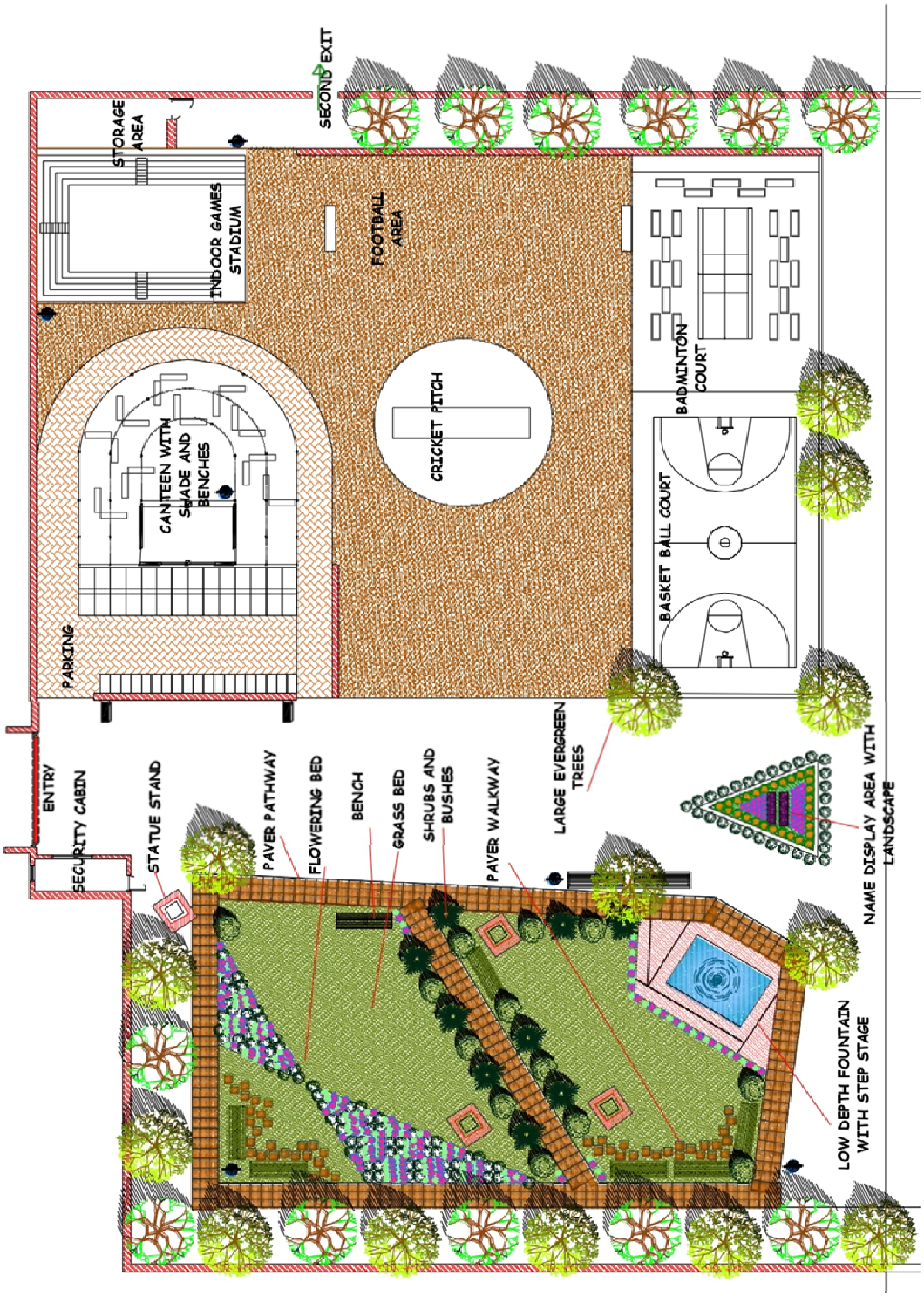


**Figure 2: Secondary School Playground**

A low-depth fountain was developed near one of the corners of the landscape area of the school for aesthetic purpose. A step stage was designed around the fountain to increase the height of the fountain from the ground for the safety of the children. Between the play area and landscape area a name display of the school was designed in a triangular shape with flowering beds and bushes around with the support of fencing.

Along with various areas and zones, a security cabin was designed near the entrance of the school building for regular checking and security, second exit was planned on the side of the play area for emergencies.

## CONCLUSION

The exterior environment of the school area affects the behaviour and development of the children. The environment of the school playground for both pre-school and secondary school was designed by the designer in such a manner that it would help every child's natural instinct and creativity. The designer designed the environment taking into consideration the comfortability of the children. Different spaces were developed by the designer which would encourage the children to use the outdoor areas of the school to the maximum.

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# HEALTH PROBLEMS EXPERIENCED BY CASHIERS OF RETAIL STORES DUE TO ILLUMINATION AT THE CHECKOUT COUNTERS

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## ABSTRACT

India is the world's fifth-largest global destination in the retail space. In many businesses, such as retail stores, the cashier is at "stepping stone" position. The work environment of a checkout counter has an impact on the cashiers. Poor illumination level at the checkout counters of the retail stores can cause various health problems among the cashiers. The present study was undertaken to assess the illumination level at the checkout counters and to find out the extent of health problems experienced by the cashiers due to illumination at checkout counters of the retail stores. The descriptive research design was adopted for the present study. Convenience sampling technique was adopted to select retail stores from Vadodara city and 60 cashiers were selected through purposive sampling technique from the retail stores. Interview schedule was used to collect data from cashiers and record sheet was used to note readings of illumination levels at checkout counters. The findings of the study revealed that the cashiers experienced physiological health problems such as eye strain, burning of eyes, headache, psychological health problems viz. stress and frustration. Moreover, a significant relationship was found between the extent of health problems experienced by the cashiers and illumination level at the checkout counter. The findings of the present study will be beneficial for the retail authorities, designers and also to the government to amplify proper lighting standards in the retail stores.

**Keywords:** Cashiers, Checkout counters, Illumination, Health problems, Retail stores

## INTRODUCTION

Retailing in India is one of the pillars of Indian economy. India is the world's fifth-largest global destination in the retail space. It accounts for over 10 per cent of the country's Gross Domestic Product (GDP) and around 8 per cent of the employment (IBEF, 2019). A team of several workers are involved in these retail stores such as cashier, sales associate, store manager, cleaning and maintenance worker, security guard, team leader and floor manager (Comentale et.al. 2018). The place in retail stores where the cashiers work is termed as checkout counters. It had a cash box, display unit, keyboard unit in front of the cashier. The work environment of a checkout counter has an impact on the cashiers (Kihlstedt and Hagg, 2011). Every retail store has various number of counters in which the cashiers performs their job.

The concept of lighting in workplaces is to allow users to see without difficulties the tasks being carried out, increase productivity, and reduce accident risk and fatigue (Leblebici, 2012). In the same way, poor or improper lighting can cause eye strain, which may involve problems in the eyes (dryness, itching, or burning), headaches, tiredness, irritability, moodiness (Martinez, 2018).

Lighting has become one of the most important aspects in efficient building design due to its impact on energy consumption. However, it must be taken into consideration that a good lighting approach should have benefits not only for economic or environmental aspects but also for comfort and health due to its influence on people's quality of life and wellbeing (Montoya, 2017).One of the main lighting problems is derived from over-illumination which occurs due to multiple artificial lights in the ceiling and/or daylight penetrating the room.

Leblebici (2012), conducted a study on impact of workplace quality on employee's productivity addressed that migraine headaches, fatigue, medically defined stress, anxiety can be caused due to poor illumination. According to Chauhan (2016), the recommended level of illumination for retail stores is 500 lux. Katabaro and Yan (2019), conducted a study which states that visual discomfort and physiological and psychological strain such as anxiety, fatigue, lethargy, headaches, eyestrain, migraine, nausea, back pain, neck pain, shoulder pain, poor concentration or lack of mental alertness, and daytime sleepiness among video display terminal workers are primarily connected with inadequate lighting in the working place and in most cases decrease work performance and efficiency. Thus, providing adequate or quality lighting condition in a working space goes beyond the act of just installing a suitable quantity of light. The lighting illuminance level and uniformity refer to the maintained minimum average illumination required to accomplish a specific task in a given work plane (Lee, 2014). Nguyen and Garcia (2019) conducted a study on the awareness, attitudes and perceptions of health risks associated with excessive lighting in night markets with 205 vendors and non-vendors. The results showed that vendors of the night markets were more likely to suffer from eye and sleep related problems than non-vendors and also women were affected more than men. The results also revealed that the majority of both vendors and non-vendors tended to have awareness about excessive lighting impacts on human health, with more vendors tending to agree with the fact than non-vendors.

## Statement of Problem

The present study aims to assess the illumination level of the checkout counters of the selected retail stores and to find out the extent of physiological and psychological health problems experienced by the cashiers due to illumination levels at checkout counters.

## Objectives of the study

1. To assess the illumination level at the checkout counters of the selected retail stores.
2. To find out the extent of physiological and psychological health problems experienced by the cashiers due to illumination level at checkout counters.

## Hypothesis of the study

**$H_1$**: There exists a relationship between the extent of physiological and psychological health problems experienced by the cashiers and illumination level at the checkout counter.

## METHODOLOGY

The descriptive research design was adopted for the study. Several retail stores of Vadodara stores were contacted, where 9 retail stores gave consent to assess their checkout counters and also interview their employees. Hence, convenience sampling technique was used to select 9 retail stores from Vadodara city and 60 respondents who have been working as cashier since one year were selected through purposive sampling from the selected retail stores. The data were collected in the months of October, November and December, 2019.Interview schedule was developed to find out the extent of health problems experienced by the cashiers. The Interview schedule consisted of two sections, section one consists of background information and section two included a scale to assess the health problems. It consisted of a list of physiological and psychological health problems experienced by the cashiers. The developed scale was pretested on 30 respondents who had similar characteristics as of those of final respondents of the study. The reliability of the scale was established through split-half methods of establishing reliability. The Cronbach's alpha test has been applied on random 30 samples. The reliability value found was 0.906 for the scale which reflects the high reliability of the tool.

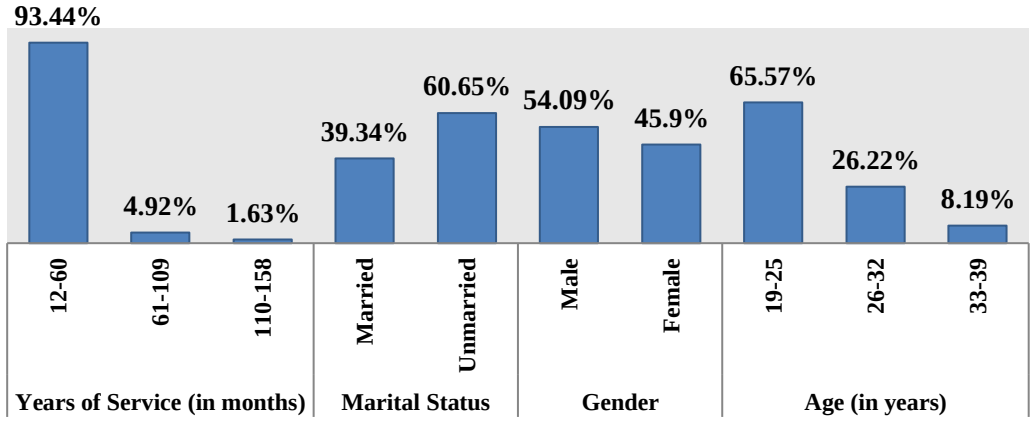
The readings of illumination level at the checkout counter were recorded in a record sheet which was measured through lux meter. Illumination level was recorded at spot 1 (Bagging area), spot 2 (Near the monitor) and spot 3 (Product scanning area) at the checkout counter of each selected retail store. This process was repeated 3 times in a day i.e. in the morning from 9:30-10:30am, afternoon from 1:30-2:30pm and in the evening from 5:30-6:30pm at checkout counters of selected retail stores.

## FINDINGS AND DISCUSSION

The finding obtained on the basis of Interview and record sheet are discussed and presented in details.

a. **Background Information of the respondents:** It consisted of information regarding the personal information of the respondents covering details on their age (in years), Gender, marital status and years of service as cashiers

**Figure 1: Personal Information of the respondents (n=60)**



The age of the respondents ranged between 19 and 39 years. A little less than two - third (65.57%) of the respondents were in age group of 19 to 25 years. A little more than one - fourth (26.22%) of the respondents were in age group of 26 to 32 years (Fig. 1). More than one - half (54.09%) of the respondents were males and less than one - half (45.9%) of the respondents were females. The data revealed that less than two - third (60.65%) of the respondents were unmarried and 39.34 per cent of the respondents were married at the time of data collection. It was also found that majority (93.44%) of the respondents were working as cashier for past 12 to 60 months whereas 4.92 per cent of the respondents were working as cashier since 69 to 109 months and only one respondent was found who was working as cashier for past 110 to 158 months.

**b. Illumination levels at selected retail stores:** In this section readings were recorded in record sheet and illumination level was measured through lux meter during three different timings i.e. morning (9:30a.m-10:30a.m), afternoon (1:30p.m-2:30p.m), and evening (5:30p.m-6:30p.m) in a day.

**Table 1: Average Illumination level at checkout counters of the selected retail stores during different shifts**

| Stores | Average illumination (in lux) at Checkout counters of Retail Stores (n=9) | | |
|---|---|---|---|
| | **Morning shift (9:30a.m-10:30a.m)** | **Afternoon shift (1:30p.m-2:30p.m)** | **Evening shift (5:30p.m-6:30p.m)** |
| 1 | 538 | 469.3 | 609 |
| 2 | 693.3 | 692.3 | 709 |
| 3 | 80.33 | 80 | 77.3 |
| 4 | 1425.3 | 1457 | 1425.3 |
| 5 | 540 | 625.3 | 560 |
| 6 | 1386.3 | 1456.3 | 1399 |
| 7 | 568 | 570 | 573.3 |
| 8 | 571 | 651.6 | 618 |
| 9 | 565.6 | 564.3 | 564.3 |
| **Average** | **707.53** | **729.56** | **726.13** |
| **Recommended lux level** | **500** | **500** | **500** |
| **Excess lux** | **207.53 (41.5%)** | **229.56 (45.91%)** | **226.13 (45.22%)** |

According to Chauhan2016, the recommended illumination for retail stores is 500 lux. The data in table 1, revealed that among the nine stores the illumination level at store 4 and 6 was found higher than the recommended level during the three shifts viz. morning (1425.3 lux), afternoon (1457 lux), evening (1425.3 lux) and morning (1386.3 lux), afternoon (1456.3 lux), afternoon (1399 lux) respectively. It was also found that store 3 had the lowest illumination level during the three shifts i.e morning (80.33 lux), afternoon (80 lux), evening (77.3 lux). It was also found that excess illumination than recommended level was found higher during the afternoon shift (229.56 lux).

**c. Extent of Physiological Health Problems experienced by the cashiers due to illumination:** The physiological health problems experienced due to illumination listed were eyestrain, headaches, blurred vision, burning of eyes, red eyes, eye irritation and dry eyes. The responses were "To High Extent", "To Some Extent" and "To Low extent" where scores ascribed were 3 through 1 respectively. High scores represented high extent of physiological health problems.

**Table 2: Distribution of respondents according to extent of physiological health problems experienced by the cashiers due to illumination level at checkout counters**

| Sr. No. | Physiological Health problems experienced by the cashiers | Respondents (n=61) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | To High Extent | | To Some Extent | | To Low Extent | | Wt. Mean score (3 – 1) |
| | | f | % | f | % | f | % | |
| i. | Eyestrain | 41 | 67.21 | 20 | 32.78 | 0 | 0.00 | 2.67 |
| ii. | Headaches | 39 | 63.93 | 22 | 37.70 | 0 | 0.00 | 2.63 |
| iii. | Blurred vision | 10 | 16.39 | 30 | 49.18 | 21 | 34.42 | 1.81 |
| iv. | Burning of eyes | 17 | 27.86 | 36 | 59.01 | 8 | 13.11 | 2.14 |
| v. | Red eyes | 5 | 8.19 | 33 | 55.73 | 23 | 37.70 | 1.70 |
| vi. | Eye irritation | 12 | 19.67 | 23 | 37.70 | 26 | 42.62 | 1.77 |
| vii. | Dry eyes | 3 | 4.91 | 8 | 13.11 | 50 | 81.96 | 1.22 |
| | **Total** | | | | | | | **1.99** |

From **table 2,** it can be concluded that more than two - third (67.21%) of the respondents faced high extent of eyestrain due to illumination. Less than two third (59.01%) of the respondents experienced 'high extent' of eyestrain and headaches due to illumination level at checkout counter. Burning of eyes problem was experienced to somewhat extent among 59.01 per cent of the respondents. Majority (81.96%) of the respondents had experienced low extent of dry eyes problem due to the illumination at checkout counters. The mean weighted score were found high for physiological health problems such as eyestrain (2.67), headache (2.63) and burning of eyes (2.14).

**d. Extent of Psychological Health Problems experienced by the cashiers due to illumination:** The psychological problems of the cashiers identified through review of literature were stress, irritation, frustration fatigue, aggressive nature and difficulty in performing tasks where the responses were "To High Extent", "To Some Extent" and "To Low extent". The scores ascribed were 3 through 1 respectively. High scores denoted high extent of psychological health problems.

**Table 3: Distribution of respondents according to extent of Psychological health problems experienced by the cashiers due to illumination level at checkout counters**

| Sr. No. | Psychological Health problems experienced by the cashiers | Respondents (n=61) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | To High Extent | | To Some Extent | | To Low Extent | | Wt. Mean score (3 – 1) |
| | | f | % | f | % | f | % | |
| i. | Stress | 39 | 63.93 | 19 | 31.14 | 3 | 4.91 | 2.59 |
| ii. | Irritation | 24 | 39.34 | 34 | 55.73 | 3 | 4.91 | 2.34 |
| iii. | Frustration fatigue | 32 | 54.45 | 26 | 42.62 | 3 | 4.91 | 2.47 |
| iv. | Aggressive nature | 30 | 49.18 | 28 | 45.90 | 3 | 4.91 | 2.44 |
| v. | Difficulty in performing any tasks | 10 | 16.39 | 40 | 65.57 | 11 | 18.03 | 1.98 |
| | **Total** | | | | | | | **2.36** |

The data in **table 3,** depicted that less than two-third (63.93%) of the respondents experienced stress to high extent due to illumination level at checkout counters. Less than two third (65.57%) of the respondents faced difficulty in performing any tasks 'to some extent' due to illumination level at the checkout counter, while 18.03 per cent of the respondents faced this problem to low extent. The weighted mean scores were found high for psychological health problem such as stress (2.59), frustration fatigue (2.47) and aggressive nature (2.44).

**e. Extent of health problems experienced by the cashiers:** A probe was made to find out the extent of physiological and psychological health problems experienced by the cashiers. The scores on each of the health problems were summated and possible range of minimum and maximum scores were divided into three categories having equal interval. The minimum score for physiological health problems experienced was 7 and maximum score was 21 and minimum score for psychological health problems experienced was 5 and maximum score was 15.

**Table 4: Distribution of respondents according to extent of physiological and psychological health problems experienced by the cashiers due to illumination levels at checkout counters**

| Extent of Physiological and Psychological Health Problems Experienced by the Cashiers | Respondents (n=61) | | |
|---|---|---|---|
| | Range score | f | % |
| **Physiological Health Problems** | | | |
| To low extent | 07-11 | 10 | 16.39 |
| To some extent | 12-16 | 41 | 67.21 |
| To high extent | 17-21 | 10 | 16.39 |
| **Psychological Health Problems** | | | |
| To low extent | 05-8 | 03 | 4.91 |
| To some extent | 09-12 | 31 | 50.81 |
| To high extent | 13-15 | 27 | 44.26 |

From table 4, it is evident that more than two-third (67.21%) of the respondents experienced physiological health problems to some extent due to illumination level at checkout counters. Nearly one - half (50.81%) of the respondents experienced psychological problems to some extent due to illumination level at checkout counters. It was also found that less than one half (44.26%) of the respondents faced psychological health problems to high extent.

**Testing of Hypothesis**

A hypothesis was formulated on the basis of objectives of the study. For the purpose of statistical analysis, the hypotheses were formulated in the null form. The results are presented here.

**Ho: There exists no relationship between extent of health problems experienced by the cashiers and illumination level at checkout counters**

**Table 5: Co-efficient of correlation showing relationship between the extent of health problems experienced by the cashiers and illumination level at the checkout counters**

| Extent of Health problems experienced | n | r-value | Level of significance |
|---|---|---|---|
| **Illumination level** | | | |
| Morning | 61 | -0.703 | 0.01 |
| Afternoon | | -0.670 | 0.01 |
| Evening | | -0.699 | 0.01 |

The Co-efficient of Correlation was found significant for extent of health problems experienced by the cashiers due to illumination level with recorded illumination level at the checkout counters during morning, afternoon and evening time. Hence, the null hypothesis was rejected. Since, the correlation values are found negative, therefore, it is inferred that low illumination level at checkout counters causes high extent of physiological and psychological health problems **(Table 5)**.

## CONCLUSION AND IMPLICATIONS

Providing a healthy working environment is very important for worker efficiency. Literatures have reported that poor indoor environmental quality such as illumination has a detrimental effect on human health and it affects their work performance as well. From the present investigation it was revealed that the cashiers experienced physiological and psychological health problems such as eye strain, headache, burning of eyes, stress, frustration and aggressive nature due to illumination level at the checkout counters. It was also found that the illumination level at the checkout counters of 8 stores was very high and 1 store has very low illumination level as compared to recommended levels due to which the cashiers experienced various health problems. Therefore, it is important to consider the illumination levels at the checkout counters of the retail stores while designing it. This will result in less absenteeism and in increase work efficiency of the cashiers.

Standards are more concerned with visual needs than with that non-visual. Therefore, there is a greater need to have a greater range of illuminances available in lighting sources. A lively artificial light is an important help, or at least an artificial lighting more similar to the daylight is desirable. Lighting system should help to improve our health and wellbeing in our professional and personal life. Lighting system must be considered as a whole, ranging from the positions of luminaires and the nature of lamp such as CFL or LED. The outcome of the research wrench the attention of the retails store authorities to contemplate the health problems of their employees caused due to improper illumination levels, considering which can reduce absenteeism and increase productivity and also overall well-being of the cashiers. The government can also develop guidelines and policies for designers to mandate and follow the recommended levels for designing retail stores.

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# DESIGNING THE INTERIORS OF SELECTED ANGANWADIS UNDER THE CSR PROJECT OF SUN PHARMACEUTICAL INDUSTRIES LIMITED

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## ABSTRACT

The interior environment of an Anganwadi has an intense impact on the behavior and the development of children. The ideal environment is that which reflects the presence of the children; which attracts the children and is rich and challenging to children, but is not over-stimulating or flashy; rather is rich in subtle visual and tactile experience. The best children's spaces are colorful and welcoming, busy but organized, energetic yet soothing. The Government has taken actions and implemented a program for the development of children namely "Integrated Child Development Service" (ICDS) which takes care of overall developmental needs of children who belong to the age group of 3-6 years, pregnant women, lactating mothers, in the age group of 15-45 years, through the Anganwadi Centers. The Anganwadi is generally operated in semi-structured or structured areas with generally inadequate infrastructures and resources which may hinder the learning activities of children. Many Corporate sectors have joined hands with the Government to serve the community in many projects in Gujarat and across India under the public-private partnership scheme. Similarly, as a part of CSR activity, Sun Pharmaceutical Industries Limited had taken an initiative to develop Anganwadis for the children of the Panchmahal district of Gujarat. Consequently, the present study focused on the assessment of the existing status of interior components and designing the interiors of the spaces provided for the development of Anganwadis in two villages viz: Ujeti and Kashipura of the Panchmahal District of Gujarat. The present Design Project is a unique example of public-private partnership. The designs developed under this Design Project would be helpful to the students of interior designing, architects and interior designers and Government for designing other Anganwadis, kindergartens, Balwadis, play-centers and primary schools.

**Keywords:** Anganwadi, Environment, ICDS, CSR Activity.

## INTRODUCTION

Children consider playing as a type of work. In their play, they build and rebuild their own world around them. The environment of the space where children play should be designed to help children's usual character to discover the world around them. Although children desire to play close to their parents or caretakers, they do slowly begin to amuse themselves alone or with friends for short periods by going to play centers where other children are accompanied.

The design for spaces occupied by children must support active experimentation and risk-taking without being unsafe for them. The interior environment and equipment must be arranged to minimize hazards and errors. When space is regimented, with open pathways that lead to activities

that offer enough to do, children manage on their own. They can move freely from one activity to another, giving the caretaker a chance to attend an individual child according to their needs. Space that is not regimented creates trouble. These consist of dead spaces that promote wandering and unruly behavior, and pathways that lead nowhere or hamper while play is already in process. When space is poorly planned, children are reliant on the caretaker for direction and the caretaker cannot assist each individual child due to time-bound.

**Initial years of childhood and their development**

Describing the initial years of childhood and their development Ruth (1961), states that

> "Since birth, the children begin a marvelous path of development in many dimensions: cognitively, socially, emotionally, and physically. Sleep, emotional and physical nourishment and sensory stimulation is important for young children during this period. Therefore, the most vital need for these young children is warm nurturing and care by the adults they depend upon in secure surroundings with safe types of equipment and play items that meet their needs and support their individual development".

During childhood, every child requires a suitable interior environment that supports shaping years of education. The process of smooth and integral change in the life of people is tied with the ways in which children are brought up. They are achieved only with advance planning, which allows the designer to think about children's designing style and design the spaces so that there's enough storage for materials, visual aids, and an activity area. Thus, there is a need for a place where the children can spend their initial years and show their own creative ideas (Dasgupta, 2012).

**Development of Anganwadi under ICDS program**

The Government has taken actions and implemented a program for the development of children named "Integrated Child Development Service" (ICDS)- a Centrally-sponsored Scheme which was implemented by the State Government and was launched on 2nd October 1975. This takes care of overall developmental needs of children who belong to the age group of 3-6 years, pregnant women, lactating mothers, in the age group of 15-45 years, through the Anganwadi Centers. The Anganwadi is literally a courtyard play center. It is the neighboring place from where Anganwadi worker (caretaker) provides correspondence of services to the beneficiaries at the community level. (https://en.m.wikipedia.org/wiki/Anganwadi). However, generally it is observed that the Anganwadi developed under the Government ICDS scheme in the rural areas and semi-urban areas are semi- structured or structured with inadequate infrastructure due to limited funds. Therefore, many corporate sectors have come forward to join hands with the government to serve the community in many projects in Gujarat and across India under the public-private partnership scheme.

**CSR activities under Sun Pharmaceutical Industries Limited**

Sun Pharmaceutical Industries Limited is an Indian multinational pharmaceutical company established in 1983. Under its Corporate Social Responsibility (CSR),it carries out various projects

which are beneficial for the community (https://www.sunpharma.com/responsibility/csr). As a part of CSR activity in the year 2019-20, Sun Pharmaceutical Industries Limited had taken an initiative to develop Anganwadis for the villagers of the Panchmahal District. Therefore, the present project was conducted which focused on designing the interiors of the spaces provided to develop in the two villages (Ujeti and Kashipura) of Panchmahal District under the CSR project of Sun Pharmaceutical Industries Limited.

During the review of literature plentiful studies were found which were conducted outside India which focused on Effectiveness of kindergarten design, Architectural structure on the learning environment and growth and development of children in education (Arian and Mirdad 2014; Cheryan et.al, 2014; Ramli et.al, 2014; Astaresh et.al, 2015). Similar kind of studies were conducted in India focusing on Facilities like toilet, kitchen, storeroom, blackboard, dairies, chart, weighing scale and measuring scale and services at Anganwadi centers (Malik et.al, 2015), Knowledge and practices of Anganwadi worker and availability of Quality infrastructure like improper ventilation, inadequate lighting, space for sitting arrangement, logistic like a chair, table and boxes provided under ICDS program (Thakur et.al, 2015, Sembiah et.al, 2017).However, a dearth was found in research projects carried out on Interior designing and development of Anganwadis under the public-private partnership concept in India. Therefore, the present design project was carried out.

The finding of the present study will give a platform to practical and 'real-life' approach to theoretical knowledge. Further, it will be useful to the students under the course of interior designing to develop and enhance the required skills and confidence in handling the 'real-life' project. It is expected that the design will be functionally effective and will foster natural creativity and play within the children of selected Anganwadis. The present study will provide essential design examples to the Interior Designers and Decorators in designing other Anganwadis and preschool premises with regard to creating designs that are aesthetically appealing and functionally satisfying, and will also provide a guiding principle which will be beneficial to the Governments ICDS scheme in designing other Anganwadis.

## OBJECTIVES OF THE STUDY

1. To assess the spaces provided for Interior designing of Anganwadis in the two villages (Ujeti and Kashipura) of the Panchmahal District of Gujarat under the CSR project of Sun Pharmaceutical Industries Limited.
2. To identify requirements by clients viz. the General Manager, CSR activities of Sun Pharmaceutical Limited and the Anganwadi workers regarding interiors of Anganwadis.
3. To design the interiors of spaces provided for Anganwadis and present detailed working drawings.
4. To provide cost estimation of the selected design by the Sun Pharmaceutical Limited and implement the selected design.

## DELIMITATION OF THE STUDY

1. The present study was limited to the interior designing of two spaces provided for Anganwadis to be developed under the CSR project of Sun Pharmaceutical Industries Limited at two villages (Ujeti and Kashipura) of the Panchmahal District of Gujarat.

# METHODOLOGY

## 1.1 Research Design

For the present study Design Project method was adopted as the research design.

## 1.2 Operational Definition

**Anganwadi:** For the present study, Anganwadi was a space provided to children for their teaching-learning activities at Ujeti and Kashipura village of Panchmahal District under the CSR Project of the Sun Pharmaceutical Industries Limited. The functioning of the Anganwadis will be in accordance with the Anganwadi Scheme of Integrated Child Development sponsored by the government where Anganwadi worker provides packages of services to the beneficiaries such as immunization, healthy food, clean water, learning environment for infants, toddlers and preschoolers.

**Anganwadi Workers:** For the present study, the Anganwadi workers were graduated women selected and appointed by the Sun Pharmaceutical Industries Limited for conducting teaching-learning activities for the children and providing a package of services to the beneficiaries directly at the respective Anganwadi of Ujeti and Kashipura village of Panchmahal District.

**Corporate Social Responsibility**: Corporate Social Responsibility (CSR) is a self-regulating business form that helps a company to be socially accountable to itself, its stakeholders, and the public. By practicing corporate social responsibility, companies can be conscious of the kind of impact they are having on all aspects of society, including economic, social, and environmental. For the present study, the development and designing of Anganwadi for the children of Ujeti and Kashipura village were taken up as a part of CSR activity by the Sun Pharmaceutical Industries Limited.

## 1.3 Locale of the study

The study was conducted in the two villages; Ujeti and Kashipura of the Panchmahal District of Gujarat, wherein two spaces were provided for designing the interiors of Anganwadis to be developed under the CSR project of Sun Pharmaceutical Industries Limited.

## 1.4 Units of Inquiry

The units of inquiry for the present study were the General Manager of CSR activity of Sun Pharmaceutical Industries Limited and the appointed Anganwadi workers of Ujeti and Kashipura village of the Panchmahal district of Gujarat.

## 1.5 Selection and construction of the tool

Keeping in mind the objectives of the study and based on the extensive literature survey, the following tools were developed to assist data collection for the present study.

### 1.5.1 Observation Sheet:

In order to assess the existing status of the space provided for developing and interior designing of Anganwadis, observation sheet was selected as a tool for the investigator to make observations of the existing conditions.

### 1.5.2 Interview Schedule:

An interview schedule was selected as a tool to get acquainted with the requirements of the clients viz: The General Manager of CSR activity of Sun Pharmaceutical Industry Limited and the appointed Anganwadi workers. The investigator personally interviewed the clients.

### 1.6 Data Collection, Design Development and Implementation

The study was conducted in four phases as described here:

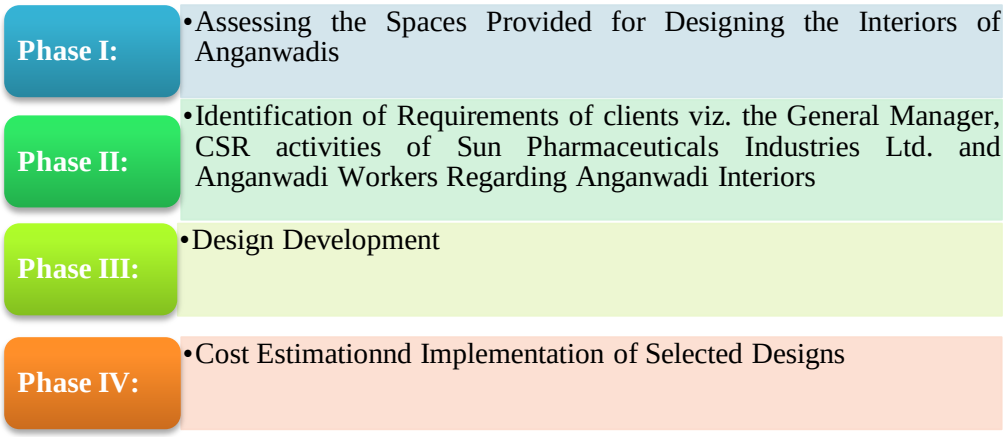


**Fig.-1 Phases of Data Collection, Design Development and Implementation**

## FINDINGS AND DISCUSSIONS

The findings and discussion included four different phases for both the design projects.

### 2.1. Design Project-I: Nandghar Ujeti and Design Project-II: Nandghar Kashipura

Project I was "Nandghar"-Ujeti. It was located in the Ujeti village and Project II -"Nandghar" Kashipura was located in Kashipura village of the Panchmahal District of Gujarat. The overall area of the space provided for Nandghar Ujeti was 596.73sq.ft and for Nandghar Kashipura was 540.44sq.ft. Both the spaces comprised of an Activity room, Kitchen,Storeroom, washroom and an outdoor area.

### 2.1.1. Phase I: Assessing the Spaces Provided for Designing the Interiors of Anganwadis

This phase constitutes a detailed discussion about the spaces provided for the interior designing. In order to assess the spaces provided for Anganwadi various components of interior like the dimension of the space provided for designing the Anganwadi, floor, walls, ceiling, windows, doors, ventilation, lighting, furniture, and storage facilities were assessed, using observation sheet as a tool.


**Fig.-2 Existing Status of Design Project-I NandgharUjeti**


**Fig.-3 Existing Status of Design Project-II Nandghar Kashipura**

### 2.1.2. Phase II: Identification of Requirements of Clients Viz. The General Manager, CSR Activities of Sun Pharmaceuticals Industries Ltd. And Anganwadi Workers Regarding Anganwadi Interiors

This phase comprises detailed information about the requirements regarding Anganwadi Interiors of the clients viz. the General Manager, CSR activities of Sun Pharmaceuticals Industries Ltd. and Anganwadi workers which were congregated with the help of the interview schedule by the researcher. They are discussed below:

**Requirement for Floor:** For the flooring various preferences like ceramic tiles, vitrified tiles, marble, rubber tiles, carpet and wooden flooring were given for the selection purpose of which for the activity room, kitchen, storeroom the clients preferred either vitrified tiles or rubber flooring. For the washroom ceramic tiles was preferred and for the outdoor area vitrified tiles was opted.

**Requirement for Walls:** For the wall's various preference like wall paint, wall texture, wallpapers, murals and wall tiles were given for the selection purpose of which for the activity room and outdoor area the clients preferred murals which are colorful and educatory. While for the kitchen, storeroom and washroom either ceramic tiles or wall paint was preferred.

**Requirement for Ceiling:** For the ceiling preferences like plain plastered ceiling and false ceiling with the provision of lighting and fans was given for the selection purpose of which for the activity room false ceiling design which is simple yet attractive with provision of ceiling lights and fans was preferred. Whereas, for the kitchen, storeroom, washroom and outdoor area plain plastered ceiling with application of paint was opted.

**Requirement for Doors and Windows:** For the doors and windows the client preferred application of oil paint which goes best with other interior components.

**Requirements for Kitchen Countertop and Sink:** For Kitchen countertop, various options like marble, granite, tiles, quartz, terrazzo and wood were given for selection purpose, amongst which the clients preferred granite or marble and preferred to have a sink for the kitchen for Nandghar Ujeti and denied for Nandghar Kashipura as new plumbing facility was constrained.

**Requirement for Furniture and Storage Facilities:** For the furniture various options like tables, chairs, stools, storage cupboards, cabinets and shelves were given for the selection purpose of which for the activity room the clients preferred not to have any furniture item due to insufficient space but opted for storage cabinets beneath the kitchen countertop.

**Requirement for Lighting:** For the lighting the clients preferred replacement of lighting fixtures for bulbs and provision of bulbs.

**Requirements for type of Water Closet and Tap:** For the Washroom various options for the type of water closet like Indian, wall- mounted and floor-mounted were given for the selection purpose amongst which the clients selected Indian water closet. Whereas for the tap various preferences like plastic, stainless steel, iron and brassware given for the selection purpose amongst which the clients opted for stainless steel tap.

**Requirements for other outdoor elements:** For the outdoor area, for Nandghar Ujeti as there was sufficient space available, the clients preferred to construct a boundary wall on four sides of the Anganwadi with an entrance gate, and also opted for landscaping, whereas, due to lack of space for Nandghar Kashipura development of outdoor area was restricted. The General Manager preferred to design a branding board including the name of the Anganwadi, name and logo of the sponsors and the year, for both the design projects.

### 2.1.3. Phase-III: Design Development

According to the requirements of the clients and based on the principle of design and various observations gathered from the studies came across during the review of literature, working drawings of Design project-I (Nandghar Ujeti) and Design project-II (Nandghar Kashipura) were prepared. For both the Design projects three different theme-based alternatives of design were given for the selection purpose to the clients, the themes were: (1). 'Underwater' theme; (2). 'Forest theme'; (3). 'Cartoon theme'.

For each theme, different designs and color schemes were provided for the Activity room, Kitchen, Storeroom, Washroom and Outdoor area.

**Proposed Design:** The overall area of Design Project-I (Nandghar Ujeti) was 1806.34sq.ft. As per the requirement of the clients, the outer boundary wall was anticipated with a height of 6'-0", which included an entrance gate of width 9'-3 ½" and height 5'-0".From the entrance gate till the Anganwadi entrance a pathway was made of size 13'-3 ½".

The overall area of Design Project-II (Nandghar Kashipura) was 540.44sq.ft. No changes were made in the floor plan, except the dismantling of the partition wall and the parapet walls next to the Kitchen platform and removal of the washbasin.

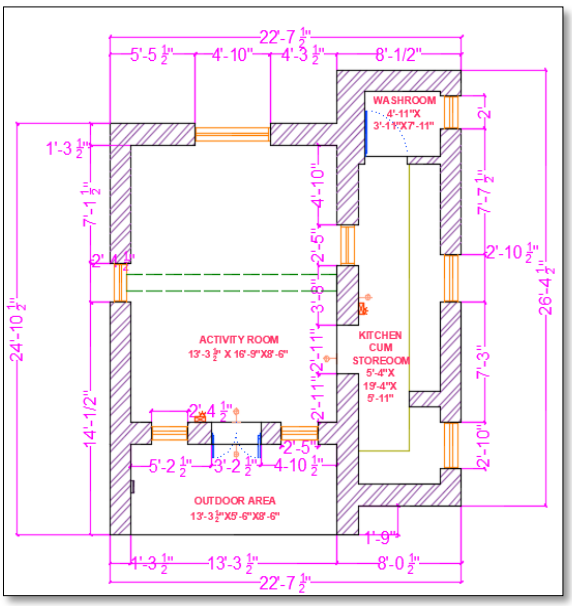


**Fig.-4 Existing Floor Plan of Design**

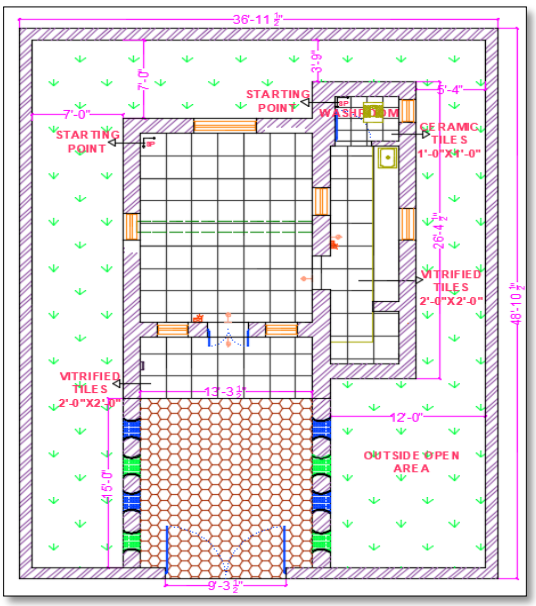


**Fig.-5 Proposed Floor Plan & Flooring Layout of Design Project-I Nandghar Ujeti**

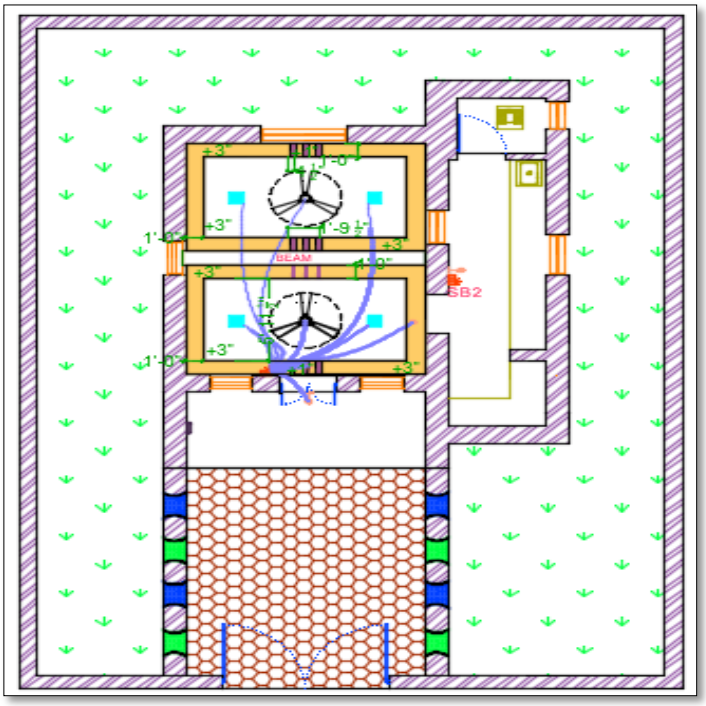

**Fig.-6 Proposed False Ceiling Design and Electrical Layout of Design Project-I**
**Project-I Nandghar Ujeti**

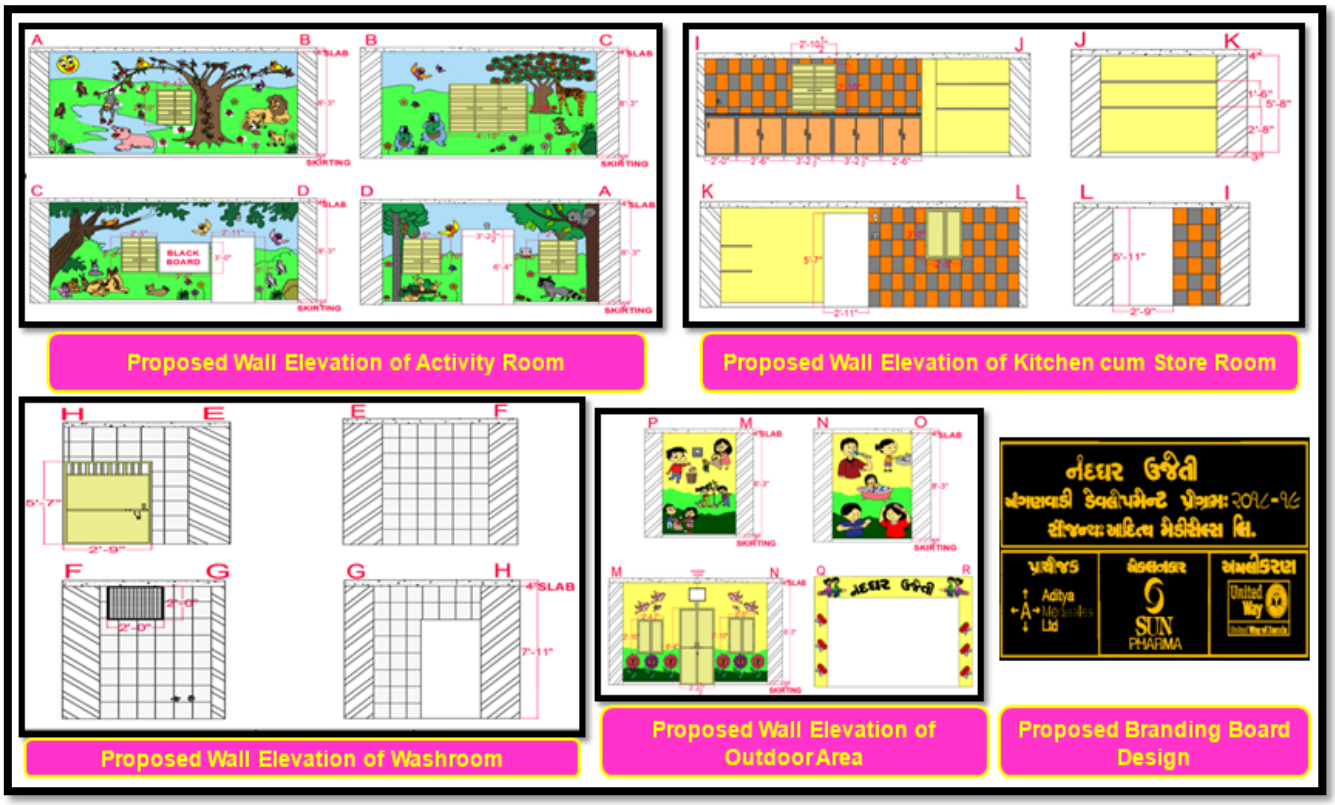


**Fig.-7 Proposed Wall Elevations of Selected and Implemented Designof Design Project-I NandgharUjeti**

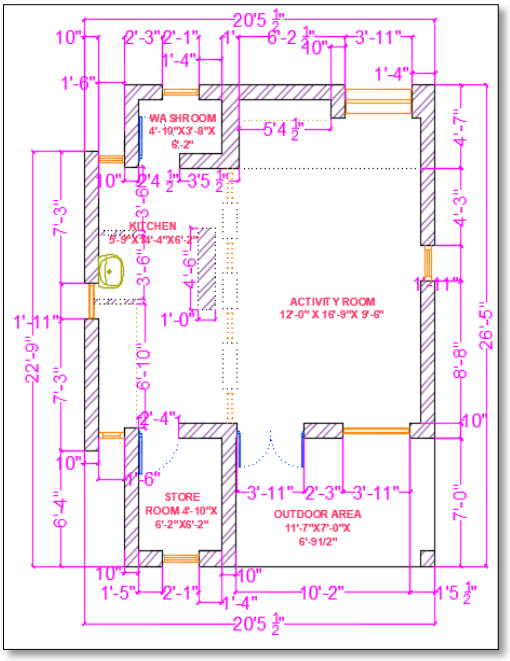


Fig.-8 Existing Floor Plan of Design

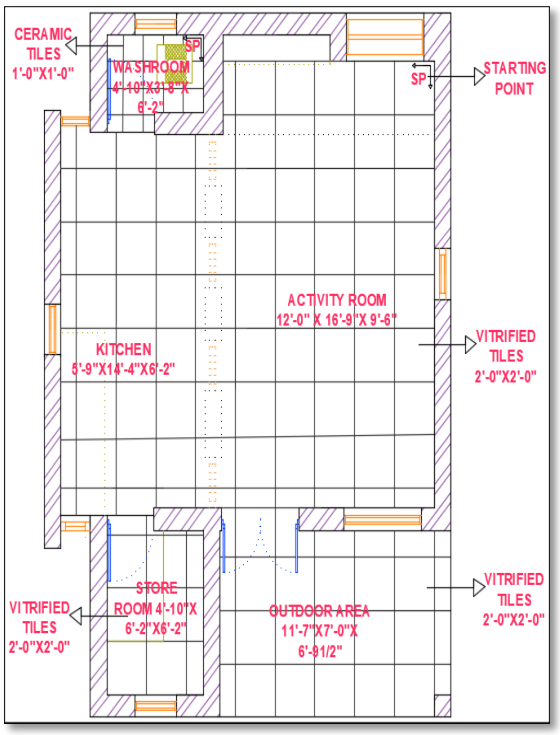


Fig.-9 Proposed Floor Plan & Flooring Layout of Design Project-II Nandghar Kashipura

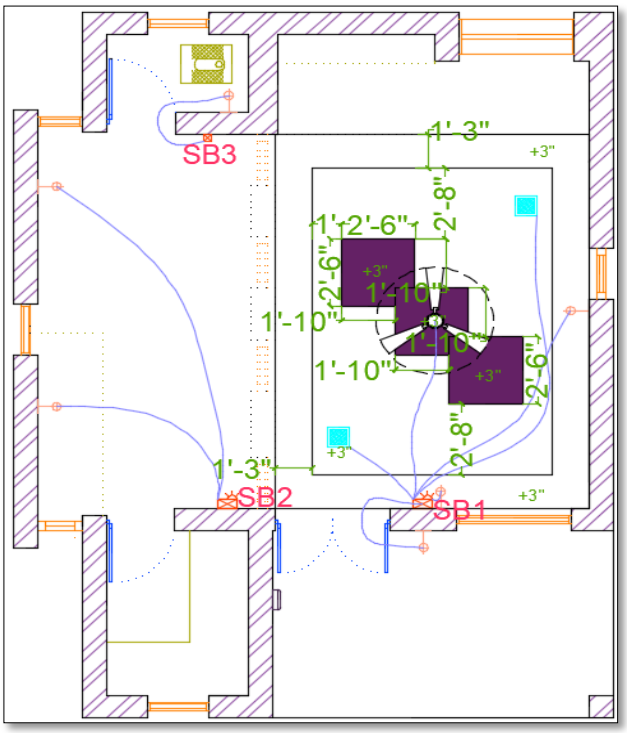


Fig.-10 Proposed False Ceiling Design and Electrical Layout of Design Project-II Nandghar Kashipura

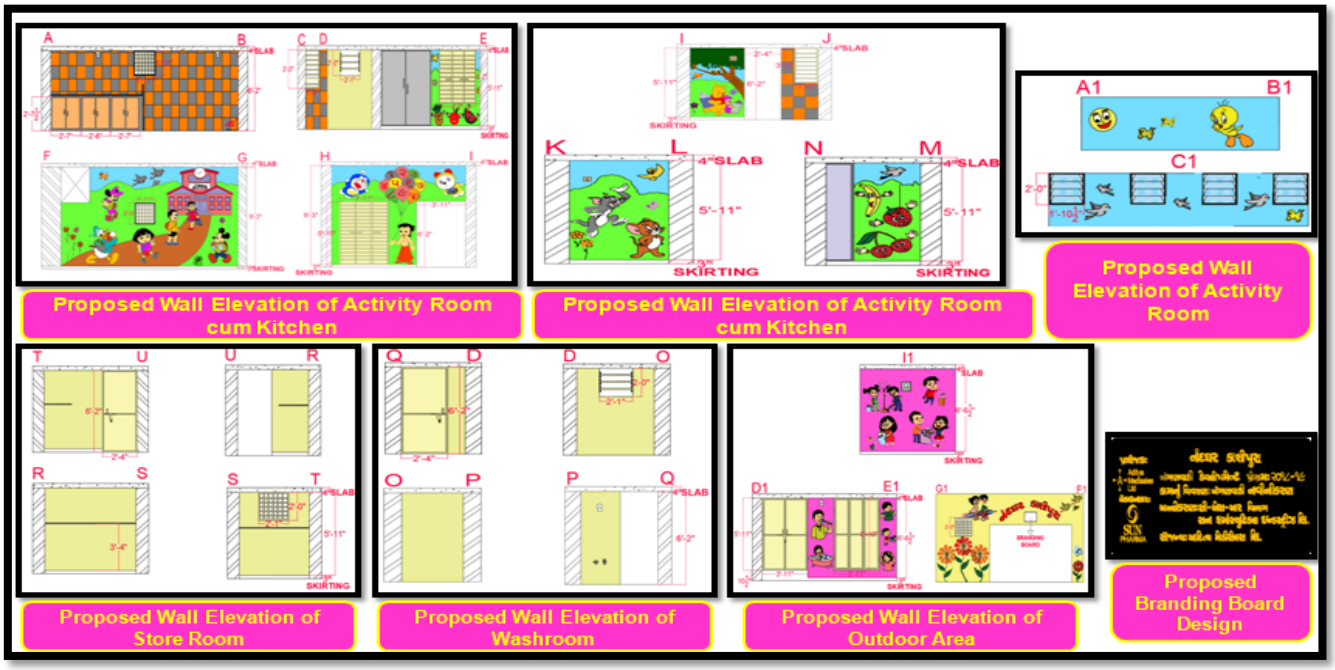


**Fig.-11 Proposed Wall Elevations of Selected and Implemented Design of Design Project-II Nandghar Kashipura**

### 2.1.4. Cost Estimation and Implementation of Selected Design

Considering the requirements of clients, three different theme-based alternatives of design were given, of which for Design Project-I (Nandghar Ujeti) Forest Theme and for Design Project-II (Nandghar Kashipura) Cartoon Theme was selected by the clients and was implemented. Cost estimation was prepared considering the actual price and labour cost of the selected design of the Anganwadi.

**Table-1 Total Cost Estimation of Design Project-I NandgharUjeti as on August, 2019**

| Sr. No | Components | Total Cost in ₹ |
|---|---|---|
| 1. | Flooring Treatment | ₹39,238.95 |
| 2. | Walls | ₹ 1,21,972.3 |
| 3. | False Ceiling | ₹ 21,050 |
| 4. | Lighting Fixture and Fan | ₹10,142 |
| 5. | Oil Paint Application on Doors and Windows | ₹ 2175 |
| 6. | Furniture | ₹8600 |
| 7. | Kitchen Countertop | ₹ 6500 |
| 8. | Plumbing Fixtures | ₹8360 |
| 9. | Developing Outdoor Open Area | ₹ 78,276 |
| | **Total Cost Estimation** | **₹2,96,314.25** |

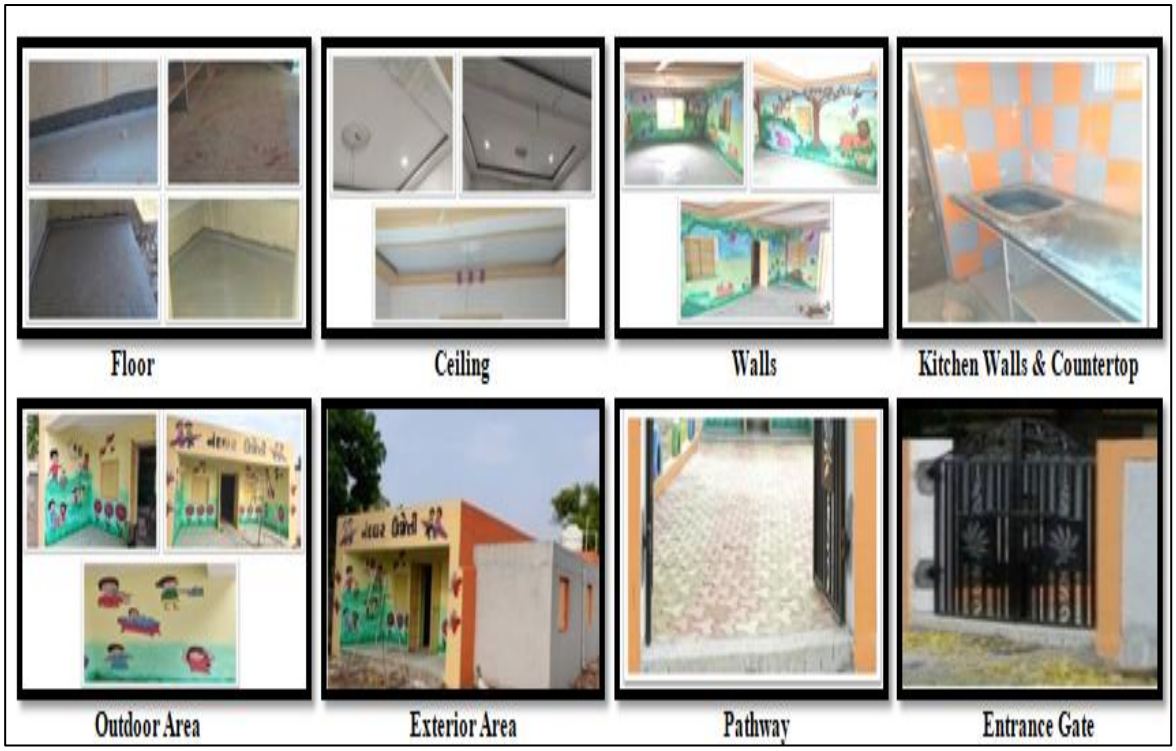


**Fig.-12 Implemented Designs of Design Project-I Nandghar Ujeti**

**Table 2: Total Cost Estimation of Design Project-II NandgharKashipura as on August, 2019**

| Sr. No | Components | Total Cost in ₹ |
|---|---|---|
| 1. | Flooring Treatment | ₹ 41,878.55 |
| 2. | Walls | ₹ 1,20,003.1 |
| 3. | False Ceiling | ₹ 12,378 |
| 4. | Lighting Fixture and Fan | ₹ 6039 |
| 5. | Oil Paint Application on Doors and Windows | ₹ 2175 |
| 6. | Furniture | ₹ 5900 |
| 7. | Kitchen Countertop | ₹ 3570 |
| 8. | Plumbing Fixtures | ₹ 5295 |
| | **Total Cost Estimation** | **₹ 1,97,238.65** |


**Fig.-13 Implemented Designs of Design Project-II Nandghar Kashipura**

## SUMMARY, CONCLUSION AND RECOMMENDATIONS

Play is an ordinary process by which children grow and learn which they do best when they are enjoying themselves. The environment of the space where children play should be designed to help children's usual character to discover the world around them. The ideal environment is that which reflects the presence of the child; which attracts the children and is rich and challenging to children, but is not over-stimulating or flashy; rather is rich in subtle visual and tactile experience.

The Government has taken actions and implemented a program for the development of children named "Integrated Child Development Service" (ICDS) which takes care of overall developmental needs of children who belong to the age group of 3-6 years, pregnant women, lactating mothers, in the age group of 15-45 years, through the Anganwadi Centers. The Anganwadi is generally operated in semi-structured or structured areas with inadequate infrastructures and resources which may hinder the learning activities of children. Many Corporate sectors have joined hands with the Government to serve the community in many projects in Gujarat and across India under the public-private partnership scheme. Similarly, as a part of CSR activity, Sun Pharmaceutical Industries Limited had taken up an initiative to develop Anganwadis for the children of the Panchmahal district of Gujarat.

For the present study, the design project method was adopted as a research design. The observation sheet was used as an instrument for assessing the space provided for the interior designing of Anganwadis. An interview schedule was used to elicit responses from the clients regarding their requirements about designing the interiors of Anganwadis. The data collection,

design development and implementation were conducted into four phases which included assessment of space, identification of requirements of clients, design development and cost estimation and implementation of selected design.

**Implication of the Study**

**For the Field of Family and Community Resource Management:** Management of Family and Community Resources is the core subject of the field of Family and Community Sciences, which teaches managing of resources. Interior design is a vital part of the curriculum, under which Residential and Commercial Space Designing subjects are taught. Therefore, in the present study the requirements acquired from the clients and the design developed will be helpful for the students in planning various community spaces.

**For Architects and Interior Designers:** The role of architects and interior designers is very vital in the overall accomplishment of any design project. The design developed under this study will provide design ideas to the planners of other Anganwadi with regard to create designs that are aesthetically attractive, theoretically strong, rationally and functionally satisfying.

**For Government:** Generally, it is observed that Anganwadi developed under the Government's ICDS scheme in rural area are semi-structured or structured with inadequate infrastructure due to limited funds. Therefore, in the present study the Anganwadi developed under the CSR project of Sun Pharmaceutical Industries Limited will prove to be a unique idea of public-private partnership. Similar kind of project can be taken by the Government in different villages in collaboration with other industries in various districts of Gujarat and at national level.

**Recommendation for Future Studies**

1. A similar kind of study can be conducted in other districts of Gujarat as well as in different states in India.
2. A comparative study can be conducted between Government Anganwadi and private kindergarten/play center with regard to interior components, services and facilities provided.
3. A research on multipurpose and compact furniture and storage design development can be conducted keeping in mind the space available for the Anganwadi.
4. A research study can be conducted on assessing various interior components of Anganwadi and its impact on children's overall development.
5. Inventive and creative concepts can be developed into consideration of optimal utilization of space in different areas of the Anganwadi.

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# INFANT AND YOUNG CHILD FEEDING PRACTICES AMONG MOTHERS RESIDING IN URBAN AND RURAL AREAS OF DEHRADUN AND ASSOCIATED BARRIERS AND FACILITATORS IN ADOPTING OPTIMAL PRACTICES

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## ABSTRACT

This cross-sectional observational study was conducted on 100 mothers of children aged 6 to 24 months, 50 each from urban and rural areas of Dehradun to compare infant and young child feeding practices and identify barriers and facilitators of optimal IYCF practices. A pretested questionnaire was used to collect the information. Early initiation of breastfeeding was significantly higher in rural mothers ($\chi^2$= 4.10, p<0.05), however timely initiation of complementary feeding was higher in urban mothers ($\chi^2$= 7.29, p< 0.05). Exclusive breastfeeding was positively associated with feeding colostrum (AOR 3.05; 95% CI 1.15, 8.11). Age of the infant was positively associated with minimum diet diversity, for every unit increase in the age, the odds of following minimum diet diversity increased by about 16% (AOR = 1.16, 95% CI: 1.05, 1.27). Nutrition-sensitive home gardening was significantly associated with consumption of vitamin A-rich fruits and vegetables ($\chi^2$= 10.28, p <0.05). The prevalence of wasting, underweight, and stunting was higher in rural areas which were 20%, 24%, and 20% respectively versus 10%, 14%, and 10% respectively in urban areas. The prevalence of overweight in urban areas was 4% whereas no child was found to be overweight in the rural area. Caesarean delivery, perception of insufficiency of milk production, lack of knowledge, traditional beliefs, time constraints were some of the barriers to optimal IYCF practices while knowledge regarding optimal feeding practices, persistence of doctor/hospital staff, family customs, support from family members and social media were reported as facilitators. Effective behavior change communication strategies focussing on mothers along with family members can be used by healthcare personnel during the ante and postnatal visits for promoting optimal feeding practices.

**Key words:** breastfeeding, nutritional status, minimum diet diversity

## INTRODUCTION

It is a well-known fact that the period from birth to two years of age is the "critical window" for the promotion of good growth, health, and behavioral and cognitive development. Optimal breastfeeding in the first year and adequate complementary feeding practices, when practiced can prevent almost one-fifth of deaths in children under the age of five years (UNICEF 2020). Poor feeding practices are a major threat to economic and social development and thus are a serious obstacle towards the nation's progress.

Only 44 percent of newborns are put to the breast within the first hour of birth, and only 2 in 5 infants (42%) under 6 months of age are exclusively breastfed, globally. A little more than two

thirds (69%) infants aged 6 to 8 months receive solid food and when diet quality and quantity are taken into consideration, only 1 in 2 receive minimum meal frequency and less than 1 in 3 receive a minimum diet diversity among children aged 6 to 23 months (UNICEF 2019). Efforts are needed to improve the diversity in the diets of children among all the segments as even the richest do not rank good in case of diet diversity.

According to the Comprehensive National Nutrition Survey in India (2016–2018) breastfeeding was initiated within one hour of birth by overall 57 percent of children aged 0–24 months and 58 percent of infants below the age of six months were exclusively breastfed. Over half (53%) of the infants aged 6 to 8 months received timely initiation of complementary feeding. Around 42% were fed the minimum number of times per day for their age and only 21% of children aged 6 to 23 months were fed an adequately diverse diet (CNNS 2019). Only 8.6% of children (6-23 months) in Uttarakhand and 12.6% in Dehradun are breastfed and receive an adequate diet (NFHS-42015-16). This suggests that poor feeding practices are widespread in Dehradun. The identification of factors that are associated with poor feeding practices and non-compliance to the suggested guidelines is important for defining strategies to promote optimal feeding practices. A study was planned with the following objectives in mind.

## OBJECTIVES

- To compare breastfeeding and complementary feeding practices in urban and rural mothers of Dehradun.
- To assess and compare the nutritional status of the infants as determined by their anthropometric measurements
- To explore associated barriers and facilitators that prevent/facilitate optimal IYCF practices

## METHODOLOGY

This study had a cross-sectional observational design. The period of investigation was from October 2019 – February 2020. A sample size of 100 mothers was selected purposively from the paediatrics OPD of a private hospital situated in an urban area and a government hospital situated in a rural area of Dehradun. Mothers were visiting the hospitals with their children for regular checkups, vaccination, or follow up after an illness episode. Data was collected through face-to-face interviews and the responses were recorded in a pre-tested questionnaire.

Data were collected on various parameters such as socio-demographic variables, assessment of barriers and facilitators, supplementary nutrition and nutrition-sensitive home gardening. Anthropometric measurements such as length (using Medsor Impex Infantometer), weight (using Torioxpediatric weighing scale), and mid-upper arm circumference (using non-stretchable tape) were taken using standard techniques. Assessment of feeding practices was done using a guide by WHO (2010). This module was modified and adapted to reflect common beverages and foods consumed in Dehradun. Ethical Clearance was obtained before data collection from Institutional Ethics Committee of Lady Irwin College.

Descriptive statistics, including mean, frequencies and proportions were used to summarize the study variables. Statistical analysis was done using MS Office Excel 2019 and IBM SPSS version 23. Chi-square test was used to compare the feeding practices of urban and rural areas. Independent t-test was applied to compare the minimum diet diversity scores of the two groups. A binary logistic regression model was used to study the influence of socio-demographic variables on dependent variables. Those variables in each of the dependent variables which score a P–Values of <0.2 in the bivariate analysis were shifted to the multivariable analysis to control the possible effect of confounders and to calculate the Adjusted Odds Ratio (AOR) with a 95% of confidence intervals which was used to determine the strength of association. In the multivariable analysis, P–Values of $\leq 0.05$ were used to declare the association as being statistically significant.

## RESULTS AND DISCUSSION

A total of 100 mothers, 50 each from urban and rural areas were included in the study. The mean age (± Standard deviation, SD) of the infants was 13.6 ± 5.8 months and 14.9 ±5 months in urban and rural areas respectively. In both the areas, the majority of the participants were Hindu, 90%, and 92% in urban and the rural area respectively. The majority of the sample population belonged to the general caste with urban area having a higher proportion of general caste (66%) as compared to rural areas (54%) whereas the proportion of SC/ST was more in the rural area (22%). The urban households had a family size of 4.52± 0.89 and rural households had a family size of 5.62±1.46. In the rural area, there were more households having a family size ≥5 (82%) as compared to the urban area (68%). The percentage of mothers who never attended school was high in the rural area (20%) although 28% of the mothers studied till senior secondary school. In the urban areas all the mothers had some amount of schooling, majority of them being graduates (44%). Majority of the sample population living in rural areas had monthly family income below Rs. 20,000 (70%) and the majority of the participants living in urban area had a monthly family income between Rs. 60,000 to Rs. 80,000 (34%). For both areas, the majority of the mothers were homemakers while the percentage of women working as government/private employees was higher in urban areas (28%). In rural areas some (8%) women were also involved in family owned businesses

### Indicators related to breastfeeding

**Table-1 Indicators related to breastfeeding**

| Indicators | Mean ± SD or n (%) | | Total n=100 | $\chi^2$, p-value |
|---|---|---|---|---|
| | Urban (n=50) | Rural (n=50) | | |
| **1. Early initiation of breastfeeding**<br>a. Within 1 hour<br>b. Within 24 hours<br>c. After 24 hours | <br>16 (32%)<br>21(42%)<br>13(26%) | <br>26(52%)<br>10(20%)<br>14(28%) | <br>42<br>31<br>27 | 4.10, p=0.043 |
| **2.Exclusive breastfeeding for 6 months** | 22(44%) | 16(23%) | 38 | 1.52, p=0.216 |

| | | | | |
|---|---|---|---|---|
| **Things fed before 6 months**<br>a) Infant formula<br>b) Cow's milk<br>d) Commercial powdered milk<br>e) Water | n= 28<br>8(28.6%)<br>2(7.2%)<br>14(50%)<br>4(14.3%) | n=34<br>13(38.2%)<br>14(41.1%)<br>2(5.9%)<br>5(14.7%) | <br>21<br>16<br>16<br>9 | |
| **3. Introduction of pre-lacteals within 3 days of birth**<br><br>**Things fed**<br>a) Milk (Other Than Breast Milk)<br>b) Sugar Or Glucose Water<br>c) Infant Formula<br>d) *Janamghutti* | 15(30%)<br><br><br><br>4 (26.7%)<br>1(6.7%)<br>9(60%)<br>1(6.7%) | 17(34%)<br><br><br><br>10(58.8%)<br>0<br>6 (35.3%)<br>1 (5.9%) | 32<br><br><br><br>14<br>1<br>15<br>2 | 0.18, p=0.668 |
| **4. Feeding of Colostrum** | 37 (74%) | 30 (60%) | 67 | 2.21, p=0.13 |

Early initiation of breastfeeding: A higher proportion of rural mothers, initiated breast feeding within one hour of birth (52%) as compared to urban mothers (32%). This difference was statistically significant ($\chi^2$= 4.10, p=0.043, df = 1). The major barrier in early initiation of breastfeeding in the rural area was the caesarean section reported by 41.7% of mothers whereas the major reason in the urban area was that the baby was in the neonatal ICU. In a systematic review by Sharma and Byrne (2016), five studies reported mother's health condition as a major factor for delaying breastfeeding. Other than this, early initiation of breastfeeding was prevented by lack of knowledge in rural mothers (25%) and in both the groups nearly 20% of mothers experienced lack of support by family members. The major facilitator for early initiation in both the groups was the role of doctor/hospital staff as reported by 62.5% and 65.4% of mothers in urban and rural areas respectively. The other facilitator which was reported by rural mothers was support of family members.

Exclusive breastfeeding (EBF): Overall, 44% of children in the urban area and 32% of children in the rural area were exclusively breastfed for 6 months ( Table -1). However, this difference was not found to be statistically significant ($\chi^2$= 1.52, p >0.05, df = 1). Overall half of the urban mothers, who did not practice EBF, fed commercial powdered milk to the baby whereas the maximum proportion of rural mothers fed cow's milk to babies (41.1%). The major reason for not exclusively breastfeeding in both the groups was the perception that breast milk was not sufficient for the baby. The second major reason in urban area was that the baby fell ill (21.6%) which led to discontinuation of breast milk and switch to formula feed/powdered milk. The second major reason in rural area was lack of knowledge about EBF (20.6%). Other reasons like convenience of feeding commercial milk (10.8%) and feeling that combining infant formula with breast milk is better (7.2%) were also reported by urban mothers.

Among working mothers, a higher proportion of mothers in rural area (14.8%) reported fatigue as a barrier to EBF as compared to urban mothers (7.2%). The major barrier in urban mothers was the perception that expressing and storing milk is not hygienic (10.7%). The major facilitator reported by both the groups was knowledge that EBF is important for the baby, reported

by 45.5% (urban) and 31.3% (rural) mothers. The other major factor was the role of doctor/hospital staff in promoting EBF reported by 27.3% and 56.3% urban and rural mothers respectively. The other facilitators reported in the urban area were crèche facilities at the workplace, expression of milk by breast pump, and social media influence.

Practice of feeding of pre-lacteals and colostrum: The percentage of children who were fed pre-lacteals was slightly higher in the rural area (34%) as compared to the urban area (30%).This difference was not found to be statistically significant ($\chi^2$= 0.18, p >0.05, df = 1). Infant formula was fed to a higher proportion of children (60%) belonging to urban area whereas in rural area, milk (other than breast milk) was fed to a high proportion of children (58.8%). Other things fed were sugar/glucose water (6.7% in urban infants) and *janamghutti* that was fed to 6.7% and 5.9% of infants residing in urban and rural areas respectively. The major barrier reported by approximately 60% of mothers from both the groups was lack of knowledge about the importance of colostrum. The other reasons were the baby was in ICU, and self-perception or perception of family members that thick yellowish milk is bad for the baby. Here again, importance of doctor/hospital staff in promoting feeding of colostrum is highlighted with approximately half of the mothers in both the groups reporting them as facilitators (48.7% and 50% in urban and rural areas respectively). The other factors were knowledge, family support and social media influence.

**Indicators related to complementary feeding**

**Table 2- Indicators related to complementary feeding**

| **Indicators** | **Mean ± SD or n (%)** | | **Total (n=100)** | **$\chi^2$, p-value** |
|---|---|---|---|---|
| | **Urban (n=50)** | **Rural (n=50)** | | |
| **1. Age at which CF was introduced (months)**<br><br>At 6 months | 6.12±0.4<br>Range= 2 (Max=8,Min=6)<br>45 (90%) | 6.58±1<br>Range=3 (Max=8,Min=6)<br>34(68%) | 6.35±0.8<br><br>79 | 7.29 ,0.007 |
| **2. Minimum meal Frequency** | 36(72%) | 35(70%) | 71 | 0.05, 0.82 |
| **3. Minimum diet diversity** | 21 (42%) | 27 (54%) | 48 | 1.44, 0.23 |
| **4. Minimum acceptable diet** | 16(32%) | 22 (44%) | 38 | 1.5, 0.28 |

Timely initiation of complementary feed (CF): The mean age at which CF was initiated was 6.12±0.4 months and 6.58±1 months for urban and rural areas respectively. A higher proportion of infants in urban area (90%) followed timely initiation of CF (at 6 months) as compared to infants in rural areas (68%). This difference was found to be statistically significant ($\chi^2$= 7.29, p=0.007, df = 1). Similar results were obtained in CNNS (2016-18) where a higher proportion of children (59%) residing in urban areas initiated CF at time, compared to their rural counterparts (51%). The major barrier that was reported for not introducing CF on time by mothers residing in urban areas was that the baby did not accept the food (80%). The same reason was also reported by 37.5% of rural mothers. Another reason reported by rural mothers was lack of awareness about initiation of

CF. Baby falling ill after the consumption of semi-solid/solid food resulted in delaying the initiation of CF as reported by 25% and 20% of rural and urban mothers respectively. The major facilitator reported by urban mothers was knowledge regarding initiation at 6 months (33.4%). Family custom '*annaprashana*' was a major facilitator for timely initiation in rural mothers (35.3%)

Minimum meal frequency (MMF): WHO (2008) defines MMFas "Proportion of breastfed and non-breastfed children 6–23 months of age who receive solid, semi-solid, or soft foods the minimum number of times or more" (p. 8).MMF for urban areas was slightly higher (72%) than that for rural areas (70%). This difference was not found to be statistically significant ($\chi^2$= 0.05, p >0.05, df = 1). The perception that more than 2-3 meals are heavy for the child was reported by 50% of urban mothers and 26.7% of rural mothers. Among rural mothers the reason reported by the maximum proportion of mothers was that the baby doesn't demand food (53.4%). For both the groups the most common facilitator reported was the knowledge that MMF is important for growth and development of the baby as reported by 42.9% and 41.7% of rural and urban mothers respectively.

Minimum Diet Diversity (MDD): Proportion of children who receive foods from 4 or more food groups are considered to meet the MDD (WHO 2008). A higher proportion of infants were fed MDD in the rural areas (54%) as compared to the urban areas (42%). The difference was not found to be statistically significant ($\chi^2$= 1.44, p >0.05, df = 1). Independent t-test was applied to compare the MDD scores of the two groups. It was found that there was no significant difference in mean MDD scores between urban and rural ($t_{95.193}$ = 0.95, p > 0.05). The average MDD score for rural area was 0.18 units greater than that for urban area. Including 4 or more groups in the diet is too heavy for the baby was reported by a high proportion of urban mothers (58.7%) whereas rural mothers reported that it is time consuming (34.8)%.

Minimum Acceptable Diet (MAD)**:** MAD is a composite indicator that requires a positive score on both the indicators- minimum diet diversity and minimum meal frequency. A higher proportion of infants were fed a minimum acceptable diet in the rural area (44%) than in the urban area (32%). This difference was not found to be significant ($\chi^2$= 1.5, p>0.05, df = 1).

Figure 1 shows the types of food groups consumed by children aged 6–24 months in the previous 24 hours. A significantly higher proportion of infants belonging to rural area received legumes and nuts (90%) and flesh foods (10%) as compared to infants belonging to urban area ($\chi^2$= 6.25, p 0.01, df = 1 and $\chi^2$= 6.38, p = 0.01, df = 1 respectively).

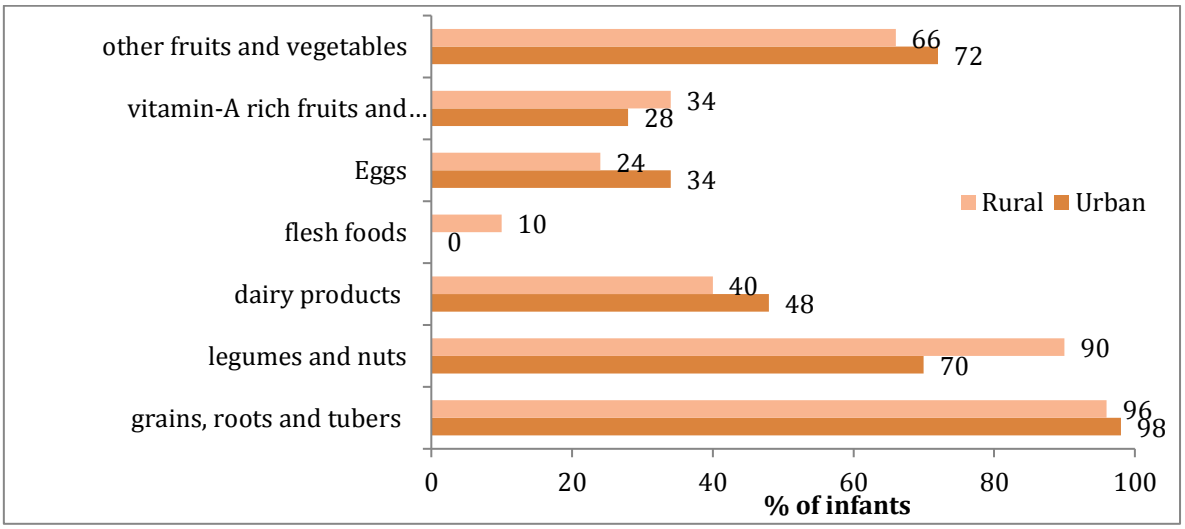


**Figure-1 Types of food groups consumed by infants**

**ICDS supplementary nutrition and nutrition-sensitive home gardening**

About 74% of infants belonging to rural area were registered in anganwadi centre (AWC) and 72% were fed food from anganwadi centre. The types of foods that they received in 'take home ration' included '*panjeeri'*, peanuts, broken wheat, ragi flour, jaggery, roasted *chana*, pulses, dates (dry) etc. The major reason for not registering at AWC was the distance of AWC from home as reported by 50% of mothers.

A higher proportion of mothers belonging to rural area (40%) practiced nutrition-sensitive home gardening as compared to urban mothers (16%).Majority of mothers from both groups grew green leafy vegetables in their kitchen gardens (75% and 70% in urban and rural area respectively). The nutrition sensitive home gardening was found to be significantly associated with consumption of vitamin A rich fruits and vegetables ($\chi^2$= 10.28, p =0.001, df = 1).

**Nutritional status of infants**

Children who were below -2SD values of the reference median on the basis of weight-for-age, height-for-age, weight-for-height and BMI for age indices were classified as 'underweight', 'stunted', 'wasted' and 'underweight' respectively and children who were between +2 SD to +3 SD values for weight-for-height and BMI for age indices were classified as overweight. The prevalence of wasting, underweight and stunting was higher in rural area which was 20%, 24%, 20% respectively whereas the prevalence of that in urban area was 10%, 14%, 10% respectively while the prevalence of overweight in urban area was 4%. On the basis of BMI for age, a higher proportion of children were found to be underweight in rural areas (16%) than in urban areas (10%). The prevalence of overweight in urban area was found to 4% whereas no child was found be overweight in rural area.

Mid-upper arm circumference (MUAC) cut-off of 11.5 cm was used as an independent diagnostic criterion to identify severe acute malnutrition (SAM). The prevalence of moderate acute

malnutrition was 8% and 12% in infants belonging to urban and rural area respectively and that of SAM was 2% in both groups.

**Factors associated with optimal feeding practices**

After adjusting for confounders, when independent variables were transferred to multiple logistic regression, birth order and caste were found to be significantly associated with early initiation of breastfeeding. There was a decreased likelihood of timely initiation of BF with increasing birth order. The likelihood of early initiation of breastfeeding was higher in mothers with birth order of 1(AOR=2.96, 95% CI 0.14, 6.89; p= 0.026) and mothers with birth order 2 (AOR= 1.01, 95% CI 0.22, 5.90; p= 0.030) as compared to a birth order of 3. The likelihood of early initiation of breastfeeding was more in mothers belonging to OBC category (AOR= 8.4; 95% CI 1.64, 44.0;p=0.011) and mothers belonging to general category (AOR= 3.4; 95% CI 0.83, 14.32; p=0.03) as compared to mothers belonging to SC/ST category (Table-3).

**Table 3- Logistic Regression model of socio demographic variables and feeding practices**

| Feeding practice | Independent variable | [a]COR (95 % CI) | [b]AOR(95 % CI) |
|---|---|---|---|
| **Early Initiation of Breastfeeding** | **Locale** | | |
| | Rural | 2.30 (1.02,5.19) | - |
| | Urban | * | |
| | **Gender** | | |
| | Male | 1.81(0.81,4.04) | - |
| | Female | * | |
| | **Order of birth** | | |
| | 1st child | 3.69(0.72,18.76) | 2.96(0.14,6.89) |
| | 2nd child | 1.52 (0.20,5.07) | 1.01(0.22,5.90) |
| | 3rd child | * | |
| | **Caste** | | |
| | OBC | 6.6(1.62,26.87) | 8.4(1.64,44.0) |
| | General | 3.08(0.95,9.97) | 3.4(0.83,14.32) |
| | SC/ST | * | |
| **Exclusive breastfeeding** | **Locale** | | |
| | Rural | 0.599 (0.265,1.35) | - |
| | Urban | | |
| | **Family size** | | |
| | <5 | | |
| | ≥5 | 1.78(0.763,4.142) | - |
| | **Infants who were** | * | |
| | **fed colostrum** | 3.19 (1.22,8.37) | 3.05(1.15,8.11) |
| **Timely initiation of complementary feeding** | **Locale** | | |
| | Rural | 0.23 (0.08,0.71) | 0.27(0.75,0.97) |
| | Urban | * | |
| | **Order of birth** | | |
| | 1st child | 36 (3.74,346) | 19.09(1.44,251.9) |

| | | | |
|---|---|---|---|
| | 2nd child | 27 (2.84,256.5) | 16.51(1.31,207.95) |
| | 3rd child | * | |
| | **Occupation** | | |
| | Homemaker | 2.95(1.06,8.22) | - |
| | Service/Family Business | * | |
| **Minimum dietary diversity** | **Age** | 1.18(1.08,1.29) | 1.16(1.05,1.27) |
| | **Religion** | | - |
| | Hindu | 3.57(0.71,18.15) | |
| | Muslim | * | |
| | **Family income** | | - |
| | Upto 40,000 | * | |
| | 40,001 to 80,000 | 0.72(0.29,1.75) | |
| | Above 80,001 | 0.34(0.11,1.12) | |
| | **MMF followed** | 1.78(0.737,4.31) | - |
| **Minimum Meal frequency** | **Religion** | | |
| | Hindu | 26.6(3.15,225.5) | 18.21(2.094,158.49) |
| | Muslim | * | |
| | **Family income** | | - |
| | Upto 40,000 | * | |
| | 40,001 to 80,000 | 0.61(0.24,1.54) | |
| | Above 80,001 | 6.66(0.81,54.8) | |

*a- Crude odds ratio-significant at a P-vale of <0.2; b- Adjusted odds ratio- significant at a P-vale of <0.05; (*)- The category is taken as a baseline/reference category against which other categories are being compared*

Infants who were fed colostrum were more likely to practice EBF (AOR 3.05; 95% CI 1.15, 8.11; p = 0.025). Thus feeding colostrum was significantly associated with EBF. Locale and birth order were significantly associated with timely initiation of CF. The likelihood of timely initiation of CF was lower among rural mothers (AOR = 0.27, 95 % CI 0.75, 0.97; p= 0.046) compared to that of urban mothers. There is a decreasing likelihood of timely initiation of CF with increased order of birth. The likelihood of timely initiation of complementary feeding was higher in mothers with one child (AOR=19.09, 95% CI 1.44, 251.9; p= 0.025) and mothers with second child (AOR= 16.51, 95% CI 1.31, 207.95; p= 0.030). A study by Dhami et al.(2019) which used the nationally representative data (NFHS-4) for India, reported that urban women were more likely to introduce CF on time compared with rural women in western parts of India.

The age of the infant was positively and independently associated with MDD practice. Accordingly, for every unit increase in the age the odds of following MDD increased by about 16% (AOR = 1.16, 95% CI: 1.05, 1.27; p=0.004). Religion was positively and independently associated with the practice of MMF among children aged 6–23 months. Accordingly, mothers belonging to Hindu religion were more likely to practice MMF than mothers belonging to the Muslim religion (AOR = 18.21, 95% CI 2.09, 158.4 p= 0.009).

The study was, however, limited by its sample size and the fact that it involved infants visiting health centres for routine check-ups. Findings therefore cannot be generalized to the young

child population of Dehradun. It must however be noted that children who were sick were excluded from the study.

## CONCLUSION AND IMPLICATIONS

The study reported differences in the feeding practices between urban and rural areas which can be used for designing of other studies with larger sample size to examine these further. It has also reported common barriers and facilitators which can help to formulate specific key interventions addressing knowledge, beliefs and family customs prevalent in urban and rural areas of Dehradun.

Knowledge regarding optimal feeding practices, role of doctor/hospital staff and support of family members were major facilitators for early initiation of breastfeeding, EBF, feeding of colostrum, timely introduction of CF and MMF. As counselling by the health workers was reported as a facilitator, training of health workers can enhance their counselling skills and performance and thereby effective promotion of optimal IYCF practices. Social media was reported as a facilitator for practices like EBF, feeding of colostrum and timely introduction of CF. It can be used as an effective communication tool for creating awareness. Effective communication strategies focusing on behavioural change not only of mothers but of family members is necessary for ensuring optimal feeding practices. It is important to educate mothers during antenatal visits with reinforcement of messages during postnatal visits.

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# ANTIDIABETIC PROPERTIES OF RICEBEAN BASED MULTI-MIX THROUGH *IN-VIVO* STUDIES

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## ABSTRACT

Diabetes mellitus is one of the lifestyle disorders which is now recognized as a silent killer which grows faster among today's global population. The present study on assessment of anti-diabetic properties of ricebean based multi-mix in alloxan-induced diabetic albino rats gives a new approach in the treatment of diabetes mellitus. The multi-mix consists of ricebean an underutilized legume along with other ingredients (rice, foxtail millet, flaxseed and tomato). GTT was done on albino rats to determine the intensity of test diet compared to reference diet on clearing glucose from the blood.Glycemic Index (GI) of test diet was determined by calculating Incremental Area Under two hours of blood glucose response or Curve (iAUC) for test diet and compared with that of iAUC for standard glucose solution. Impact of supplementation of developed multi-mix on blood glucose level was determined through single intra-peritoneal administration of alloxan induced diabetic rats.The peak blood glucose level in experimental groups after consumption of Multi-mix was obtained at 60 min which decreased significantly ($p<0.01$) till the observation period of 120 min indicating slow digestion and absorption of the Multi-mix when compared to reference food. The Multi-mix was found to be a low glycemic index food (32). The Experimental Group supplemented with Multi-mix showed highest significant decrease ($p<0.01$) in blood glucose level when compared to Diabetic control groupfed and Experimental Group injected with standard metformin and both fed with rat ration. From the present study, it was found that 40% incorporation of Multi-mix have the maximum ability to decrease the mean blood glucose level in alloxan induced diabetic rats The Multi-mix developed from ricebean and other functional ingredients was found to be a novel food with all the therapeutic potentials when studied through animal model for preventing and management of various lifestyle disorders like Diabetes Mellitus.

**Keywords:** Ricebean, Functional ingredients, Antidiabetic, Glycemic index, Glucose tolerance test.

## INTRODUCTION

North Eastern region has a vast array of indigenous legumes, ranging from large rainforest trees to small annual herbs like sword bean (*Canavaliaensiformis),* Sem or Lablab bean (*Dolichos lablab*) and Ricebean (*Vignaumbellata*). Among all the other underutilized legumes of North east India, ricebean is the lowest input crop. Ricebean (*Vignaumbellata*) is basicaly a protein rich legume, the cultivation of which is mainly distributed throughout the North Eastern Hills. Diabetes mellitus is always been one of the leading cause of death and disability in the world among other lifestyle disorders. Recent research reveals that legume consumption has been associated with a lower risk of Diabetes mellitus in observational epidemiological studies, and has been shown to

decrease high blood sugar in clinical trials. *In-vivo* studies using animal models have contributed to a great understanding in the field of medical and nutrition research [Rosac, 2016]. Hence, to assess the functional efficacy in terms of low glycemic index, a ricebean based Multi-mix has been developed with following objectives:

## OBJECTIVES

1. Determination and calculation of glycemic index of the developed Multi-mix.

2. Impact of supplementation of developed Multi-mix on blood glucose level of alloxan induced diabetic rats

## MATERIALS AND METHOD

**Collection of samples:**

Fresh samples of ricebean had been procured from the local haat (market) of Sadiya, Assam. Fresh samples of rice (Luit variety) had been procured from Majuli, Assam. Foxtail millet, flaxseed and tomato powder had been collected from Jorhat, Assam. All the collected ingredients were separately processed and ground to very fine powder. The powdered samples were mixed properly in 30:40:10:10:10 (rice: ricebean: foxtail millet: flaxseed: tomato)) ratio to get the Multi-mix.

***In-vivo studies:***

**Glucose tolerance test**

For GTT twelve numbers of white albino rats were obtained from College of Veterinary Sciences, Dept of Pharmacology and Toxicology, AAU Khanapara. The animals were weighed (between 150 and 250 gram) and were divided into two groups, namely reference group fed on standard glucose and Experimental Group fed on developed Multi-mix. Both the group consists of 6 animals, notably, with no statistical differences.Fully controlled condition was maintained for keeping the experimental rats. Rats were kept for12 hours of light and dark cycle for acclimatization. Deionized distilled water was fed as *ad libitum.* The guidelines of the Institutional Animal Ethics Committee were followed for the use of animals in experimentation. GTT was conducted on overnight fasted animals. Fasting blood glucose was drawn from the reference group before giving 0.15 g standard glucose dissolved in distilled water. Blood glucose level was checked after feeding at fifteen, thirty, forty five, sixty, ninety and one twenty minutes. The same method was performed with the experimental group by taking their fasting blood glucose and then giving them amount of test food containing 0.15 g carbohydrate according to method outlined by Thannoun*et al.* (2010). Blood sampling was done by taking Blood samples from tail tipping of the experimental animals. Blood glucose was determined by using glucose tester Device Accu check Roche.

**Measurement of blood glucose response and calculation of glycemic index using measurement of incremental area under curve (iAUC):**

Glycemic Index (GI) of test diet was determined by calculation of Incremental Area Under two hours of blood glucose response or Curve (iAUC) for each diet and compared with the iAUC for standard glucose solution based on the method outlined by Wolever*et al*. (1991) by using the following equation:

$$GI = \frac{\text{Incremental Area Under 2hour blood glucose Curve for food}}{\text{Incremental Area Under 2hour blood glucose Curve for glucose}} \times 100$$

The glycemic index calculated for the test sample were classified by using the GI scale given below:

Glycemic index scale [Gordillo-Bastidas*et al.*2016]: Low: less than or equal to 55; Medium: 56-69; High: 70 or more

**To study the impact of supplementation of Multi-mix on blood glucose level of alloxan induced diabetes rats.**

Thirty six number of animals (white albino rats) were used for this experiment. They were obtained from College of Veterinary Sciences AAU Khanapara. The animals were weighed (between 150 and 250 gram) and were divided into four groups. The proportion of diets for assessing hypoglycemic effect of developed Multi-mixis shown in table 1. The rats were kept in a controlled condition of 12 hours light and dark cycle. Distilled water which are deionized was fed as *ad libitum.*

**Table. 1: Proportion of diets for assessing hypoglycemic effect of developed Multi-mix.**

| Experimental Group | Number of animals | Diets |
|---|---|---|
| Control | 6 | 100% rat ration |
| A (Diabetic control) | 6 | Alloxan + 100% rat ration |
| B (Standard metformin) | 6 | Alloxan + 100% rat ration |
| C<br>C1 | 6 | Alloxan + 80% Rat ration + 20% Multi-mix |
| C2 | 6 | Alloxan + 70% Rat ration + 30% Multi-mix |
| C3 | 6 | Alloxan + 60% Rat ration + 40% Multi-mix |

**Induction of diabetes and Determination of glycemia**

Diabetes was induced by the standard procedure of a single intraperitoneal administration of alloxan (140 mg/kg) with 4% saline solution (an average of 0.90 ml per specimen) [Florian*et al.*2013], [Lenzen and Panten, 1988] (plate 1). Before administering alloxan, baseline glycemia was tested. After 48 hours blood samples by puncture of the tail vein was taken and blood glucose level was checked and the rats that showed levels above 250 mg/dL were considered diabetic. Blood samples were taken from tail tipping of the experimental animals at 0, $5^{th}$, $10^{th}$ and $15^{th}$ day (plate 2). Blood glucose was determined by using glucose tester Device Accu check Roche and results expressed in the unit of mg/dl.

**Plate 1. Intravenous induction of alloxan**

**Plate 2. Blood collection through tail tipping**

## RESULTS AND DISCUSSION

**Estimation of glycemic index of the developed Food Multi-mixes.**

The glycemic index (GI) is a type of rating scale that ranks the foods items containing carbohydrates from 0-100 by how much they raise blood glucose levels compared to a standard reference food [Eleazu, 2016]. The standard food generally used for study are glucose or white bread. In 2016, Huber have revealed that diabetic patients can reduce their average blood glucose levels by eating a diet having a lower glycemic index. Many studies have also suggested that foods with low GI (GI$\leq$ 55) has beneficial effects on various aspects of physiology and metabolic disorders involved in chronic non transmissible disease.

The carbohydrate-rich foods with GI value more than 70, increases the postprandial blood sugar levels whereas, carbohydrates from low GI (55 and below) foods are digested slowly. Hence, consuming foods with a low GI can help diabetic people to control their blood glucose levels [Chiu *et al.*2011], [Melanson*et al.*2012]. Kabir*et al.* in 1997 reported that low GI foods have the ability to prolong insulin stimulated glucose transport in adipocyte cells, indicating increased glucose utilization for long time and thus preventing blood glucose level to rise at a faster level.In the present study the glycemic index of foods were determined by calculating Glucose tolerance test (GTT) as outlined by Thannoun*et al.* (2010).

**Glucose tolerance test (GTT)**

Glucose tolerance test (GTT) was conducted on overnight fasted animals. Fasting blood glucose was drawn from the reference group before giving 0.15 g standard glucose dissolved in distilled water. Blood glucose was determined after feeding at 15, 30, 45, 60, 90 and 120 minutes. The same method was performed with the experimental group by taking their fasting blood glucose and then giving them an amount of test food containing 0.15g available carbohydrates for each group. The blood glucose response for reference food and test foods are presented in Table 2.

**Blood glucose response for Multi-mix**

The blood glucose level was monitored at fasting period and after feeding at an interval of 15 min, 30 min, 45 min, 60 min, 90 min and 120 min, respectively. The peak blood glucose level in experimental groups after consumption of Multi-mix was obtained at 60 min which decreased significantly ($p<0.01$) till the observation period of 120 min (2hours) indicating slow digestion and absorption of the Multi-mix. Whereas, reference food showed peak blood glucose level at 30 min and then decreased progressively till the observation period of 120 min (Fig 4.6). The initial mean fasting blood glucose level of animals in Experimental Group A fed with Multi-mix was 76±0.65 mg/dl which raised to peak level of 93±0.05 mg/100ml at 60 minutes and gradually decreased to 85±0.36 mg/dl after 120 minutes. The developed Multi-mix showed blood glucose lowering properties which may be due to in-situ composition of glucose lowering properties of functional ingredients used to develop the Multi-mix. Incorporation of ricebean, foxtail millet and flaxseed in the Multi-mix are responsible for slow digestion and absorption due to their high fibre content. Various findings evidenced that ricebean, foxtail millet and flaxseeds are excellent sources of dietary fibre, particularly soluble fibres [Kim *et al.*2010], [Gualda and Medeiros, 2013], [Kasote, 2013]. These soluble fibres are responsible for providing a greater feeling of satiety as it slows down the transition of food through the stomach and intestines [El-Adawy, 2003]. These functional ingredients also prolong the absorption of glucose in the body, which prevents sudden changes in blood sugar levels and also hampers the rise in blood cholesterol levels like LDL and VLDL.

**Table 2. Mean blood glucose response for multi-mix fed to normal healthy rats.**

| Groups (n=6) | Samples | Mean fasting blood glucose level | Mean blood glucose level at different time intervals (blood glucose mg/100ml | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 15 min | 30 min | 45 min | 60 min | 90 min | 120 min |
| Reference Group | Glucose standard | 86±0.13 | 128±0.03 | 157±0.26 | 140±0.09 | 118±0.56 | 98±0.41 | 93±0.12 |
| Experimental Group A | Multi-mix | 76±0.65 | 78±0.54 | 81±0.36 | 88±0.21 | 93±0.05 | 90±0.11 | 85±0.36 |
| | | | | | | F-Value | S Ed | CD at 5% |
| For factor treatment | | | | | | 46.4** | 6.6 | 17.6 |
| For factor time | | | | | | 75.1** | 5.9 | 15.2 |

Values are expressed in mean ±SD; ****** Signifcant at P<0.01

Normal postprandial blood glucose= 70-99 mg/dl

Many studies evidenced the potential properties of legumes in glycemic control [Madar and Stark, 2002], [Venn and Mann, 2004], [Duranti, 2006], [Zang*et al.*2011], [Mirmiran*et al.*2013], [Bahadoran*et al.* 2013]. Pulses like ricebean are excellent source of slowly digestible starch (SDS) and resistance starch (RS) which are effective in lowering blood glucose level and also cholesterol level [Gupta*et al.*1992]. The slowly digestible starch (SDS) and resistance starch (RS) present in legumes lowers blood glucose level by providing a greater feeling of satiety and slowing down the transition of food through the stomach and intestine. They prolong release of glucose into the blood stream leading to low glycemic response in the body. This mechanism makes it suitable for use in controlling post parandialrise of blood glucose levels [Olopade*et al.* 2017].

The mean blood glucose response curve for Multi-mix fed to normal healthy rats are presented in Fig.1

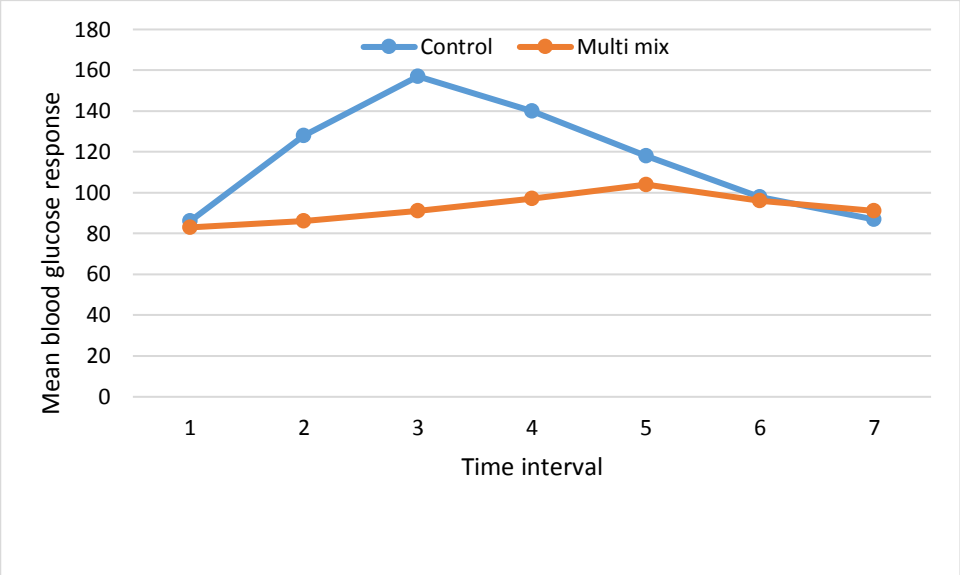


**Fig 1. Mean blood glucose response curve for Multi-mix fed to normal healthy rats**

**Estimation of incremental area under blood glucose response curve (iAUC) and glycemic index of developed Multi-mix:**

From Fig 1. the incremental area under blood glucose response curve was calculated by following the method outlined by Wolever*et al.* (1991). The (iAUC) value of reference food and test food are presented in Table 3. The mean (iAUC) of reference food was 3201 and FMM I was found to be 1221. From the mean (iAUC) values it can be observed that the blood glucose levels for the test product was markedly lower than orally administered glucose. Glycemic index of Multi-mix was found to be 32 after calculating from iAUC of reference food and Multi-mix. The low glycemic index in Multi-mix was probably due to presence of functional ingredients. Literature has shown that foods developed from various functional ingredients are rich in slowly digestible starch fractions which undergoes slower digestion in the small intestine, resulting in lower blood glucose levels [Brennan*et al.*2008], [Thondre and Henry, 2009], [Giri*et al.* 2017]. In 2017, Gourineni*et al.* found that inclusion of legume based slowly digestible starch in cold pressed bars resulted in significantly lower blood glucose level in alloxan induced diabetic rats.

**Impact of supplementation of developed Multi-mix on blood glucose level of alloxan induced diabetic rats**

The increase in blood sugar concentration was observed in the experimental rats after intraperitoneal injection of alloxan monohydrate. Such increase in blood sugar level was due to the toxic and destructive effect of alloxan monohydrate on the beta cells of the pancreas [Bansal *et al.* 1980].

**Table 3: Effect of oral supplementation of Multi-mix on blood glucose level of alloxan induced diabetic rats.**

| Experimental groups | Blood glucose level before induction of diabetes (mg/dl) 0 Day | Effect of supplementation on blood glucose after induction of diabetes (mg/dl) | | | |
|---|---|---|---|---|---|
| | | 2 days (48 hours) | 5 days | 10 days | 15 days |
| Group A Diabetic control | 78±6.6 | 285±7.1 | 292±4.2 | 294±3.4 | 293±4.6 |
| Group B Standard Metformin | 82±6.8 | 274±6.8 | 267±6.4 | 234±4.3 | 206±4.1 |
| Group C | | | | | |
| C1 | 74±5.9 | 268±5.5 | 256±3.5 | 244±6.4 | 238±4.3 |
| C2 | 77±6.0 | 264±6.9 | 254±4.8 | 238±6.8 | 230±3.6 |
| C3 | 85±6.2 | 260±4.8 | 255±4.7 | 235±5.5 | 220±4.1 |

*Values are expressed in mean ± SEM*

******** *Signifcant at P<0.01*

*NS- Not Significant*

*Normal postprandial blood glucose= 70-99 mg/dl*

The experimental animals were equally divided into three groups, namely Group A, Group B and Group C comprising of 6 experimental rats each. Group C consisted of 18 rats. Under Group C three sub groups were formed consisting of 6 rats each and were fed on 20%, 30% and 40% incorporation of Multi-mix for a period of 15 days.

Experimental Group A (Diabetic control) fed with rat ration showed significant ($p \leq 0.01$) increase in the blood glucose level after induction of alloxan from the initial value of 285±0.41mg/dl to 293±0.46 mg/dl at the end of the supplementation period.

Experimental Group B injected with standard metformin and fed with rat ration showed a significant decrease ($p<0.01$) in its blood glucose level from an initial value of 274±0.48 mg/dl to 206±0.35 mg/dl. The mean decrease in blood glucose level was 7 mg/dl to 68mg/dl at the end of supplementation period (Table 4).

Under Group C, Group C3 supplemented with 40% incorporation of Multi-mix showed highest significant decrease ($p<0.01$) in blood glucose level from the initial value of 283±0.28 mg/dl to 170±0.41 mg/dl at the end of the supplementation period compared to C1 and C2. The mean decrease in blood glucose level was highest in C3 (113mg/dl) followed by C2 (62mg/dl) and C1 (25 mg/dl) at the end of the supplementation period as shown in table 4.

From the present study, it was found that 40% incorporation of Multi-mix have the maximum ability to decrease the mean blood glucose level in alloxan induced diabetic rats which may be due to inclusion of different functional ingredients like ricebean, flaxseed and foxtail millet which are potential source of high fibres like cellulose, lignin, RS and SDS.

Findings of the present study were similar with the work done by Narayanan *et al.* (2016) who reported that supplementation of a meal with lower GI foods like foxtail millet and flaxseed resulted in the reduction of glycemic profile of experimental animals. The high dietary fibre content has been found to reduce gastric emptying and absorption of glucose after a meal, resulting in improved glucose tolerance [Bahadoran*et al.* 2013]. The soluble dietary fibre decreases the activity of digestive enzymes, which leads to incomplete hydrolysis of carbohydrates, protein, fats and delays absorption [Kam *et al.* 2016].

It can be concluded from the above results that the Experimental group fed with ricebean based Multi-mix showed effective hypoglycemic and antidiabetic properties which may be due to presence of dietary fibre, SDS and RS in the functional ingredients.

The mean decreases in blood glucose level (mg/dl) after supplementation of Multi-mixes are presented in Table 4.

**Table 4: Mean decrease in blood glucose level (mg/dl) after supplementation of Multi-mix**

| Experimental groups | Mean decrease in blood glucose level after supplementation of Multi-mix (mg/dl) | | |
|---|---|---|---|
| | 5 days | 10 days | 15 days |
| Group A<br>Diabetic control | -7 | -9 | -8 |
| Group B<br>Standard Metformin | 7 | 40 | 68 |
| Group C (Multi-mix)<br>C1<br>C2<br>C3 | <br>29<br>22<br>25 | <br>40<br>33<br>62 | <br>66<br>61<br>113 |

## CONCLUSION

Diabetes Mellitus is becoming a global burden in the recent years. About 468 million people were affected by type 2 diabetes out of 6.28% of global population. Legumes are always known to be the powerhouse of phytonutrients and phytochemicals including enzyme inhibitors, phytohemagglutinnins (lecitins), phytoestrogens, oligosaccharides, saponins and phynolic compounds, which play metabolic role in providing hypoglycemic and antidiabetic properties. It has been observed that there are about 19000 known legume species listed as edible. Out of which only 70% are used as food and rest are uncultivated and kept unutilized. The present study is thus an initiative in unlocking the potentials of ricebean an underutilized legume to generate the health benefits in terms of glucose lowering properties through developing a multi mix.

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# A STUDY ON DIETARY ASSESSMENT AND ENERGY EXPENDITURE OF FEMALE BHARATANATYAM DANCERS IN MUMBAI CITY

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## ABSTRACT

Dance is categorized as moderate to high intensity activity. The daily schedule of the dancer is difficult to determine but includes training period, practice period, workouts and performances.
Objective: To study the Dietary Intake Assessment and Energy Expenditure of Female Bharatanatyam Dancers in the age group of 18-25 years residing in Mumbai city.
Methodology: 60 participants were selected whose anthropometric measurements and body composition analysis were recorded. 1 day 24 hour diet recall was recorded to assess the nutritional intake. Data regarding the physical activity duration and patterns was obtained through the International Physical Activity Questionnaire (IPAQ)- short form version, a self- designed dance based Questionnaire and the pedometer was used to record the steps and calories and SPSS software was used for analysis of data.
Results**:** The Baseline characteristic values of the participants were normal except for muscle mass which was found to be high and bone mass which was found to be low. The Mean calorie intake of the participants was 1363 ± 501.145 kcal, the mean protein , carbohydrate and fat intake was; 36 ± 15.80 gms, 201 ± 92.70 gms and 40 ± 19.62 gms which in comparison to the Recommended Dietary Allowance (RDA) was found to be low. The mean calcium and iron intake was 295 ± 130.36 mg and 5.6± 2.83 mg.
Conclusion: The study concluded that calorie intake was found to be low in comparison to the energy expenditure of these participants leading to energy imbalance in Bharatanatyam dancers.

**Keywords:** Bharatanatyam, Energy Expenditure, IPAQ, Nutritional Status, Pedometer

## INTRODUCTION

Dance**,** is the movement of the body in a rhythmic way, usually to music and within a given space, for the aim of expressing a concept or emotion, releasing energy, or simply taking delight in the movement itself (*Mackrell, J 2008*). The main aim of dancing is to be able to express as creatively as possible (*Chatterjee, S et al 2013*). In India, the history of dance can be traced back to the devadasi system although each of the style has originated from a particular region, their roots can be traced back to the Natya-veda (*Rajguru, S. 2007).* Bharatanatyam is a dance form originated and developed in Tamil Nadu and is more than 2000 years old dance form and has been recognised as one of the foremost classical style among Indian dances *(Sarabhai, M. 2007)*. As an art form, Bharatanatyam is multi-faceted. It includes melody, rhythm, poetry and drama. It involves Nrittha which is rhythmic dance movements, Natya which is dance in dramatic aspect and Nrithya which is a combination of both (*Ramachadrashekhar, P 2011*). The population of dancers is very unique

as they are not just athletes whose work intensity is no less than a football or a tennis player but also they are artists who constantly strive to perfect the subtle and aesthetic details in performance. There are huge number of professional dancers and countless amateur dancers or recreational dancers and they are a unique group of athletes with aesthetic nature of sport (*Hoch, A.Z., et al 2011).* The artistic body movements displayed in dance place a high physical and physiological demand on the body in terms of muscular and joint flexibility, stability, muscle strength, coordination, sensory motor integrity, etc. (*Sharma, M et al 2018*). Dancers, requires the support which includes cardiovascular fitness, muscle flexibility, muscular strength/power to be able to perform (*Thomas, C. 2018*). Dancers are also found to have incidence rates of musculoskeletal injuries. Various potential risk factors for dancers have been suggested ranging from physical overload, psychological distress and poor nutritional status but there is a lack of any conclusive evidence on the risk factor (*Jyoti, S. et al 2018*). Very few research articles are available on the energy expenditure and nutritional status and its effects on the dancing population especially Indian classical dancers. Hence, a study of this kind was undertaken to throw a light on the requirements of the dancers.

## OBJECTIVE

To study dietary intake assessment and energy expenditure of female Bharatanatyam dancers in the age group of 18-25 years residing in Mumbai city

## MATERIALS AND METHODS

A cross- sectional study was conducted where female Bharatanatyam dancers in the age- group of 18-25 years currently residing in Mumbai, Maharashtra were selected to be a part of the study. Ethical clearance was obtained from Inter System Biomedica Ethics Committee Mumbai, Maharashtra. Study sites included Nalanda Nrityakala Mahavidyalaya, Juhu and Nrtyanjli, Thane. Purposive sampling technique was used where the inclusion criteria included professional female Bharatanatyam dancers who were training for 3 hours/day for 5 days a week and participants suffering from any major illness were excluded from the study. Anthropometric measurements and body composition analysis of the participants was recorded. 1 day 24 hr diet recall of the participants was recorded to assess nutrient (calories, protein, carbohydrate and fat) and micronutrient intake (iron and calcium). Food Frequency Questionnaire (FFQ) was used to collect information on frequencies of eating junk food on a frequency ranging from daily to once /month. Data regarding their physical activity duration and patterns was obtained through the International Physical Activity Questionnaire (IPAQ)- short form and a self- designed dance based Questionnaire. The dancers used the pedometer during the study (2 working days and 1 rest day) to record the calories expended by the participants during the course of the day. The data was collected after obtaining the consent of the participants. The Height of the participants was measured using the stadiometer whereas the weight and body composition analysis was recorded using the Tanita Scale. The nutritive value of each meal was assessed using nutritive Calculator and the daily nutritive intake was compared to the Recommended Dietary Allowance (RDA) from the Indian Council of Medical Research (ICMR).

Statistical analysis: Data was analyzed using SPSS software (20). Paired t-test was applied to see significant differences. P value less than 0.05 was considered statistically significant.

## RESULTS

A total of 60 participants in the age group of 18 to 25 years were a part of the study. Out of the 60 participants, 66.6% of them have been training in Bharatanatyam for 10 years and above, 30 % of the participants have been training for less than 10 years and only 3.3% of the participants were beginners. Table No 1 highlights the mean Baseline characteristics of the participants.

### I Baseline characteristics of the participants

**Table No 1: Baseline Characteristics of the Participants**

| Parameters | Mean | Normal Cut off Values |
|---|---|---|
| Age (years) | 20.67 ± 2.41 | 18-25 years |
| Weight (kgs) | 54.62 ± 10.45 | 55 kgs |
| Height (m) | 1.97 ± 0.181 | - |
| BMI $(kg/m)^2$ | 21.54 ± 4.36 | 18.5-22.9 $(kg/m)^2$ |
| Body Fat (%) | 29.47 ± 7.01 | <30 % |
| TBW (%) | 51.45 ± 5.45 | 45-60% |
| Muscle Mass (%) | 35.68 ± 3.64 | 24.3-30.3% |
| Bone Mass (%) | 2.13 ± 0.34 | 13-20 years: >1.3%<br>20-40 years: >2.4 % |
| BMR | 1199.02 ± 138.89 | 1084 |
| Visceral Fat (%) | 3.22 ± 2.38 | 1-9 % |

In Table No 1 the baseline characteristics of the participants is presented. The mean age of the participants was 20.67 ± 2.41 years. The mean weight of the participants was 54.62 ± 10.45 kgs, mean BMI was 21.54 ± 4.36 kg/ $m^2$, Body fat 29.47 ± 7.01% , mean TBW 51.45 ± 5.45% , mean Bone Mass 2.13 ± 0.34 %, mean BMR 1199.02 ± 138.89 and mean visceral Fat was 3.22 ± 2.38%.

Baneerjee, N. et al (2017) conducted a study to find out the impact, if any, of Bharatnatyam dancing, a novel anthropometric markers of CV health status. 72 female Bengalee Bharatanatyam dancers and 96 females who do not undergo any physical activity in the age group of 25-30 were selected for the study. The criteria's of assessment included Anthropometric, demographic data, socio economic status, body composition analysis. The study highlighted that the Control group were found to have significantly higher Body Mass Index (BMI), Body Adiposity Index (BAI), Neck Circumference (NC), Waist Circumference (WC) compared to the Bharatanatyam dancing group (BDG). From their study, it was concluded that practicing of Bharatanatyam dancing, one of

the most popular traditional Indian classical dance forms, had a favourable impact on body adiposity, indicating a much better cardiovascular health status, as adjudged in terms of the CVD markers like BMI, BAI, WC, NC on adult Bengalee females practicing it regularly.

Mukherjee et al (2012) had conducted a study with the aim to study the impact of training in Bharatanatyam dancers on their body composition, physical fitness and its indirect effect in reducing the cardiovascular risk factors in adult Bengalee females who are receiving training at least for 5 years in the age group of 17-24 years. 87 Bengalee women training in Bharatanatyam comprised of the Dancing group (DG) and 39 women who are not participating in any physical activity comprised of the control group (CG). Anthropometric measurements, body composition analysis, VO2 max and physical fitness tests were the tools used for estimation. The results observed that the BMI of DG individuals was significantly lower than the CG individuals in both the age ranges. It was also observed that the mean subcutaneous fat % in whole body of DG individuals was significantly lower than CG individuals, in both of the age groups whereas the estimated VO2 max was found to be higher in the DG group. The study concluded that females receiving training in Bharatanatyam for a period of at least 5 years were found to have healthier body composition and improved physical fitness thus reducing the probability of cardiovascular risk factors.

**II: Nutrient intake of the participants**

**Table No 2: Nutrient Intake of the Participants***

| Nutrient Intake | Mean | Recommended Dietary Allowance^ |
|---|---|---|
| 24 hr Diet Recall calorie (kcal) | 1363 ± 501.145 | 2230 |
| Protein (g)/ day | 36 ± 15.80 | 55 |
| Carbohydrate (g) | 201 ± 92.70 | 306.62 |
| Fat (g) | 40 ± 19.62 | 86.72 |
| Calcium (mg) | 295 ± 130.36 | 600 |
| Iron (mg) | 5.6± 2.83 | 21 |

^ ICMR- 2005

In Table No: 2 The Nutrient intake of the participants is presented. The mean 24 hour diet recall calories was 1363 ± 501.145 kcal, the mean protein , carbohydrate and fat intake was; 36 ± 15.80 gm, 201 ± 92.70 gm and 40 ± 19.62 gm. The mean calcium and iron intake was 295 ± 130.36 and 5.6± 2.83 mg.

The Recommended Dietary Allowance (RDA) for ladies above 18 years of age undergoing moderate physical activity states that the requirement is 2230 kcal, 55 gm of protein, 86.72 gm of

fat and 306.62 gm of carbohydrate. The calcium and iron requirement for this category is 600 mg and 21 mg respectively.

Sousa et al (2013) conducted a study to understand the nutritional recommendations for dancers. The study stated that, so as to diminish the danger of energy imbalance and associated disorders, dancers must consume at least 30 kcal/kg fat-free mass/day, plus the training energy expenditure; for macronutrients, a daily intake of 3 to 5 g carbohydrates/kg, 1.2 to 1.7 g protein/kg, and 20 to 35% of energy intake from fat can be recommended. The study also said that dancers can also be at risk of several micronutrient deficiencies and hence it is necessary to make sure adequate intake through diet or nutritional supplements.

**III: Correlation of Energy Intake and Energy expenditure of the participants**

**Table No3: Correlation of Energy Intake and Energy expenditure of the participants***

| Parameters | IPAQ MET<br>Pearson Correlation<br>Significance | IPAQ Kcal<br>Pearson Correlation<br>Significance | Pedometer MET<br>Pearson Correlation<br>Significance | Pedometer Kcal<br>Pearson Correlation<br>Significance |
|---|---|---|---|---|
| 24 hr recall (kcal) | -0.101<br>0.444 | -0.084<br>0.522 | -0.041<br>0.757 | -0.127<br>0.335 |
| Kcal/Kg BW | 0.052<br>0.695 | -0.181<br>0.167 | 0.053<br>0.686 | -0.263**<br>0.042 |
| Protein (g) | -0.235<br>0.07 | -0.120<br>0.359 | 0.042<br>0.748 | -0.055<br>0.676 |
| Protein/Kg BW | -0.116<br>0.378 | -0.193<br>0.139 | 0.094<br>0.475 | -0.188<br>0.151 |
| Carbohydrate (g) | 0.000<br>0.997 | -0.036<br>0.785 | 0.031<br>0.815 | -0.126<br>0.338 |
| Fat (g) | -0.119<br>0.367 | -0.061<br>0.641 | 0.030<br>0.820 | 0.021<br>0.873 |
| Calcium (mg) | -0.265**<br>0.040 | 0.004<br>0.973 | -0.284**<br>0.028 | -0.123<br>0.348 |
| Iron (mg) | -0.164<br>0.211 | 0.066<br>0.618 | -0.103<br>0.433 | -0.039<br>0.766 |

**P<0.05

Out of the 60 participants, the Mean IPAQ and Pedometer MET values are 1474.35 ± 283.82 MET and 450.86 ± 130.87 MET and the mean IPAQ and Pedometer Kcal values are 1374.92 ± 480.64 kcal and 403.51 ± 111.89 kcal respectively.

In Table no 3, Correlation of Energy Intake and Expenditure of the participants are presented. Significant Negative Correlation was observed in between Pedometer Kcal and Kcal/ Kg BW. Negative correlation was also observed in between Calcium (mg) and IPAQ MET values, Calcium and Pedometer MET values. Decreased calorie consumption was seen within the participants.

There was lesser calorie consumption for the physical activity they were undergoing. The results also highlighted that calcium consumption was poor in comparison as compared to the energy expenditure of the participants.

No correlation was observed in between International physical activity questionnaire (IPAQ) and pedometer. Although, it had been seen that IPAQ was found to be more generalised and pedometer was found to be more individualised.

Sitthipornvorakul et al (2014), conducted a study to look at the correlation of physical activity levels assessed by pedometer and those by the Global Physical Activity Questionnaire (GPAQ) in a population of office workers. A cross-sectional study with 320 office workers was conducted where a self-administered questionnaire was distributed to every office worker by hand. Physical activity level was objectively assessed by a pedometer for 7 consecutive days and subjectively assessed by the GPAQ. No correlation in the physical activity level assessed by the pedometer and GPAQ was found .When considering the pedometer as the criterion for comparison, 65.3% of participants had underestimated their physical activity level using the GPAQ, whereas 9.3% of participants overestimated their physical activity level. The study concluded that physical activity level in office workers assessed by a subjective measure was greatly different from assessed by an objective tool.

**IV: Correlation of International Physical Activity Questionnaire (IPAQ) and pedometer with BMI categories of the participants**

**Table No 4: Correlation of International Physical Activity Questionnaire (IPAQ) and pedometer with BMI categories of the participants***

| Parameters | BMI Classification | | | | F value, P |
|---|---|---|---|---|---|
| | <18.5 kg/m$^2$ n=13 | 18.5-22.9 kg/m$^2$ n=29 | 23-24.9 kg/m$^2$ n= 9 | 25-29.9 kg/m$^2$ n=9 | |
| No of days of Vigorous activities | 6.23 ± 0.59 | 6.28 ± 0.59 | 6.22 ± 0.83 | 6.22 ± 0.44 | 0.034, 0.992 |
| No of minutes of vigorous activities per day | 201.15 ± 46.01 | 195.34 ± 28.02 | 197.78 ± 38.57 | 173.89 ±2.66 | 1.287, 0.288 |
| No of days of Moderate activities | 0.15 ± 0.5 | 0.10 ± 0.409 | 0.00± 0.00 | 0.78 ± 1.716 | 0.141, 0.105 |
| No of minutes of moderate activities per day | 2.31 ± 8.32 | 2.07 ± 7.73 | 0.00 ± 0.00 | 5.00 ± 10.60 | 0.628, 0.600 |
| No of days of walking (leisure and exercise) | 6.31 ± 0.94 | 5.62 ± 1.61 | 5.56± 1.59 | 5.67 ± 1.32 | 0.779, 0.511 |

| | | | | | |
|---|---|---|---|---|---|
| No of minutes walking per day (leisure and exercise) | 40.00± 18.37 | 30.69± 14.43 | 36.67 ± 10.00 | 31.11± 13.86 | 1.402, 0.252 |
| No of hours sitting on a weekday | 3.15 ± 1.90 | 3.90 ± 1.11 | 4.11 ± 13.53 | 3.56 ± 1.13 | 1.162, 0.332 |
| Calculated IPAQ MET | 1514.31 ± 317.70 | 1490.76 ± 280.70 | 1509.00± 327.72 | 1329.11± 175.68 | 0.946, 0.425 |
| Calculated Pedometer MET | 449.72 ± 144.26 | 480.72 ± 135.66 | 450.92 ± 95.59 | 356.26 ± 90.81 | 2.197, 0.999 |
| Calculated IPAQ kcal | 1130.46 ± 294.36 | 1372.10 ± 605.11 | 1542.22 ± 291.49 | 1569.78 ±189.49 | 2.087, 0.112 |
| Calculated Pedometer kcal | 324.17 ±107.04 | 416.11 ±112.74 | 462.00 ± 87.01 | 419.03 ± 90.40 | 3.598, 0.019** |

**P<0.05

*****= original tables

Table No 4, presents the correlation of IPAQ and Pedometer values with BMI. The above table was done to observe any association between the IPAQ and Pedometer values with respect to the BMI of the participants. There was no significant association observed in any of the values except for the pedometer Kcal of the participants. As the BMI increased the, the pedometer kcal values also increased.

## DISCUSSION

In table No 1, when the baseline characteristics was compared to the cut off values, the BMI, Body Fat (%), TBW (%), Bone Mass (%), BMR and Visceral Fat (%) no significant difference was observed apart from for Muscle Mass (%) which was found to be high and Bone Mass (%) was found to be low. The rise in Muscle Mass (%) might be due to training for more number of years. However, lower Bone Mass (%) might be attributed to lowered calcium intake because it is observed in Table No 2, the mean calcium intake was found to be 295 mg whereas the Recommended Dietary Allowance (RDA) suggests 600mg for optimal bone growth and maintenance.

In Table No 2, when the participant's intake was compared to the Recommended Dietary Allowance (RDA), the calories, protein, carbohydrate, fat, calcium and iron intake was found to be lesser than the minimum requirements for the physical activity they endure. Within the present study, the mean kcal/Kg BW of the participants was 26 kcal/Kg BW. When this was compared to the Recommended Dietary Allowance (RDA) i.e. 40.5 kcal/Kg BW and a similar study conducted by Sousa, M. Et al on dancers i.e. 30 kcal/kg BW, it was observed that the mean kcal/Kg BW of the participants was low.

Table No 3, highlighted that the Energy Intake was low as compared to the expenditure which may affect the performance of the participants. The poor calcium intake in comparison to the energy expenditure increases the susceptibility to fractures.

Table No 4 presented that the pedometer kcal had a positive effect on the BMI of the participants.

## CONCLUSION

The results suggest that diets of those dancers were nutritionally inadequate. The dancers were at a risk of energy imbalance. The calorie intake was found to be low as compared to the energy expenditure of those participants. Low calcium intake could possibly increase the risk of fractures and low iron levels could lead to anaemia. Hence it can be concluded that it is necessary to improve the nutrition in professional Bharatanatyam dancers.

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# PREBIOTIC FRUCTOOLIGOSACCHARIDE (FOS) AS A COMMUNICATOR BETWEEN ENTERIC AND CENTRAL NERVOUS SYSTEM: EFFECT ON GUT MICROBIOTA AND DEPRESSION

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## ABSTRACT

More than 450 million people across the globe suffer from mental illnesses.Depression is projected to be the third leading cause of disease burden by 2030(WHO,2016). The gut-brain axis consisting of bidirectional communication between the central and the enteric nervous system, suggests the potential for microbial based therapeutic strategies in the augmentation of human microbiome for the management of depression. FOS a potential prebiotic can alter the intestinal microbiota. The present study was designed with the aim to understand the role of prebiotic therapy in improving gut health which in turn may bring changes in depression status through gut-microbiota-brain loop. The current research was planned with the broad.**Objective:** To assess the efficacy of prebiotic fructooligosaccharidein triggering the colonization of good gut bacteria to bring about an improvement in depression status. **Methodology:** Subjects aged 20-50 years from The M.S.University of Baroda who were willing to participate were screened usingBeck's Depression Inventory. Further enrolment of 30 subjects was done by systemized random sampling of the population. Baseline data was collected for mild to moderately depressed subjects regarding general information, daily habits and medical history. Gut microflora was determined with respect to the microorganisms- *Lactobacillus, Bifidobacteria and E. coli* in faecal sample. Serum cortisol was determined using bidirectional Chemi Luminescent Immuno assay, in ROCHE machine. Intervention trials included supplementing 10 ml FOS for period of 45 days to 30 subjects. **Results**: Significant decrease in mean depression scores and cortisol values was seen by 18.69% and 1.76% respectively. The faecal log count of *Lactobacillus* and *Bifidobacterium* showed a significant increase by 6.80 % and 6.13% respectively and a reduction by 3.13% in *E. coli*.**Conclusion:** Prebiotic can modulate gut flora to a positive balance providing avenue for regulating CNS and depression therapy.

**Keywords** – depression, cortisol, gut-brain axis, microbiome, prebiotic

## INTRODUCTION

Mental health typically takes a toll on overall health; still, its effect on an individual's wellbeing is often underestimated. More than 264 million people of all ages worldwide suffer from depression. Unipolar depression is projected to be the second contributor in the global burden of disease by 2030, first being anxiety disorder. It is also expected to be the world's leading cause of Disability Adjusted Life Years(WHO factsheet 2020). Conceptually, which is equivalent to losing one year of healthy life because of disease.

Humans are supra organisms, live bacteria accounting for around 2 lbs of a body's weight is the most numerous and diverse member of its microbiome, with approximately 160 species per person per fecal sample (Karlsson; 2013). The human enteric nervous system ruled by the microbiota can also be expounded as the body's second brain. Trillions of good bacteria residing in our intestinal tract actually define our mental state by communicating directly and indirectly with our brain through the vagus nerve, endocrine, immune, central and peripheral systems (Carabotti,Scirocco, Maselli, and Severi;2015). However, dysbiosis of the intestinal microbiome down regulates the gut integrity, which causes microbes and its metabolites to breech the system leading to leaky gut. Endotoxins released interferes and threatens the mental stability (de JR, Forlenza, and Forlenza;2018).

Researches have elicited lower establishment of beneficial bacteria in the gut with stress responsiveness and decline in the body's natural feel-good chemical serotonin (Yano et al., 2015) suggesting the presence of microbiota-gut-brain axis. Increased density of good bacteria, particularly *Bifidobacteria* and *Lactobacilli* are a marker of the healthy intestinal environment. They produce antimicrobial substance and strong acids, i.e. butyric acid, acetic, and lactic acid which reduces intestinal pH and neutralizes the activity of bacterial toxins, such as nitrosamines inhibiting the growth of pathogens preventing several diseases Markowiak and Ślizewska; 2017). Endotoxin infusions to healthy subjects with no history of depressive disorders triggered cytokine release and subsequent emergence of classical depressive symptoms indicating that pro-inflammatory cytokines play a role in the development of anxiety and depression (Berk, Williams and Jackaet al; 2013).

Targeting the gut microbiome is the key to the modulation of mental health. Prebiotic has evolved out as a catalyst in the colonization of good gut bacteria. Scientific Association of Probiotics and Prebiotics (ISAPP) 2008 defines prebiotic as "a selectively fermented ingredient that results in specific changes in the composition or activity of the gastrointestinal microbiota, thus conferring a benefit upon host health" (Gibson et al; 2017).

Kristin Schmidt et al., (2015) at Oxford studied the effect of prebiotics on emotional processing in humans and showed that subjects who were given prebiotics tended to be less attentive to negative stimuli. Prebiotic ingestion also claims to increase BDNF and release of GABA, by gut bacterium (Strandwitz et al; 2019). Anti-anxiety drugs like valium also act by focusing on these neurotransmitters, associating the efficacy of prebiotics to anti-depressant drugs (Sarkar et al;2016).

Microbial target therapy for the improvement of brain functionality carries significant implications for research that points the way towards the use of prebiotic supplementation in improving mental health. Animal researches are quite suggestive, in proving the communication loop amid gutmicrobiota, and brain, informative work has also been done on the effect of probiotics on mental degenerative disorders. Yet there is no convincing human study associating the consumption of prebiotic to brain health. This study was being conducted to assess the potential of FOS as a dietary intervention in improving gut health and reducing depression levels. As per the US, FDA notice no. GRN 000118 FOS consumption is regarded as safe.

## OBJECTIVE

To assess the efficacy of prebiotic fructooligosaccharide (FOS) in triggering the colonization of good gut bacteria to bring about an improvement in depression status.

**Specific objectives**

1) Screening of the subjects aged (20-39) using Beck's Depression inventory and collection of baseline data with regards to background information, medical history, personal habits.

2) Enrolment of subjects with mild to moderate depression for determination of gut microflora (*Lactobacillus, Bifidobacterium, and E. coli*) and serum cortisol.

3) Intervention trials on enrolled subjects with 10ml liquid FOS daily for a period of 45 days.

4) Impact Evaluation of the supplementation on depression and gut health.

## HYPOTHESES

1) There is no association between consumption of prebiotic and gut health.
2) There is no association between consumption of prebiotic and depression.

## METHODOLOGY

**1.Screening of the subjects**

Using purposive sampling procedure subjects aged 20-39 years who gave their consent were screened from The Faculty of Family and Community Sciences, The M.S .University of Baroda, Gujarat. Written permission was sought from the head of various departments within the faculty. Permission was also obtained from the Psychologist, Health center, The MS University of Baroda before screening. Beck's Depression Inventory was administered to determine the presence of depression and subjects were classified into normal (Score 0-11), mild (score 11-16), borderline clinical (score 17-20), moderate (score 21-30) and severe category (score >31). All the subjects were oriented regarding the objective and the implications of the study. Subjects suffering from any of the chronic diseases, taking any supplements or medicines, and falling in the category of severe depression were excluded from the study. Written consent was taken from the participants prior to the intervention.

**2. Enumeration of gut microflora**

The gut microflora was determined with respect to the microorganisms- *Lactic acid bacteria, Bifidobacteria*, and *E. coli* in the faecal sample.

**2.1 Collection of the fecal sample**

The subjects were given airtight sterile containers for the collection of stools then the sample was transferred in iceboxes and carried to the laboratory where it was stored at an appropriate temperature (-20°C) in the deep freezer.The sample was used within 2 days for enumeration after collection.

**2.2 Preparation of the sample**

One gram of fecal sample was weighed on a sterilized balance and was used for the estimation.

**2.3 Sterilization of the glassware**:

All the petri dishes and the other glassware such as beakers and conical flask were sterilized before use. The petri dishes were kept in the petri dish box and the other glassware were kept in a hot air oven at $180^0$C for 2 hours for sterilization. The micro-tips were sterilized by autoclaving them at $121^0$C for 15 minutes at 15 lbs. pressure. The other instruments like the weighing balance and spatula were all sterilized by alcohol swabs and alcohol flaming using 70 % alcohol.

**2.4 Preparation and Sterilization of dilution blanks**

For the preparation of dilution blanks 1 g of peptone was dissolved in 1000 ml of distilled water. This solution was transferred in a portion of 100 ml in 10 dilution bottles. These bottles were autoclaved at $121^0$C for 15 minutes and cooled at room temperature before putting them to use.

**2.5 Preparation and Sterilization of media**

The media used for the enumeration of *Bifidobacteria*, *Lactobacillus*and*E.coli*was Bifidobacterium agar, MRSagar and VRB agar supplied by HiMedia. The prepared media was autoclaved at $121^0$C for 15 minutes.

**2.6 Preparation of sample, inoculation, incubation, and enumeration of *Lactic acid bacteria*, *Bifidobacteria*, and *E. coli*.**

Frozen fecal sample was first thawed and brought to room temperature; one gram of fecal sample was accurately weighed and mixed homogeneously in 99 ml of 0.1% peptone water to provide 1% (w/v) fecal slurry. One ml of the slurry was diluted serially in peptone water. Then 0.1 ml of dilution was pipetted from each of the dilutions to the petri plates containing respective media. The above procedure was carried out inside laminar flow to ensure a sterile environment thereby preventing contamination from outside. The plates of *Bifidobacterium* were then incubated at 37$^o$C placed in the anaerobic jar in the incubator with the gas packs and read after 48 hours. Plates of *Lacticacid* bacteria were placed in a desiccator as it is a facultative anaerobe and *E.coli* were directly placed in the incubator. After 48 hours of incubation, the colonies were counted on colony counter (Cintex colony counter, Dadar Mumbai) and colonies that appeared in the range of 30 – 300 were converted into log counts after multiplying with their dilution factors (Ramona et al. 2001).

**3. Assessment of serum cortisol**

Cortisol levels were determined in blood serum, by an expert lab technician. The flow of blood in the arm was stopped by wrapping an elastic band around the upper arm, which made the veins in the arm to become more visible and easier to insert the needle. Alcohol was used to clean the site on the skin where the needle was inserted. The needle was inserted into the vein, and blood was collected in a tube that's attached to the needle. After the needle was removed from the skin,

cotton or gauze was placed on the site of the needle insertion. A bandage was used to secure the cotton or gauze. Blood was drawn into plain tubes, preserved freeze at −4°C and then separated for subsequent measurement of cortisol in serum with the IMMULITE. The volume of serum required was 10 µl. Cortisol was determined at the pharmacological lab from blood serum by Chemi Luminescent Immunoassay in the ROCHE machine.

**4. Intervention trials with FOS**

The Fructooligosaccharide used for the intervention was procured from TATA chemicals Ltd, Mumbai. The FOS was given in liquid form packed in jars. Subjects were asked to incorporate 10ml FOS daily for a period of 45 days into commonly consumed food items.

**5. Impact Evaluation of the supplementation on cognition and gut health.**

Post data was collected on the parameters similar to the baseline i.e. Beck's Depression Inventory, serum cortisol and gut microflora (*Lactobacillus, Bifidobacteria, and E.coli*)

**6. Statistical Analysis**

Paired t-test in the present research is used for determining the significance of the mean difference in the Beck's Depression Inventory's depression scores, serum cortisol levels, and enteric pathogenic counts pre- and post-intervention with FOS.

## FINDINGS AND DISCUSSION

The present study revealed Fructooligosaccharide (FOS) as one of the emerging nutraceutical prebiotics extending its role to emotional psychiatry. As depicted in table 1.1, FOS proved out to be an effective measure in modifying the gut bacteria to a positive balance. The fecal log counts of *Lactic acid bacteria* and *Bifido bacteria* showed a significant increase of 6.80% and 6.13% respectively ($p<0.001$). There was a significant reduction by 3.13% ($p<0.05$) of fecal log counts of Enteric pathogen in mild to moderately depressed subjects after prebiotic supplementation. Changing the composition of gut microflora by supplementation of 10 g fructooligosaccharide (FOS) for a period of 45 days in mild to moderately depressed adults brought about a significant reduction of their depression score by 18.69%. Consonant with these results decrease in serum cortisol levels was observed. Cortisol is a stress biomarker, altered cortisol indicates a stress response with immediate and long-term health consequences (Lee, Kim, and Choi; 2015). However, this difference was non-significant because it is a measure of HPA activity which is affected by various other factors.

**Table 1: Mean values for depression score, serum cortisol and log count of gut microbial profile of mild to moderate depressed subjects before and after FOS supplementation**

| | | |
|---|---|---|
| Depression score | Preintervention | 19.26 ± 5.00 |
| | Post intervention | 15.66 ± 7.07 |
| | Paired 't' test | 3.78*** |
| | % difference | 18.69% |
| Serum Cortisol | Pre intervention | 9.72 ± 6.74 |
| | Post intervention | 9.55 ± 3.50 |
| | Paired 't' test | $0.13^{NS}$ |
| | % difference | 1.76% |
| *Lactobacillus* *(log$_{10}$ CFU//g)* | Pre intervention | 5.73 ± 0.44 |
| | Post intervention | 6.14 ± 0.31 |
| | Paired 't' test | 4.53 *** |
| | % difference | 6.80% |
| *Bifidobacterium* *(log10 CFU*/g*)* | Pre intervention | 5.87 ± 0.49 |
| | Post intervention | 6.23 ± 0.43 |
| | Paired 't' test | 5.59*** |
| | % difference | 6.13% |
| *E. coli* *(log10 CFU*//g) | Pre intervention | 6.17 ± 0.14 |
| | Post intervention | 5.94 ± 0.39 |
| | Paired 't' test | 3.13* |
| | % difference | 3.72 |

Note: pvalue<0.05: *;pvalue<0.01: **;pvalue<0.001:***;NS=notsignificant

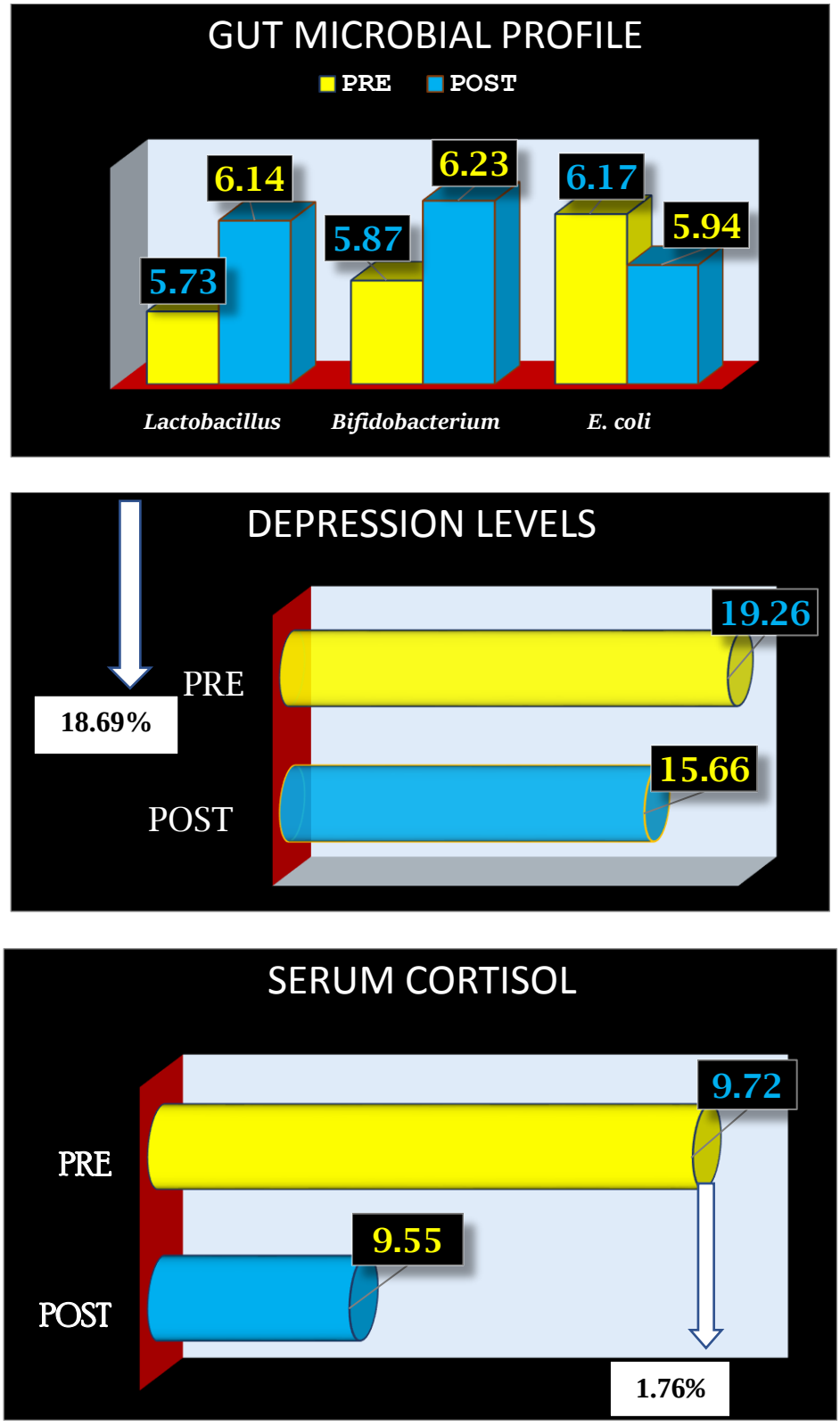


**Fig.1 -Impact of FOS supplementation on gut profile, depression scores and cortisol levels**

This data is supported by another research showing improvement in the mental health of 45 patients with fecal microbial transplantation over antibiotic treatment (Jalankaet al ;2018). Which rules out microbial targeting therapy as an effective measure in the brain's wellbeing. The ability of FOS in modifying the gut flora is proved by Kaplan and Hutkins (2000) where *Lacticacidbacteria* and *Bifidobacteria* when screened for their ability to ferment FOS on MRS agar, showed positive results. A study on animal model revealed supplementing oligofructose to mice increased the abundance of *Bifidobacterium* and *Lactobacilli* (Everard et al., 2014). Moreover, human trials also elicited oligosaccharides that are fermented by colonic microflora enhanced the growth of beneficial commensal organisms like *Bifidobacteria* and *Lactobacillus* (Sheth and Singh; 2017). Prebiotic efficacy in increasing the level so f*Bifidobacterium* significantly was seen on consuming biscuit containing 6.6g FOS daily (Tuohy, Kolida, Lustenberger and Gibso; 2018). A study in Japan confirmed, only 4g FOS per day would be needed to observe an increase in beneficial gut flora (Tuohy, Rouzaud, Bruck and Gibson; 2005).

The fecal microbiota of Parkinson's disease patients displayed elevated levels of *Enterobacteriaceae* compared to healthy control groups (Gerhardt and Mohajeri; 2018). Gram-positive bacteria mainly *Lactobacillus* and *Bifidobacterium*acts as effective fertilizers in improving mental disorders likeAlzheimer's disease, Parkinson's, and Autism (Akkasheh et al., 2016; Pirbaglou et al., 2016; Wallace and Milev;2017; Desharwala and ShethThesis 2019). Analogs to studies confirming the potential role of prebiotic in enhancing the gut microbial environment our research findings point, towards significant loop amid FOS supplementation and microbial colonization which in turn reduced depression levels.
This study proves alternate hypothesis to be true.

## CONCLUSION

The result of the present study and supported literature proves the existence of a bidirectional mechanism and a strong positive relation between gut flora and depression. FOS supplementation has proved out to be an attractive remedy in the management of mild to moderate depression and is safer than conventional medication while providing additional health benefits. The microbial environment in the gut can affect the brain carries significant implications for further research that points the way toward dietary or drug interventions to improve brain function.

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# COMPARISON OF ANTHROPOMETRIC INDICES WITH BIO-ELECTRICAL IMPEDANCE ANALYSIS (BIA) METHOD TO ASSESS OVERWEIGHT AND OBESITY IN INDIAN WOMEN: NEED FOR MORE APPROPRIATE INDEX

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## ABSTRACT

Obesity is a major public health concern and a risk factor for non-communicable diseases. With the increasing prevalence of obesity in Indian women, it has become imperative for precise estimation of body fat. Anthropometric indices are simple and non-invasive method over laboratory technique to assess obesity. However, these indices need to be validated against laboratory techniques for Indian adult women. The present study was aimed to compare the anthropometric indices with a laboratory technique, called Bio-Electrical Impedance Analysis (BIA) to assess obesity among adult Indian women. A descriptive cross-sectional study was conducted on 261 adult women from New Delhi, aged between 25-45 years. Information on body weight, height, waist circumference, and hip circumference and body fat measurements was collected with accuracy. Different anthropometric indices were calculated using this data obtained. The data were subjected to statistical analysis after assessing the reliability of anthropometric measurements and the normality of data. The fat mass index was highly correlated with BF% ($r=0.965$; $p<0.0001$) followed by body mass index (BMI) ($r=0.951$; $p<0.0001$). The least correlated index was waist to hip ratio (WHR) ($r=0.497$; $p<0.0001$). All anthropometric indices were significantly different across BMI categories of underweight, normal and overweight, except WHR. The ROC curve analysis showed that with 35% body fat, the BMI cut-off should be 23.7 kg/m$^2$.BMIis preferred index in many epidemiological surveys and studies, but the limitation of BMI to distinguish between fat and fat free mass cannot be overlooked. This study also showed that Indian women had higher body fat at lower BMI, but does not suggest to lower the BMI cut-off. More studies are required to lower BMI cut-off.

**Keywords:** Anthropometric Indices, Overweight, Obesity, Body Fat Percent, Indian Adult Women

## INTRODUCTION

Obesity is a condition with an excess accumulation of fat in the body **(WHO, 2000a, WHO, 2000b)** and becoming a major public health concern for both developed and developing countries. Many low-middle income countries like India, is facing the dual burden of malnutrition where equal burden of over nutrition like overweight and obesity exists **(NFHS-4)**. However, this dual burden of malnutrition can also exist within a same individual where, there is accumulation of fat in the body along with other micronutrients insufficiency. The excess energy intake increases the risk of developing numerous non-communicable diseases (NCDs) and adverse health outcomes **(Bruins et al., 2019)**. Therefore, an accurate estimation of overweight and obesity has now become imperative. Assessing overweight and obesity using a method which is simple and non-invasive, a numerous anthropometric index has been developed. Major advantage of these indices is that they can be used in epidemiological surveys with negligible cost **(Whitlock et al., 2009)**. The most

commonly used index is body mass index (BMI). The other anthropometric indices such as fat mass index (FMI), fat free mass index (FFMI), waist to hip ratio (WHR), waist circumference (WC), hip circumference (HC), waist circumference to height ratio (WC-HR) and body adiposity index (BAI)are also available which is easier and simpler to implement at population and field level **(Whitlock et al., 2009)**. However, these indices have been scrutinized by anthropologists and public health scientists for its ability to assess body fat percent (BF%). BMI is a very useful index which defines an individual to normal weight, overweight or obese category, but it fails to distinguish between fat mass (FM) and Fat Free Mass (FFM) **(Whitlock et al., 2009)**. More accurate methods such as, doubly labeled water (DLW), dual X-ray absorptiometry (DEXA), air/water displacement plethysmography and bio-electrical impedance analysis (BIA) method exists, which can distinguish body weight into FM and FFM**.** However, these are either suitable to carry out in laboratory setting or are expensive **(Kuriyan, 2018)**. Therefore, several studies have been carried out to validate the use of anthropometric indices to assess obesity **(Cerqueira et al., 2013)**. However, these have not been specific to Indian adult women who are at greater risk of accumulating excess body fat and as a consequence, developing NCDs **(Bruins et al., 2019)**. According to the latest national survey (NFHS-4) in India, the prevalence of overweight and obesity as assessed through BMI has increased from 12.6% to 31.3% among adult females, which is higher than males **(NFHS-4)** with simultaneous increase in the prevalence of cardiovascular diseases and diabetes among Indian women**(Gupta et al., 2014)**. Hence, it has now become imperative for accurate population level estimation of body fat percent in adult Indian women.

## OBJECTIVE

The present study was aimed to compare simple and non-invasive anthropometric indices with laboratory technique, called Bio-Electrical Impedance Analysis (BIA) to assess obesity among adult Indian women.

## HYPOTHESIS

All anthropometric indices correlate positively with body fat percent (BF%) in identifying obesity among adult Indian women.

## METHODOLOGY

### Study participants and selection

A cross-sectional study was conducted on adult females (aged 25-45 years), recruited from four locations in South Delhi, India, namely, VasantKunj, VasantVihar, Saket and HauzKhas, belonging to middle income group and consented for the participation in the study. The exclusion criteria for the participants were pregnancy and lactation, habitual smokers, women who were morbidly obese (BMI $\geq$40 kg/m$^2$), women having irregular menstrual cycle and suffering from any persistent health problem. The study was approved by Institutional Ethics Committee of Lady Irwin College, University of Delhi and informed written consent was obtained from each participant.

## Data collection

All anthropometric measurements were performed by single investigator and the intra-individual variability in measurements was analyzed on 20 participants which were not included in the main study. The participants were weighed in kilograms using digital weighing scale (TANITA, BC 420-MA, Illinois, USA) with a sensitivity of 0.1kg and dressed in minimal clothing without shoes or socks with empty bladder and before the meal in morning.The standing height was measured using anthropometric rod (Galaxy Informatics, India) with sensitivity nearest 0.1cm. The waist and hip circumference were measured using non-stretchable flexible tape with a sensitivity of 0.1cm. The waist circumference was measured in the narrowest part between the last rib and iliac crest. The hip circumference was measured around the most prominent protrusion of the buttocks. It is the largest circumference around buttocks. All measurements were taken in duplicates and average was used for analysis.

The body composition of participants was measured using BIA method (TANITA, SC-331S, Illinois, USA) in a two-compartment model by measuring the resistance of the body to conduct electricity and thereby, giving total body water (TBW). It is based on the principle that FFM contains water and FM contains essentially no water **(Kuriyan, 2018)**. Thereby, TBW helps to estimate FFM as it contains water that conducts electricity and FM can then be derived as the difference between body weight and FFM.The instrument supplies a constant current source of high frequency (50kHz) through eight electrodes positioned in a such way that the electric current is supplied from the electrodes passes from the tips of the toes of both feet and voltage is measured in the heel of both the feet. The instrument was previously validated against DEXA with correlation of r = 0.92 ($p<0.0001$) **(John and Jebb, 2014)**. All measurements for body composition were taken in morning before breakfast in empty bladder. The participants were asked to remove all metallic substances from the body which could conduct electricity.

Using the data from anthropometric measurements and BIA, the anthropometric indices were calculated namely, BMI, FMI, FFMI, WHR, WC, HC, WC-HR and BAI. BMI was calculated as weight (in kg) to squared height (in $m^2$). FMI and FFMI are the ratio of fat mass (in kg) and fat free mass (in kg) to height (in $m^2$) respectively. The WHR was calculated as ratio of waist circumference to hip circumference. The WC-HR calculated as WC to height ratio. The BAI is an index that can be used to determine BF% in adult men and women. BAI was estimated using following equation –

$$BAI = \frac{HC\ (cm)}{Height\ (cm)^{1.5}} - 18$$

## Statistical Analysis

The sample size of 316 participants was obtained using the observed prevalence of obesity (29%; NFHS-3) among women aged 15-49 years belonging to non-slum area of Delhi with 2 standard deviations (SD) assumed variation in the population and 5% level of significance **(NHFS-3)**.The data are presented as mean and SD. The intra-observer variability, precision and reliability of the anthropometric measurements were assessed by calculating – percentage technical error of measurement (percentage TEM) and coefficient of reliability. This analysis was done on 20

participants and these were not included in the sample of the study. The normality of the data was analysed using one sample Kolmogorov-Smirnov test and P-P plots. Pearson's correlation coefficients (r) were calculated between anthropometric indices and BF%. One – way ANOVA analysis were done for different anthropometric indices and body composition across BMI categories of underweight, normal, overweight and obese. Different models were formulated using multiple regression analysis to provide predictive equations for assessing BF% from anthropometric measurements. All analysis was carried out in SPSS (version 23.0). In order to generate approximate cut-offs for anthropometric indices like BMI, FMI, FFMI, BAI, WC-HR, WHR, WC and HC receiver operating characteristic (ROC) curves were generated at 35% body fat taken as criteria for defining obesity using MedCalc (version 15.11.4). The level of significance was set at $p<0.05$.

## RESULTS

For the current study a total of 320 participants were screened, out of which a total of 261 were enrolled in the study based on the inclusion and exclusion criteria. The percentage TEM and coefficient of reliability was <1.0% and 0.999 respectively for all anthropometric measurements. The data was normally distributed ($p>0.05$) and the descriptive characteristics of the population is described in Table 1. Majority of women (86.2%) were married and 59.8% women were home-makers. Though the sampling of the participants were from South Delhi, but 20.3% women were from Haryana, 18.8% women from Uttar Pradesh, 18.0% women from Delhi and remaining from other states. The mean age, weight, height and BF% of the participants was 36.5±7.2 years, 60.9±11.8 kg, and 154.9±6.1 cm and 35.9±6.7%, respectively. The body fat percent increased with increase in age, except in 35-39 y group, where it slightly decreased. The same trends were seen for anthropometric indices; WC, HC, FM, FFM, BMI, FMI and FFMI. The highest mean BF% was in the age group of 40-44 y (38.3 ± 4.9%) and 45-49 y (38.5±5.4%).

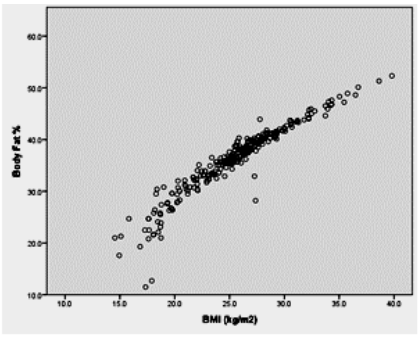
**Table 1: Basic descriptive of the population**

| **Variable** | **Age (y)** | | | | | |
|---|---|---|---|---|---|---|
| | **25-45** | **25-29** | **30-34** | **35-39** | **40-44** | **45-49#** |
| | **n=261** | **n=63** | **n=39** | **n=31** | **n=78** | **n=50** |
| Height (cm) | 154.9 ± 6.1 | 155.6 ± 5.5 | 156.4 ± 7.1 | 154.5 ± 5.8 | 154.1 ± 6.3 | 154.6±5.4 |
| Weight (kg) | 60.9 ± 11.8 | 54.4 ± 10.8 | 63.3 ± 11.7 | 59.4 ± 12.3 | 63.5 ± 10.5 | 64.2±11.6 |
| WC (cm) | 87.2 ± 11.9 | 77.9 ± 11.1 | 88.3 ± 10.9 | 85.6 ± 12.8 | 91.2 ± 9.6 | 92.9 ± 9.4 |
| HC (cm) | 101.5 ± 9.8 | 95.5 ± 9.2 | 102.6 ± 9.8 | 100.3±10.1 | 103.5 ± 8.1 | 105.9±9.7 |
| BF% | 35.9 ± 6.7 | 30.9 ± 7.2 | 36.4 ± 5.7 | 34.9 ± 7.0 | 38.3 ± 4.9 | 38.5 ± 5.4 |
| FM (kg) | 22.6 ± 8.0 | 17.5 ± 7.4 | 23.8 ± 7.6 | 21.5 ± 8.0 | 24.7 ± 6.8 | 25.3 ± 8.0 |
| FFM (kg) | 38.3 ± 4.5 | 37.0 ± 4.3 | 39.5 ± 4.7 | 37.9 ± 4.8 | 38.5 ± 4.4 | 38.9 ± 4.1 |
| BMI (kg/m²) | 25.3 ± 4.5 | 22.5 ± 4.1 | 25.8 ± 4.4 | 24.8 ± 4.6 | 26.7 ± 3.8 | 26.8 ± 4.5 |
| FMI (kg/m²) | 9.4 ± 3.3 | 7.2 ± 3.0 | 9.7 ± 3.1 | 9.0 ± 3.2 | 10.4 ± 2.7 | 10.6 ± 3.3 |
| FFMI (kg/m²) | 15.9 ± 1.4 | 15.2 ± 1.3 | 16.1 ± 1.3 | 15.8 ± 1.5 | 16.2 ± 1.2 | 16.2 ± 1.3 |
| BAI (%) | 34.7 ± 5.5 | 31.3 ± 4.8 | 34.6 ± 5.9 | 34.3 ± 5.4 | 36.2 ± 4.7 | 37.2 ± 5.3 |
| WC-HR | 0.6 ± 0.1 | 0.5 ± 0.1 | 0.6 ± 0.1 | 0.6 ± 0.1 | 0.6 ± 0.1 | 0.6 ± 0.1 |
| WHR | 0.9 ± 0.1 | 0.8 ± 0.1 | 0.9 ± 0.1 | 0.9 ± 0.1 | 0.9 ± 0.1 | 0.9 ± 0.1 |

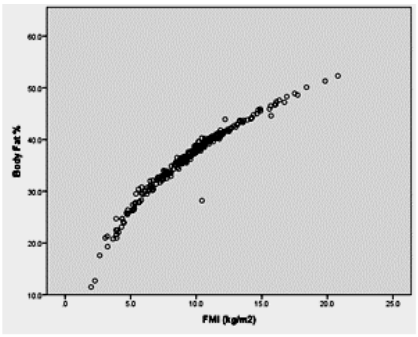
{*Table 1 footnote: Presented as Mean ± SD; #This class interval consists of only one valid element i.e. 45 years of age. No research was carried out on women above 45 years; WC: Waist Circumference; HC: Hip Circumference; BF%: Body Fat Percentage; BMI: Body Mass Index; FMI: Fat Mass Index; FFMI: Fat Free Mass Index; BAI: Body Adiposity Index; WC-HR: Waist Circumference to Height Ratio; WHR: Waist to Hip Ratio*}

The correlation of anthropometric indices with BF% revealed that the highest correlated index is FMI ($r=0.965$; $p<0.0001$). This was followed by BMI ($r=0.951$; $p<0.0001$), FFMI ($r=0.848$; $p<0.0001$), WC-HR ($r=0.832$; $p<0.0001$), WC ($r=0.825$; $p<0.0001$). HC ($r=0.803$; $p<0.0001$) and BAI ($r=0.765$; $p<0.0001$). While the least correlated index with BF% was WHR ($r=0.497$; $p<0.0001$)[Fig. 1].On comparing anthropometric indices across BMI categories [Table 2], it was observed that each BMI category was significantly different for all anthropometric indices except WHR. The WHR did not show any significant difference between underweight and normal ($p=0.134$) as well as overweight/at risk and obese groups ($p=0.224$).

**Figure 1: Correlation between BF% and various anthropometric indices (a) BMI (r = 0.951; p<0.0001) (b) FMI (r = 0.965; p<0.0001), (c) FFMI (r = 0.848; p<0.0001), (d) BAI (r = 0.765; p<0.0001), (e) WC-HR (r = 0.832; p<0.0001), (f) WHR (r = 0.497; p<0.0001), (g) WC (r = 0.825; p<0.0001) (h) HC (r = 0.803; p<0.0001)**




a)

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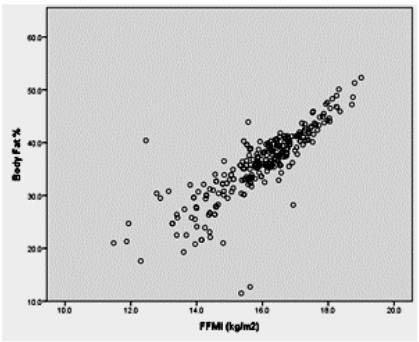
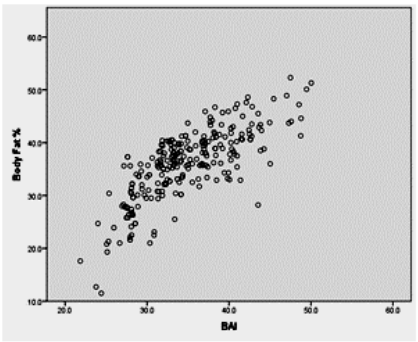



c)

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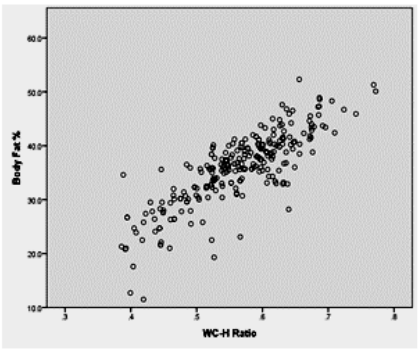
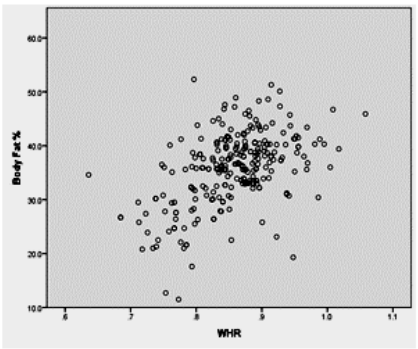
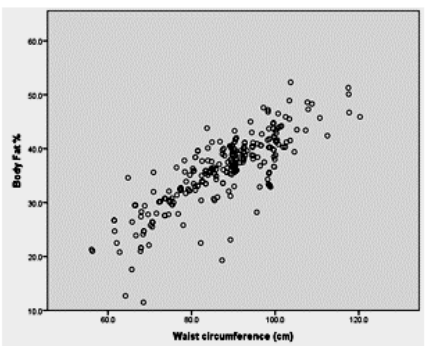


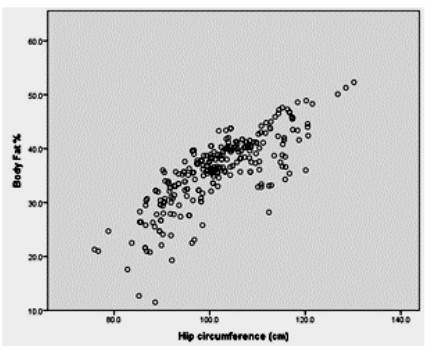

e)




f)




g)




h)

**Table 2: Comparison of anthropometric indices across BMI categories**

| Indices | Underweight (n=18) | Normal (n=56) | Overweight/At risk (n=35) | Obese (n=152) |
|---|---|---|---|---|
| FMI (kg/m$^2$) | 3.8 ± 1.0$^*$ | 6.2 ± 1.1$^*$ | 8.3 ± 0.5$^*$ | 11.5 ± 2.4$^*$ |
| FFMI (kg/m$^2$) | 13.4 ± 1.1$^*$ | 14.6 ± 0.5$^*$ | 15.7 ± 0.3$^*$ | 16.8 ± 0.8$^*$ |
| BAI (%) | 26.6 ± 2.4$^*$ | 30.1 ± 2.4$^*$ | 34.2 ± 3.2$^*$ | 37.5 ± 4.8$^*$ |
| WC-HR | 0.44 ± 0.05$^*$ | 0.49 ± 0.04$^*$ | 0.55 ± 0.05$^*$ | 0.61 ± 0.05$^*$ |
| WHR | 0.79 ± 0.07 | 0.82 ± 0.06 | 0.86 ± 0.06 | 0.88 ± 0.05 |
| WC (cm) | 68.2 ± 8.7$^*$ | 75.5 ± 6.4$^*$ | 86.2 ± 7.9$^*$ | 94.0 ± 8.1$^*$ |
| HC (cm) | 86.5 ± 5.9$^*$ | 92.0 ± 3.7$^*$ | 100.5 ± 7.3$^*$ | 107.0 ± 7.3$^*$ |
| Weight (kg) | 41.7 ± 5.2$^*$ | 49.3 ± 3.8$^*$ | 57.7 ± 5.8$^*$ | 68.2 ± 8.5$^*$ |
| BF% | 22.1 ± 4.9$^*$ | 29.6 ± 3.2$^*$ | 34.7 ± 1.4$^*$ | 40.1 ± 3.7$^*$ |

*{Table 2 footnote: Presented as Mean ± SD; $^*$Shows significant difference between groups; Underweight (BMI < 18.5 kg/m$^2$); Normal (BMI 18.5 – 22.9 kg/m$^2$); Overweight/At risk (BMI 23.0–24.9 kg/m$^2$); Obese (BMI ≥ 25 kg/m$^2$)}*

**Table 3: Multiple regression analysis using different models to predict BF% from anthropometric measurements**

| Covariates | Regression coefficients | SE | p-value | R | $R^2$ | Adjusted $R^2$ | SEE |
|---|---|---|---|---|---|---|---|
| Model 1: BF% Vs WC and Age | | | | | | | |
| Constant | -5.204 | 1.789 | 0.004 | 0.827 | 0.684 | 0.682 | 3.7548 |
| WC | 0.444 | 0.022 | 0.0001 | | | | |
| Age | 0.065 | 0.036 | 0.074 | | | | |
| Model 2: BF% Vs HC and Age | | | | | | | |
| Constant | -20.970 | 2.508 | 0.0001 | 0.817 | 0.668 | 0.665 | 3.8486 |
| HC | 0.506 | 0.026 | 0.0001 | | | | |
| Age | 0.149 | 0.035 | 0.0001 | | | | |
| Model 3: BF% Vs Height and Weight | | | | | | | |
| Constant | 74.299 | 3.277 | 0.0001 | 0.953 | 0.908 | 0.908 | 2.0221 |
| Height | 0.584 | 0.012 | 0.0001 | | | | |
| Weight | -0.478 | 0.022 | 0.0001 | | | | |
| Model 4: BF% Vs BMI and Age | | | | | | | |
| Constant | -1.769 | 0.806 | 0.029 | 0.956 | 0.914 | 0.913 | 1.9641 |
| BMI | 1.346 | 0.029 | 0.0001 | | | | |
| Age | 0.097 | 0.018 | 0.0001 | | | | |
| Model 5: BF% Vs FMI and Age | | | | | | | |
| Constant | 15.343 | 0.554 | 0.0001 | 0.968 | 0.936 | 0.936 | 1.6848 |
| FMI | 1.913 | 0.034 | 0.0001 | | | | |
| Age | 0.071 | 0.016 | 0.0001 | | | | |

{*Table 3 footnote: p-value is significant at <0.05; SE: Standard Error; R: Pearson's correlation coefficient; $R^2$: It indicates the amount of change in dependent variable (here BF%) attributed through independent variable; SEE: Standard Error of Estimate*}

The multiple regression analysis evidently shows that highest variability in BF% was due to FMI and age ($R^2$ = 0.936; p<0.0001).However, height and weight contribute about 90.8% variability in BF%, suggesting anthropometric indices can act as proxy for BF% estimation. The details of other models for BF% using anthropometric indices are presented in Table 3. The ROC curve analysis shows that with 35% body fat, the BMI cut-off should be 23.7 kg/$m^2$ [Table 4].For other indices, like WHR, the cut-off was 0.79.

**Table 4: The optimal cut-off, AUC and sensitivity and specificity of anthropometric indices at BF% ≥35% as diagnosis criteria**

| Anthropometric Indices | AUC (95% CI)* | Cut-off | Sens (%) | Spec (%) | +PV | - PV |
|---|---|---|---|---|---|---|
| BMI | 0.982 (0.957 – 0.994) | 23.7 | 98.81 | 90.32 | 94.9 | 97.7 |
| FMI | 0.994 (0.975 – 1.000) | 8.3 | 100.0 | 96.77 | 98.2 | 100.0 |
| FFMI | 0.952 (0.918 – 0.974) | 15.5 | 95.24 | 80.65 | 89.9 | 90.4 |
| BAI | 0.857 (0.808 – 0.897) | 31.3 | 95.83 | 62.37 | 82.1 | 89.2 |
| WC-HR | 0.884 (0.838 – 0.920) | 0.53 | 89.29 | 75.27 | 86.7 | 79.5 |
| WHR | 0.729 (0.671 – 0.782) | 0.79 | 94.05 | 41.94 | 74.5 | 79.6 |
| WC | 0.902 (0.860 – 0.935) | 82.7 | 91.67 | 77.42 | 88.0 | 83.7 |
| HC | 0.903 (0.860 – 0.936) | 96.3 | 94.05 | 75.27 | 87.3 | 87.5 |

{*Table 4 footnote: *All values were significant at p<0.0001; AUC: Area Under ROC Curve; CI: Confidence Interval; Sens: Sensitivity; Spec: Specificity; +PV: Positive Predictive Value; - PV: Negative Predictive Value*}

## DISCUSSION

The present study aimed to compare various anthropometric indices against laboratory technique like BIA method to assess obesity in Indian adult women. It was observed that FMI was highly correlated with BF% followed by BMI and FFMI. The other indices also showed positive correlation. Additionally, the study also found that the Indian adult women have higher body fat at lower BMI based on ROC curve analysis. These results are in concordance to other studies. There are myriad studies that compared BMI with BF% for the assessment of obesity. In Asian women, it was found that BMI was correlated with BF%, with Indonesian women reporting a correlation of r=0.834 (p<0.0001) **(Ilman et al., 2015)** while in Chinese women it was less r=0.661 (p<0.001) **(Chen et al., 2006).** In a study on Indian women it was found that BMI was highly correlated with BF% (r=0.939; p<0.01)**(Singhal et al., 2011)**.The same results was found among Caucasian women with correlation ranging from (r=0.839 to 0.798; p<0.00002) across the age group of 20-59 years **(Flegal et al., 2009)**.In case of FMI and FFMI, a study on south Indian adults showed that

FMI was highly correlated with BF% (r=0.900; p<0.001) while FFMI was least correlated with BF% (r=0.430; p<0.001)**(Rao et al., 2012)**.

To overcome the inability of BMI index to distinguish between FM and FFM, another index has been devised, known as BAI. This index can estimate the adiposity among adults and had been under study to validate the use for different populations. A study conducted on Indian adults has reported that BAI significantly correlated with BF% (r=0.80, *P* <0.001) **(Gupta and Kapoor, 2014)**. Many studies have been conducted in Mexican or African American population and all of them concluded that BAI correlated with BF% **(Bergman et al., 2011; Freedman et al., 2013)**. However, one study showed that BAI was poorly related to BF% (r=0.356; *P* <0.02) contrary to the results obtained in the present study **(Lutoslawska et al., 2014)**. This suggests that the use of BAI for assessing obesity in the population needs to be carried out with caution. However, the multiple regression analysis in the present study found that the anthropometric measurement like weight and height can show 90.8% variability in BF%, which suggest that the use of anthropometric indices would be next possible proxy indicator for assessing body fat and obesity.

Originally, the index BMI was designed to estimate the risk of mortality in an individual. However, this index has undergone some modifications over the years and now is adapted to analyze the risk of morbidity. Many studies have reported the risk for various diseases like cardiovascular disease, type 2 diabetes mellitus, hypertension and some types of cancer with increasing BMI **(Huxley et al., 2010; Flegal et al., 2013)**.Since the NCDs are major health outcomes being under study, the use of BMI is now shifted to assess the risk of morbidity as they are related to body fat and BMI is highly correlated to BF%. It has been seen that with increasing BMI, the risk for developing these diseases increases. Based on morbidity of the disease, a cut-off of 25 kg/m$^2$ was defined as overweight or obese point, where the risk of adverse event increases. However, for Asians, it has been hypothesized that this cut-off may be lower as Asians have higher body fat even at lower BMI. In the view of increased body fat at lower BMI, the WHO consultation group in 2004 has provided an 'action point' for Asians as there was no sufficient evidence which suggested lowering BMI cut-off **(WHO expert consultation, 2004)**. There are studies which assessed the risk of morbidity and mortality with BMI among Asians and showed that the cut-off at which the risk of mortality increases remains at 25 kg/m$^2$ suggesting that lowering the BMI cut-off does not decrease the risk of mortality **(Gu et al., 2006; Lin et al., 2011)**. It is important to note here that lowering BMI cut-off will increase the prevalence of overweight or obesity overnight and limited epidemiological studies is indicating that risk of developing morbidity increases even at lower BMI cut-off. In the present study, it was observed that the Indian women had higher BF% at lower BMI of 23.7 kg/m$^2$. But we have not studied the health status of these women in terms of blood pressure, blood sugar levels or general health check-up. Therefore, to define a lower cut-off for BMI using the present study will not be appropriate until the data on health parameters are also taken into account. This then calls for a wider study including all the parameters that are needed to be assessed for lowering the cut-off for BMI. This is the major limitation of the study. Another important anthropometric index, WHR, which is used to define the risk of chronic diseases, showed a cut-off of 0.79 which is lower than the cut-off provided by **WHO (2008)**. However, the cut-off of 0.85 provided for women by WHO suggest that the risk of metabolic complications is substantially increased at this point. Therefore, the cut-off reported in present study implies to a cut-off for defining at risk population.

Another limitation of the study is the measurement of BF% using BIA method which estimates the body composition by measuring the resistance of the body to conduct electricity. Since this method is based on electrical conductivity, the hydration status of the participants can affect the reading of body water thereby affecting BF%. However, while measuring the participants in the present study, strict selection process and measuring procedures were followed and maintained so that the hydration status of the participants could not act a confounder. The strength of the study lies in its large sample size and statistical analysis. Though the use of BIA method to determine body fat could be criticized as the most accurate method to measure FM and FFM is DLW technique or DEXA. But to collect the data on this huge sample size using these laboratory techniques would be expensive and tedious. Using BIA in field setting is simple and easier to conduct. Further, the robust statistical analysis adds to the value of the research.

## CONCLUSION

The appropriate selection of anthropometric indices to estimate obesity in Indian adult women is essential. The FMI showed highest correlation with BF% but, the BMI is more preferable index in field setting as measuring height and weight is much easier than measuring fat mass. Also, the present study showed highest variability in BF% due to weight and height suggesting that the anthropometric index can be used as proxy for measuring obesity. Another important finding of the study was that the Indian adult women had higher BF% at lower BMI. However, to reduce BMI cut-off point requires a large epidemiological study with gold standard technique for measuring fat along with health outcomes to understand whether the risk of morbidity increases at lower BMI among Asian population.

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# MICROFARMING THROUGH CULTIVATION OF SELECTED VARIETIES OF MICROGREENS

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## ABSTRACT

Elaboration in the area of nutrition has rapidly increased as community is looking forward to combating many of the lifestyle disorders. The science deals with the process of acquiring the essential nutrients that are needed for the body for essential growth and maintenance of body. Many researchers pointed out the strong link between nutrition and agriculture. Both share the usual term that is *food*. The major result of all farming practices is food, and this is the main input that paves the way to nutrition. Food may be a major outcome of agricultural activities, and, in turn, may be a key input into good nutrition. The field of farming and agriculture has deliberately paved newer methods to increase the availability of nutrients. One such innovation that grabs attention is the microgreens or Lilliputian vegetables. These greens are loaded with micronutrients and can be easily grown in home gardens. The microgreens are also associated with lowering the risk of many communicable disorders. The present study aims to identify the growth pattern and cultivation of selected varieties of microgreens.

**Keywords**: Nutrition, Agriculture, Microgreens, Outcome.

## INTRODUCTION

Microgreens began to show up on chefs' menus during twentieth century in San Francisco that is in California. The initial varieties which were grown there were very specific. But the case has changed drastically now and the industry has spread across U.S providing various varieties of Microgreens. The term microgreens has been known as a innovative ingredient to promote the flavor and texture of various salads, appetizer ,main courses and various recipes (**Treadwell et al, 2010**).Research comparing microgreens to more mature greens reports that nutrient levels in microgreens are often up to nine fold above than those found in mature greens. Though microgreens are packed with nutrients, they are not so common in our country mainly towards the southern part of India. The introduction of these greens will be remarkable advantage in our diets (**Xiao et al , 2012**).

## OBJECTIVES

The proposed research objectives are as follows:

- To Study growth pattern in selected varieties of microgreens.

- To study on the harvesting techniques adopted for the harvest of microgreens
- To study about the climatic condition and type of medium required for the growth of the selected microgreens.

## HYPOTHESIS

To analyze the Growth pattern, harvesting and cultivation of the selected varieties of micro greens

## METHODOLOGY

The study entitled "Micro farming through cultivation of selected varieties of micro-greens" is discussed under the following headings:

**a.** Selection of samples
b. Selection of tools
c. Selection of growing medium
d. Cultivation of micro-greens

**Selection of sample**

Micro-greens are available in wide varieties and can be purchased from online shopping sites as well as from seed growing nurseries in metropolitan cities. The samples selected for the study belongs to three families. The selection of samples was done based on their adaptability to grow in tropical climate. The samples selected for the study include:

**Table – 1: Samples selected for the study**

| **Family** | **Commercial name** | **Genus and species** |
|---|---|---|
| *Brassicaceae* | Mustard | *Brassica nigra* |
| | Broccoli | *Brassica oleracea* |
| | Bok Choy | *Brassica chinensis* |
| *Apiaceae* | Celery | *Apium* graveolens |
| | Dill | *Anethumgraveolens* |
| *Lamiaceae* | Mint | *Anethumgraveolens* |

The table 1 gives the detail on the selected family of microgreens with its commercial name and scientific name.

**b. Selection of tools**

The tools required for growing micro-greens include:

a. Container: containers can be of any shape and measurement. The containers selected for the study were rectangular trays of 29×24×6cm respectively.

- Coco peat: This was selected as a growing medium for the cultivation of micro-greens. It has known to absorb moisture which enables them to be the best growing medium.
- Water: a sprayer was used to water the micro-greens seeds.
- Micro-green seeds: the micro-green seeds which was used for the study comprises from the families of *Brassicaceae, Apiaceace* and *Lamiaceae*
- Aluminium foil paper: this was used to cover the trays after sowing the seeds to black out the seeds.

**c. Selection of growing medium**

The growing medium selected for the growth the micro-green was coco peat. It consists of a mixture of coco pit compost and coconut fiber in 2:1 proportion. It has the ability to retain and absorb water and maintains the moisture level for the growth of the greens.

**d. Cultivation of micro-green seeds**

Cultivation of micro-greens can be discussed under different steps:

a. Preparation of the trays: the trays used for sowing were of 29×24×6cm. Wet the tray by sprinkling some water and spread out the coco peat evenly up to a height of 3cm. Sprinkle some water on to the peat.
b. Sowing of seeds: transfer the entire seeds in the packet into a glass and spread the seeds over the peat by shaking the glass so that it falls evenly. Tap the seeds with a piece of thick paper so that the seeds come in contact with the peat.
c. Covering the tray: cover the tray with an aluminium foil and place the tray in a darker area for the first 4-5 days.
d. Watering the seeds: sprinkle water on the seeds, twice a day by removing the cover and then place the foil over the tray. Continue this for about 4-5 days and then remove the cover and place the tray in an area where it receives sunlight.

## FINDINGS AND DISCUSSION

The findings and discussion of the study entitled "Micro farming Through Cultivation Of Selected Varieties Of Micro-greens**"** is discussed under the following headings:

a. Growth of the micro-greens
b. Harvest of micro-greens
c. Climatic conditions and type of medium used for the growth of micro-greens

a. Growth of the micro-greens

The three different families of micro-green selected for the study have different degree of germination and growth. For the faster growth rate the seeds were covered with aluminum foil paper to black out the tray so as to prevent the entry of sunlight. This enabled the seeds to use up the stored nutrients within them so that when they reached a height of 4 inches they were rich in micronutrients.

**Table – 2: Growth pattern of selected sample of micro-greens**

| Common name | No of days taken for germination | No of days taken to attain mature stage |
|---|---|---|
| Mustard | 1 | 12 |
| Broccoli | 4 | 16 |
| Bok Choy | 4 | 15 |
| Celery | 7 | 20 |
| Mint | 10 | 21 |
| Dill | 18 | 30 |

The table 2 describes the growth pattern of the three various families chosen for the conduct of the study which is discussed below.

The Micro-greens selected from *Brassicaceae* family include broccoli, bok choy and mustard greens. Out of these three, mustard micro-greens have a faster germination and growth rate. They sprouted within 24 hours and about 100% of the seeds germinated. The broccoli and bok choy micro-green seeds germinated after 2 days of sowing and their growth rate was slow. Only 60% of the seeds germinated. On the 3rd day, foil cover was removed from the mustard micro-greens and was placed in sunlight, while the foil cover of broccoli and bokchoy was removed after four days. Mustard micro-green seeds had a faster germination capacity than the other two seeds of the same family. About 100% of the seeds germinated within 24 hrs and after two days they attained a height of one inch. On the $5^{th}$ day they reached a height of 2.5 inches and were light green in colour.

Micro-greens selected from *Apiaceace* family include celery and dill. Both of them have slow germination capacity. Celery seeds germinated after7 days of sowing and only 50% of the seeds germinated while the celery micro-green seeds germinated on the $20^{th}$ day of sowing and their growth rate was slow but 90% of the seeds germinated.

Micro-green selected from *Lamiaceae* family includes mint. They were very slow growers and germinated after $10^{th}$day of sowing. About 60% of the micro-greens had positively germinated but the growth was not adequate.

### b. Harvest of micro-greens

Harvest of micro-greens was done once they reached a height of 4 inches and at this stage the microgreens are known as the 'baby leaf' stage. The micro-greens at this stage are rich in micronutrients especially antioxidant-rich vitamins and minerals (**Tomasi et al 2015**). Harvest was done with the help of scissors. The greens were harvested by cutting their stem and leaving the portion which was in contact with the peat.

**c. Climatic conditions and type of medium used for the growth of micro-greens**

Micro-greens of all varieties can be grown in any climatic condition but their germination and growth rate may vary. Table 3 and Table 4 discuss on the growth pattern on the microgreens.

**Table -3: Rate of growth**

| **Family name** | **Rate of growth** |
|---|---|
| *Brassicaceae* | Faster |
| *Apiaceace* | slow |
| *Lamiaceae* | Very Slow |

From the table-3 it is clear that, *Brassicaceae* family has faster growth rate in tropical climate. The micro-greens from the *Apiaceace* family has slower growth rate and that of *Lamiaceae* family has much more growth rate than *Apiaceace*. The medium used for the growth was coco peat which consisted of coco pit compost and coconut fibers in 2:1 proportion. Coco peat helped in retaining and absorbing water which provided the optimum moisture level for the growth of the microgreens.

**Table -4: Average height of sample plants**

| **Family name** | **Average height attained (inches)** |
|---|---|
| *Brassicaceae* | 3.5 |
| *Apiaceace* | 2.8 |
| *Lamiaceae* | 1.1 |

From table 4, it is observed that the average height attained by *Brassicaceae* family was 3.5 inches and that of *Apiaceace* family was 2.8 inches. The average height attained by *Lamiaceae* family was 3 inches. The graphical representations given below shows the relation between average height and average number of days to mature.

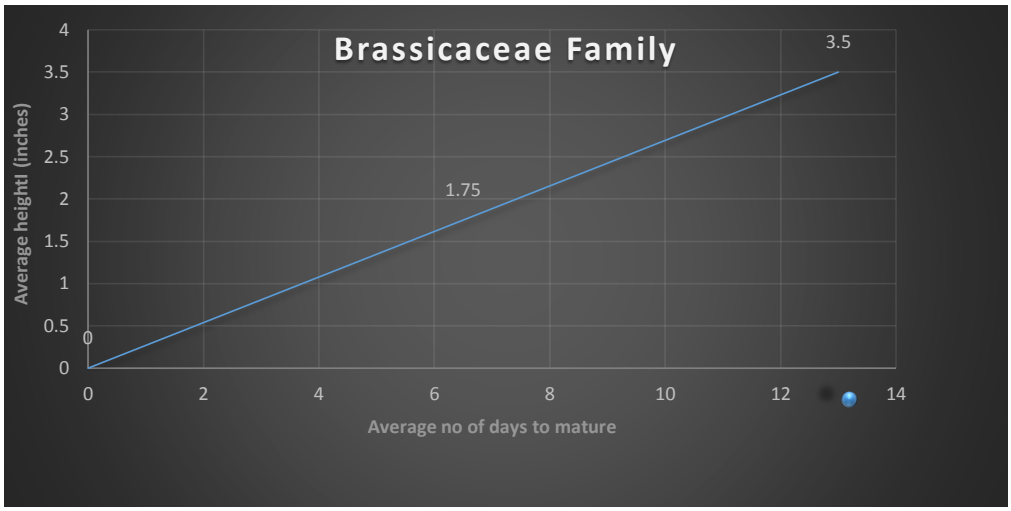


**Fig - 1 Average height obtained and the average number of days taken by the micro-greens selected from the Brassicaceae family**

Figure -1 represents the graphical relation between the average height obtained and the average number of days taken by the microgreens selected from the Brassicaceae family. From the graph, it is clear that, on an average 7$^{th}$ day of sowing the greens attained an average height of 1.75 inches and on an average 13$^{th}$ day the greens attained an average height of 3.5 inches.

## SUMMARY AND CONCLUSION

As discussed above, the Microgreens are clearly very tender and also young seedlings which had been cultivated with various varieties of edible species .Considering small size of the greens compared to its mature counterparts as micro-herbs, which intensify flavors, texture and appeal of the recipes prepared .They point out the most welcoming category with various traits with in reference to sprouts. Awarding micro-greens as a novel crop, the researches regarding the same are not yet progressing and a very little scientific information are available in the same field. With more research insights and supportive studies micro-greens can definitely be the super foods.

Therefore, the study entitled "Micro-farming Through Cultivation of Selected Varieties of Micro-greens" was carried out and the salient findings of the study were listed as follows:

### a. Growth of the microgreens

- The three different families of microgreen selected have different degree of germination and growth. For the faster growth rate the seeds were covered with aluminium foil paper to black out the tray so as to prevent the entry of sunlight. This enabled the seeds to use up the stored nutrients within them so that when they reached a height of 4 inches they were rich in micronutrients.
- The Micro-greens selected from *Brassicaceae* family include mustard, broccoli and bok choy. Out of these three, mustard microgreens have a faster germination and growth rate. They sprouted within 24hrs and about 100% of the seeds germinated. The rest of the two micro-greens were slow in their growth and germination. Micro-greens selected from

*Apiaceace* family include celery and dill. Both of them have slow germination capacity. Micro-green selected from *Lamiaceae* family includes mint. They were also found to be very slow in growth and germination.

**b. Harvest of micro-greens**

Harvest of micro-greens was done once they reached a height of 4 inches and at this stage the micro-greens are known as the baby leaf stage. The micro-greens at this stage are rich in micronutrients especially antioxidant rich vitamins and minerals. Harvest was done with the help of scissors. The greens were harvested by cutting their stem and leaving the portion which was in contact with the peat.

**c. Climatic conditions and type of medium used for the growth of microgreens**

- Micro-greens of all varieties can be grown in any climatic condition but their germination and growth rate may vary. Among the three families selected, *Brassicaceae* family has faster growth rate in tropical climate. The micro-greens from the *Apiaceace* family has slower growth rate and that of Lamiaceaefamily has much more growth rate than Lamiaceae. The medium used for the growth was coco peat which consisted of coco pit compost and coconut fibres in 2:1 proportion. Coco peat helped in retaining and absorbing water which provided the optimum moisture level for the growth of the micro-greens.
- The graphical relation between the average height obtained and the average number of days to mature, by the micro-greens selected from the Brassicaceae family shows that, on an average $7^{th}$ day of sowing the greens attained an average height of 1.75inches and on an average $13^{th}$ day the greens attained an average height of 3.5inches.

## CONCLUSION

The dissertation work on the topic **"**Micro-farming Through Cultivation Of Selected Varieties of Micro-greens**"** found that micro farming can be possible with selected varieties of micro greens with very little expense and, much more nutrient contents. The study revealed that the growth of selected varieties of micro-greens was found to be positive in tropical climate in terms of height. The type of medium used for the growth of micro-greens was coco peat which consists of coco pit compost and coconut fibers in 2:1 proportion.

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# A STUDY ON FAMILY RELATION OF EDUCATED WOMEN IN PRESENT SCENARIO (WITH SPECIAL REFERENCE HAJIPUR TOWN OF BIHAR)

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## ABSTRACT

Women spend all their time on family, if we say that a woman is such a link in the family that keeps the all family members together then it will not be an exaggeration. If the woman is educated, she can maintain the home management effectively, keeping in mind all these said, the present study has been done to know about the family relationship of the educated women. A total of 150 educated women (age group of 35-60 years) were selected for study (from Hajipur town of Vaishali District) through schedule-cum-checklist. According to the study finding more than half (59%) of the women had low education level, while 41% of them had high level of education. Most of the high-educated women (75.61%) preferred nuclear family. In present study, significant association was observed between level of education and preference of types of family, number of children, awareness about health of family members, while relationship with husband and mother in law, behaviour in home were not associated with education level of the women.

**Keyword:** Family relation, Low education, High education, Women

## INTRODUCTION

In ancient times, the condition of women in India was very pathetic, women were generally kept within the boundary of the house, their contribution to the economic development of the house was negligible, and they only got the responsibility of cooking and caring for the children. The status of any civilized society is known by looking at the condition of women in that society. The condition of women has been changing from time to time according to the country. Over the time, there have been many changes in Indian society, in which the situation of women has declined day by day and it has more impact on the poor or low educated women, because India is considered as one of the poor countries in the world due to hundreds of years of subordination. The role of women in development on a society is as important as water, air, and food to keep the body alive. Women's condition in relation to education was also very poor because parents' attention to the education of girls was very less. Today, even after 72 years of independence, the condition of women has not much improved in mainly rural India and in some states. Even with the development of modernity, the statistics of crime against women in the country, especially in a state like Bihar, are staggering; they are facing many problems even today. Many types of religious

customs, dowry harassment, gender discrimination, social oppression etc are still prevalent, though in less amount.

However, in the last few decades, the participation of women in almost all government and non-government sectors including defense and administration has increased very fast. Women are coming out of the four walls and contributing to the development of the country. If it is said that the way of living of educated women of today is becoming completely different from women of a few decades ago, then it will not be an exaggeration. Women are giving their contribution outside the 'curtain practice- Parada System'.

Women's education leads to significant social development. Some of the most notable social benefits include decreased fertility rates and lower infant mortality rates, and lower maternal mortality rates. Closing the gender gap in education also increases gender equality, which is considered important both in itself and because it ensures equal rights and opportunities for people, regardless of gender. Gradually, the condition of educated women is becoming equal to men in the society, which is also influencing the women condition in the family.

## JUSTIFICATION OF THE STUDY

Social, economical, religious, educational, and occupational and other such boundation have been imposed on women, due to which they do not get the opportunity to move forward in life and develop proper personality. These boundations have emerged as huge challenges and problems for them. Due to these boundations, these women could neither contribute to the public sector nor get education, despite having the skills, abilities and skills in the work. But now, in present time, Bihari women have always emerged as the pillars of the rural and urban economy due to their total involvement with animal husbandry, agriculture, business and dairying. The study is important because it will show the impact of the women's education on family relation (preference of family, child birth, relationship with husband and mother in law, behaviour in home) which can have a major positive or negative impact on the family environment. Keeping in the view the above stated thoughts, the study was undertaken with the objectives of knowing the family relation of educated women in Bihar.

## OBJECTIVES

The specific objectives of the study are as follow: -

1. To study the education level of the women and their relationship with family members
2. To assess the whether the high education has an impact on the family relation

**Hypothesis: -**

- High educated women have healthy family relations

## METHODOLOGY

A total of 150 educated women (age group of 35-60 years) were selected for study (from Hajipur town of Vaishali District) through random sampling. The respondents who had matriculation or below education were categorized as 'low category of education level',

intermediate and above along with technical degree holders were considered as' highly educated' and were put under high category of education level. Data were collected through both primary and secondary sources. Primary sources mean the data were obtained through interview schedule. Secondary sources mean the information was also obtain through office records such as different journals, reports, bulletins, magazines, literatures & national government websites. The survey method was used for data collection. The data were collected by interview schedule-cum-checklist method, using a schedule developed for the purpose. The structured schedule was used to collect information regarding socio- demographic information and family relation. The data were analyzed with the help of SPSS software.

## RESULTS and DISCUSSION

### 1. Educational Level of respondents

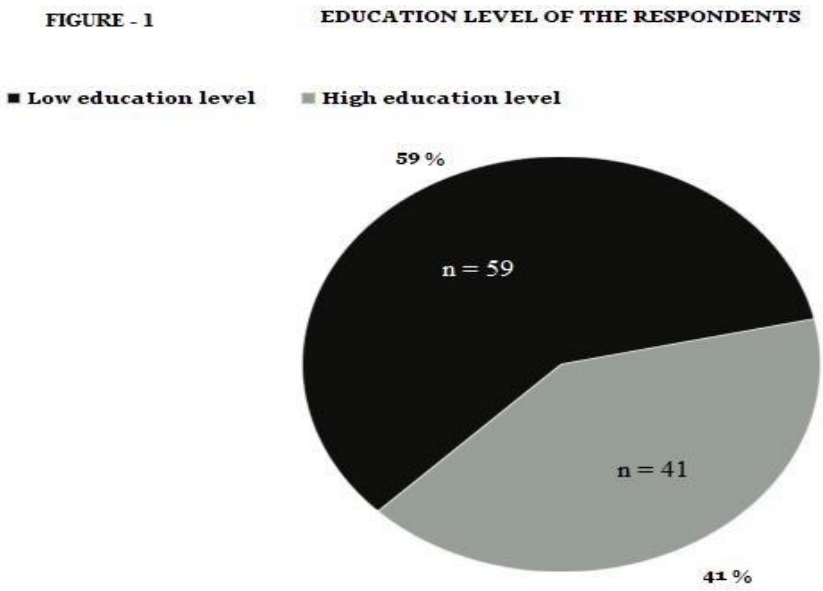


Figure -1 revealed the data on level of education of the women. According to the data more than half (59%) of the women had low education level, while 41% of them had high level of education.

**Table-1: Preferences of family**

| Sr. no. | Types of family | Education Level | | p- value |
|---|---|---|---|---|
| | | Low (n=59) | High (n=41) | |
| | | Frequency (%) | Frequency (%) | |
| 1 | Nuclear | 26 (44.07) | 31 (75.61) | .001727* |
| 2 | joint | 33 (55.93) | 10 (24.39) | |
| Significance level= 0.05 | | *Significant at p< .05 | | |

Table-1 revealed the data on preferences of family type of the respondents. According to the data, in category of low level educated women more than half (55.93%) prefer joint family while rest of them prefer nuclear family. In category of high-level education most of them prefer nuclear family (75.61%). According to the data there is highly significant association (the p-value is .001727) between preference of family and level of education.

**Table-2: Preferences of number of children**

| Sr. no. | Children | Education Level | | p- value |
|---|---|---|---|---|
| | | Low (n=59) | High (n=41) | |
| | | Frequency (%) | Frequency (%) | |
| 1 | <2 | 13 (22.03) | 19 (46.34) | .035838* |
| 2 | 3-4 | 29 (49.15) | 13 (31.71) | |
| 3 | >4 | 17 (28.81) | 09 (21.95) | |
| Significance level= 0.05 | | *Significant at p< .05 | | |

Table-2 showed the data on preference of number of children. In low level of education category near about half (49.15%) of them preferred 3 to 4 children. 2 or less than 2 and more than 4 children were preferred by the 22.03% and 28.81% of the low level educated women respectively. In high level educated category nearly half (46.34%) of them preferred 2 or less than 2 children. There is a significant association (the p-value is .035838) between preference of child and level of education.

**Table-3: Relationship with Mother in law**

| Sr. no. | Relationship | Education Level | | p- value |
|---|---|---|---|---|
| | | Low (n=59) | High (n=41) | |
| | | Frequency (%) | Frequency (%) | |
| 1 | Healthy | 21 (35.59) | 13 (31.71) | .78025 |
| 2 | Normal | 19 (32.20) | 16 (39.02) | |
| 3 | Bad | 19 (32.20) | 12 (29.27) | |
| Significance level= 0.05 | | *Significant at p< .05 | | |

Table -3 revealed the data on relationship with mother in law of the respondents. In low level of educated category almost similar percentage of the respondents had healthy, normal and bad relationship, while in high level of educated respondents 31.71% of them had healthy, 39.02% had normal and 29.27% of them had bad relation with their mother in law. However, in present study it was statistically not significant (p=.78025).

**Table-4: Relationship with husband**

| Sr. no. | Relationship | Education Level | | p- value |
|---|---|---|---|---|
| | | Low (n=59) | High (n=41) | |
| | | Frequency (%) | Frequency (%) | |
| 1 | Interdependent | 11 (18.64) | 09 (21.95) | .118036 |
| 2 | Sacrifices | 23 (38.98) | 10 (24.39) | |
| 3 | Control freak | 13 (22.03) | 08 (19.51) | |
| 4 | Abuser | 07 (11.86) | 03 (07.32) | |
| 5 | Insecurity | 05 (08.47) | 11 (26.83) | |
| Significance level= 0.05 | | *Significant at p< .05 | | |

Table -4 represented the data on relationship with husband of the respondents. In low education category, 18.64% of them were interdependent, 38.98% of them did many sacrifices, and 22.03% of them were control freak, while 8.47% of them were feeling insecurity in relationship. In high level educated category, 21.95% of them were interdependent, 26.83% of them were feeling insecurity, while 24.39% of respondents sacrificed with her husband. In present study it was statistically not significant (p=.118036).

**Table-5: Behaviour in Home**

| Sr. no. | Behaviour | Education Level | | p- value |
|---|---|---|---|---|
| | | Low (n=59) | High (n=41) | |
| | | Frequency (%) | Frequency (%) | |
| 1 | Aggressive | 13 (22.03) | 14 (34.15) | .174543 |
| 2 | Normal | 27 (45.76) | 20 (48.78) | |
| 3 | Neutral | 19 (32.20) | 07 (17.07) | |
| Significance level= 0.05 | | *Significant at p< .05 | | |

Table-5 revealed that most of low level educated women 45.76% (n=27) had normal behaviour in her family, while few of them 22.03% had aggressive behaviour. In high level of educated category near about half (48.78%) of them had normal behaviour. Aggressive and neutral behaviour was seemed in 34.15% and 17.07% respectively.

**Table-6: Awareness about health of family members**

| Sr. no. | Awareness | Education Level | | p- value |
|---|---|---|---|---|
| | | Low (n=59) | High (n=41) | |
| | | Frequency (%) | Frequency (%) | |
| 1 | Careful | 19 (32.20) | 27 (65.85) | .000408* |
| 2 | Neutral | 09 (15.25) | 08 (19.51) | |
| 3 | Not interested | 31 (52.54) | 06 (14.63) | |
| Significance level= 0.05 | | *Significant at p< .05 | | |

Table-6 revealed the data on awareness about health of family members of the respondents. According to the data, in low level of education category more than half (52.54%) of the respondents were not interested in health of family members, while 32.20% of them were very careful about health of family members. In high level of educated category more than half (65.85%) of the respondents were very careful while few of them (14.63%) of them were not interested in health of the family members. In present study a significant association (the p-value is .000408) was observed between awareness about health of family members and level of education.

## CONCLUSION

The development of any country or society is possible only if the women are educated. Education of woman enhances all the qualities that are necessary for an efficient management of home. Educated women pay special attention to the upbringing of their children so that the all-round development of children can be possible and the children can contribute to the development of the society. However, in modern educated society family relations are slowly changing- woman are giving more preferences to nuclear family. In present study, significant association was observed between level of education and preference of types of family, number of children, and awareness about health of family members. The relationship with husband and mother in law, behaviour in home were not associated with education level of the women.

**Recommendations:**

- There is a need to provide necessary knowledge about family planning and home management, especially in low level of educated women.
- Counseling should be provided by government, NGO, educational institutions for improving of the family relation.

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# MENTAL HEALTH STATUS OF THE AGED POPULATION IN THE FLOOD AFFECTED AREAS OF ALAPPUZHA

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## ABSTRACT

The ageing population of the world presents major challenges for society and for health services. Mental health issues are extremely important, as mental disorders, notably dementia and depression, are common in old age. Mental ill health can profoundly affect the quality of people's old age and has a significant impact upon the use of health and social services. The present study on "Mental health status of the aged population in the flood affected areas of Alappuzha" explores to understand the level of mental health of the aged people. Hundred samples were taken for the present study. Equal consideration was given to both the gender. The study was carried out to assess the socio-economic status of the samples, level of mental health and level of stress among them. A well-prepared set of Interview schedule was used to collect the data by interview method. A Mental Health Scale (MHS) by Dr.Jagadish and Dr.Srivastava (1983) was used to assess the mental health. In order to know the level of stress a Perceived Stress Scale by Sheldon Cohen (1988) was adapted. From the study it was concluded that majority of the samples possess a medium level of mental health and also majority of the samples possess medium level of stress. There also existed significant differences in the level of mental health between the genders.

**Key words:** Mental health, aged population, flood

## INTRODUCTION

Ageing is a universal phenomenon. It is a biological process which has its own dynamic, largely beyond human control. The elderly age group (60 years and above) is one of the most vulnerable and high-risk group in their health both physical as well as psychological. Rapid ageing is happening around the world and it has both challenges and opportunities (Balan et al, 2010). Now most people can expect to live into their sixties and beyond. A longer life indicates an important opportunity, not only for older people and their families, but also for societies as a whole. Additional years provide the chance to pursue new activities. Yet the extent of these opportunities depends heavily on one factor: health. The World Health Organization defines health as "state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity". Because mental health is essential to overall health and well-being, it must be recognized and treated including older adults, with the same urging as physical health. For this reason, mental health is becoming an increasingly important part. Mental health is recognized globally as being of huge social and public health importance. Societies, that adapt to these changing demographics and invest in healthy ageing, enable individuals to live both longer and healthier lives and for societies to reap the dividends (Mansuri, 2009).

Global warming and climate change have led to an increase in the frequency and intensity of extreme events all over the world. In 2018, Kerala was affected by one of the worst natural calamities of the century. The heavy downpour in Kerala in August 2018 that caused floods and destruction is an illustration of such an event.

Kerala experienced abnormally high rainfall from 1 June 2018 to 19 August 2018 (about 42% above normal). Initially, months of June and July were somewhat wetter than usual with 15% and 18% precipitation above normal respectively. The situation took an unprecedented turn in August when in the first three weeks, the state experienced downpours 164% above normal—the worst flooding in nearly a century. Thirty-five dams across the state were opened to release flood runoff. All five overflow gates of the Idukki Dam were opened for the first time in 26 years. Heavy rains in Wayanad and Idukki districts caused severe landslides.

Due to such high rainfall, there was an absence of appreciable storage in reservoirs upstream, along with the shrinkage of carrying capacities of lakes, rivers, and the porous land. The limited capacity of Vembanad Lake and Thottappally Spillways worsened the flooding in the Kuttanad region and the backwaters. Many areas were submerged under water for more than two weeks (IMD 2018). This affected the people, especially the Aged, living in that area to a great extent. Hence a study was conducted with the following objectives.

## OBJECTIVES

1) To understand the socio-economic status of aged population in the flood affected areas.

2) To analyse the mental health status of the aged population in the flood affected areas of Alappuzha

3) To know the level of stress among the aged population

## METHODOLOGY

Alappuzha is one of the 14 districts in the state of Kerala in India. It is the smallest district in Kerala. The elderly population of Kerala is higher in the district of Alappuzha**.** Kuttanad, located in the Alappuzha district was one of the worst affected areas in the 2018 and 2019 Kerala deluges. Nedumudipanchayat, belonging to Kuttanadtaluk, which is the worst affected area, was hence selected for the study. The total population of Nedumudipanchayat is 14601 and it has been divided in to 15 wards. From that, 5 wards were randomly selected. For the present study, a hundred aged people from both the genders were selected as the samples. Equal consideration was given for both the genders.

A well-structured interview schedule was used to collect the baseline information related to the samples. It comprises of questions related to the socio-economic status, living arrangements and problems faced during the severity of flood. A Mental Health Scale (MHS) by Dr.Jagadish and Dr.Srivastava (1983) was used to assess the mental health and factors influencing it. The scale consists of fifty-two statements. Each statement has four alternatives- Always, most of the time, Some times and never, which indicate samples' feelings and views, and were given to a scoring of 4,3,2,1 respectively for a positive statement. There were 30 positive statements and 22 negative statements. The maximum score that a sample can obtain was 208 and the minimum score was 52.Perceived Stress Scale by Sheldon Cohen (1988) was adapted to measure the level of stress among the samples. It comprises of 10 statements in which 4 were positive and the rest of the statements were negative. Each statement had five alternatives, Always, Sometimes, Undecided,

Rarely, Never, were given to a scoring of 0, 1,2,3,4 respectively. Positively worded items were reverse scored and the ratings were summed with higher scores indicated more perceived stress.

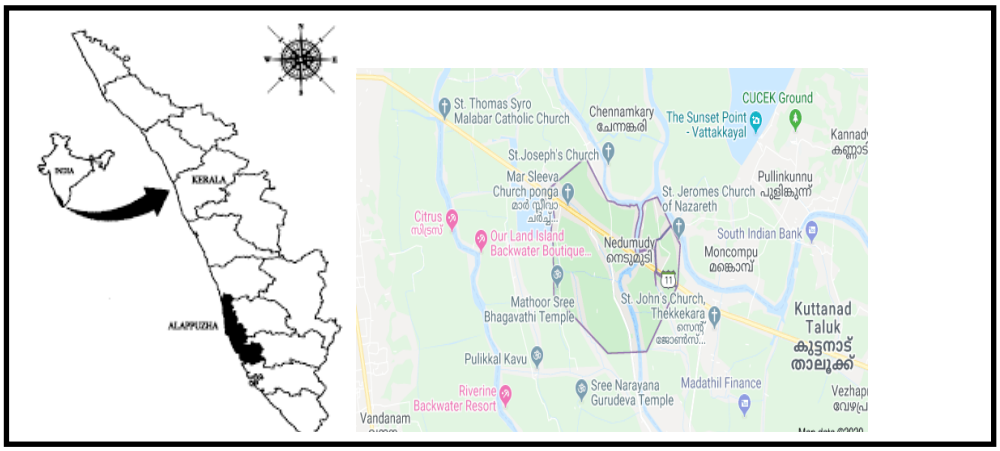


**Plate no 1: Study area**

## RESULT AND DISCUSSION

### Personal data of the samples

Personal data such as age and marital status of the samples are discussed below

. **Table: 1: Personal data of the sample**

| **Category** | **Percentage (%)** | **Percentage (%)** | **Percentage (%)** |
|---|---|---|---|
| **Age (in years)** | **Total (n=100)** | **Male n=50** | **Female n=50** |
| 60-70 | 42 | 42 | 42 |
| 71-80 | 47 | 48 | 46 |
| 80+ | 11 | 10 | 12 |
| **Marital Status** | | | |
| Married | 78 | 86 | 70 |
| Single | 01 | | 02 |
| Widow | 17 | | 40 |
| Widower | 04 | 14 | |

With regard to the marital status more than three fourth of the samples were married. Among male elderly 86 per cent were married and the rest of them belongs to the widower category. Seventy per cent of female elderly were married, forty per cent were in the widow category and a small per cent (2per cent) were single.

**Occupational status of the samples**

Employment keeps the elderly busy, entertained as well as providing them with the feeling of social relevance**.** Occupational status of the samples is discussed in Table 2.

**Table: 2: Occupational status of the samples**

| Category | Percentage (%)(n=100) | Percentage (%)(n=50) | Percentage (%)n=(50) |
|---|---|---|---|
| | Total | Male | Female |
| **Occupational Status** | | | |
| Retired | 10 | 10 | 10 |
| Presently working | 22 | 22 | 22 |
| Self employed | 16 | 18 | 14 |
| Not working | 52 | 50 | 54 |

*Multiple responses

Regarding the occupational status of the samples it was found that 50 per cent of male elderly and 54 per cent of female elderly were not working presently. In that it includes the 12 per cent of the people who never had a paid employment in their whole life. About 22 per cent of both the genders were working presently.

**Sources of income**

Income plays an important role in human life. The feeling of acquiring of more income is the thought of the most middle-aged people. Even it varies among them. So most often the major source of income of an elderly people would be pension, agriculture or from children. Figure 1 depicts the sources of income of the samples.

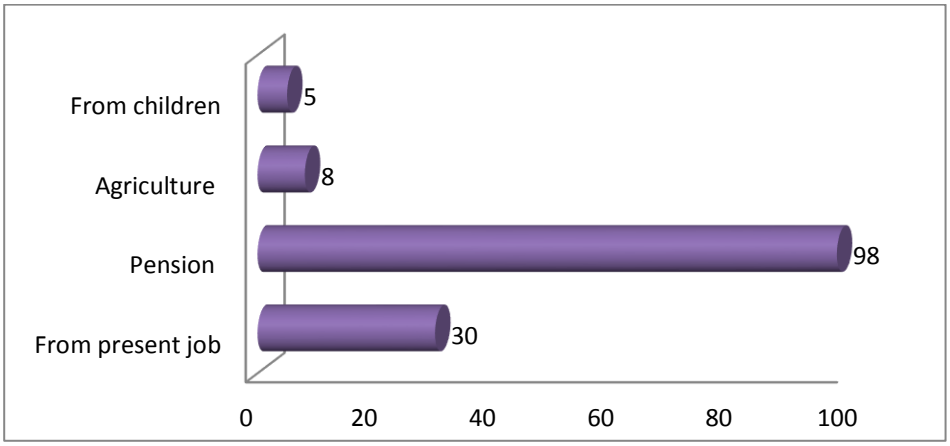


**Figure no 1: Sources income of the sample**

It was found that all the male samples were getting pension. Among the female samples 98 per cent were getting pension. About 32 per cent of male sample and 28 per cent of the female elderly

were earning from their current job. This trend in continuing in job to an extent is a positive sign of engaging themselves during the life span, unless and until it is not a burden for them.

**Severity of flood**

Any natural calamity will definitely affect the normality of life in every aspect. Extend of severity of flood on land property, job, income, family distraction are discussed in Table 3

**Table: 3: Severity of flood**

| Category | To a greater extend Percentage(n=100) | Fully affected Percentage (n=100) | Average Percentage (n=100) | Mere Percentage (n=100) |
|---|---|---|---|---|
| Land property | 21 | 62 | 15 | 2 |
| Job | 1 | 26 | 37 | 36 |
| Income | 7 | 33 | 37 | 23 |
| Family distraction | 4 | 12 | 41 | 43 |

All the elderly from the sample were affected by flood during the 2018 deluge. From the above table it was found that about 62 per cent of samples' land property was fully affected in 2018 deluge. Severity of flood on Job, Income, and family distraction was an average for majority of the samples. Since they belong to the physically vulnerable category, the flood causes physical, mental as well as emotional problems. Emotionally they become too weak because of the damages happened to their house and belongings. Some of the samples still had the delusion of having flood.

**4.2.2 Problems faced by the of family during flood**

There were several problems that were witnessing by the people during the time of flood and it is discussed in Table 4.

**Table: 4: Problems faced by the of family during flood**

| Category | Percentage (%) |
|---|---|
| Low income | 64 |
| Indebtedness | 20 |
| Family disturbances | 34 |
| Other | 14 |

*Multiple responses

It was found that lack of income or low income was the major problem faced by the family of the samples (64 percent) during the time of flood. This has resulted in other issues like indebtedness, disturbances inside the family and among the members. Other than this they have also mentioned health problems, agricultural loss, document loss, death of domestic animals etc during the time of flood. In short, flood has created a big vacuum in the life of the families of the samples, which ultimately affected them too on a personal account.

**Food storage system**

The food storage system during the time of flood is pictured below.

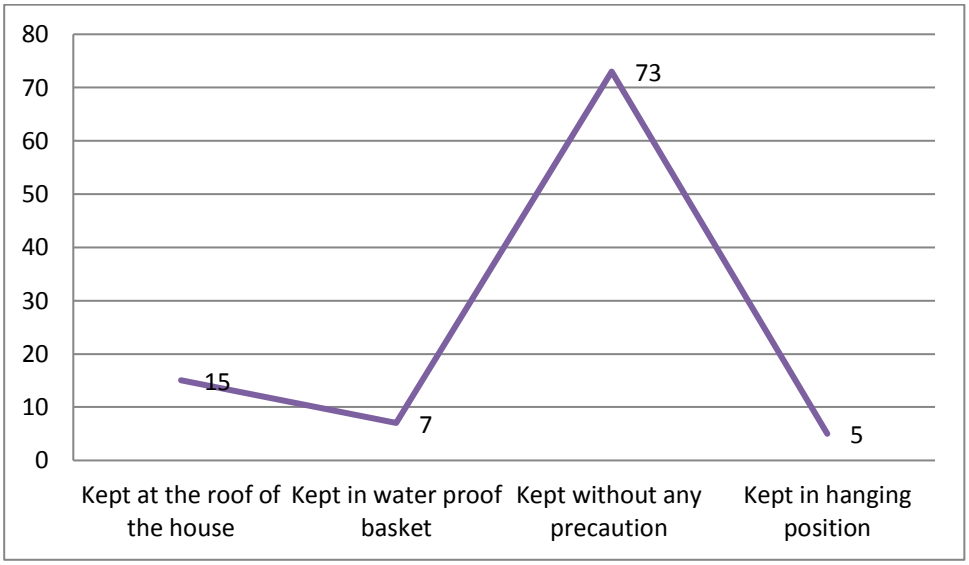


**Figure no 2: Food storage system of the samples**

It was clear that 73 per cent of samples kept food without any precaution during the time of flood. Fifteen per cent of samples kept food at the roof of the house, seven per cent of samples kept the food in water proof basket and five per cent of them kept the food item in hanging position.

**Level of Mental Health of the samples**

A Mental Health Scale (MHS) by Dr.Jagadish and Dr.Srivastava (1983) was used to assess the mental health and factors influencing it. The scale consists of fifty two statements. Each statement has four alternatives Always, Most of the time, Some times and never which indicate samples feelings and views, and were given to a scoring of 4,3,2,1 respectively for a positive statement. There were 30 positive statements and 22 negative statements. The maximum score that a sample can obtain was 208 and the minimum score was 52.

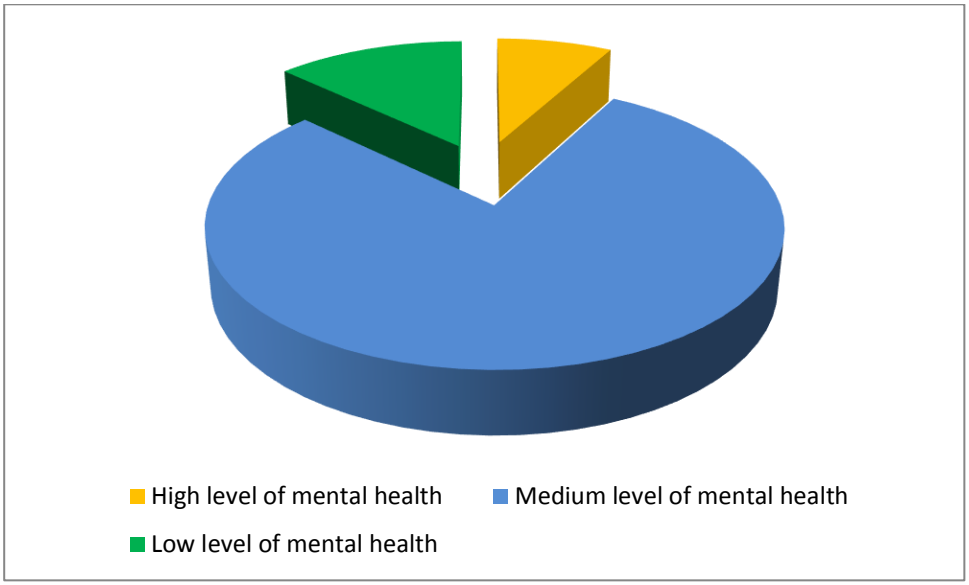


**Figure no3: Level of Mental Health of the samples**

From the above analysis it was clear that more than three fourth of the samples (79per cent) had a medium level of mental health. Thirteen per cent possess low level of mental health and only 8 per cent had high level of mental health status. This less percentage in the high level of mental health among the samples may be because of the severity of flood that they faced during the flood period and its impact on them. The experience of deluge was for the first time for almost all the samples, during their life time, and so almost everyone were undecided on how to react to the situation during the initial days of flood. It took a while for many to accept the effects of the deluge and many are still recollecting them as a dreadful event.

The samples opined that about 86 per cent of samples always had affection and attachment with their neighbours and 85per cent revealed that they were never hesitated in meeting with others. Also 54 per cent of samples revealed that they always get irritated by their family members and the things what they were going through. The opinions of the samples with regard to their mental health were aligning with the similar studies conducted in this area. In a study conducted by Thomas (2019) "Prevalence and severity of depression among people residing in flood affected areas of Kerala" found that a significant amount of people residing in flood affected areas showed signs and symptoms of depression, and the maximum prevalence of depression was observed in the geriatric population.

In this study majority of the samples were found in the medium level of mental health category. They may be considered as high risk people who have the chances to fall in to a low level of mental health.

**Level of Stress among the samples**

Stress is a common factor in life. Children experience stress from school, new social situations and simply growing up. Adults feel the stress of working, paying bills, raising kids and maintaining household's .Seniors also feel the stress, even though some may have retired, raised their children and paid off for their homes.

Certain amounts of stress are a part of life for people of all ages. Level of stress among the samples is depicted in Figure 4.

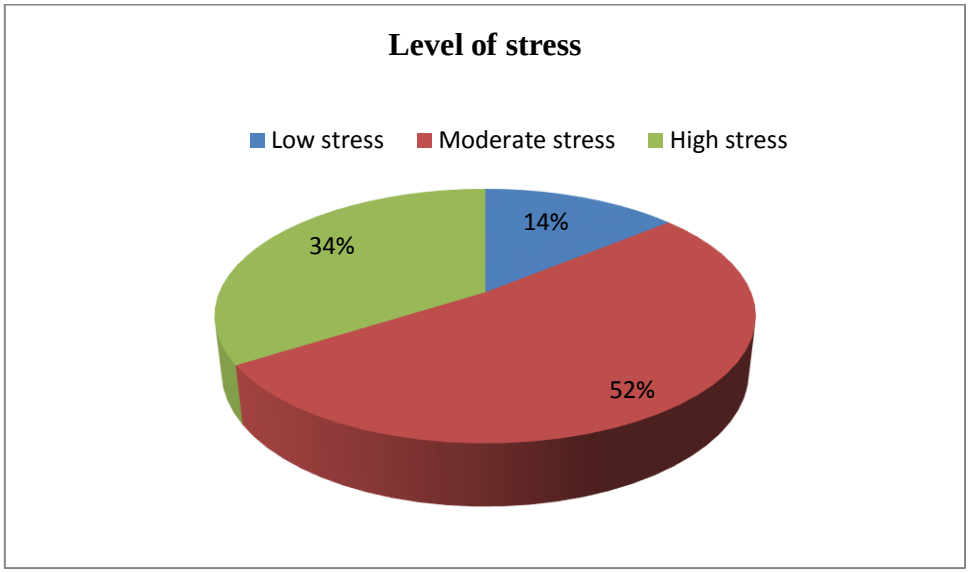


**Figure no 4: Level of stress**

It was found that majority of the samples (54percent) had moderate level of stress. Fourteen per cent of samples had low level of stress. This may be because of several reasons such as worries for not being able to live independently, deterioration of physical abilities and chronic illness, caring for grand children or a sick spouse etc.

**Distribution of samples based on gender and Mental Health**

T test was used to check the difference in the level of mental health with respect to gender**.**

**Table: 5: Distribution of samples based on gender and Mental Health**

| Gender | Number | Mean | Standard deviation | p- value |
|---|---|---|---|---|
| Male | 50 | 146.06 | 14.739 | 0.005 |
| Female | 50 | 137.66 | 14.242 | |

.

It was found that male elderly received high mean score of mental health 146.06 as compared to the female elderly 137.66 with a standard deviation 14.739 and 14. 242.Since p-value,0.005 is <0.05(significance level), significance difference observed in the mean values of mental health with respect to gender

## CONCLUSION

The particular study was an attempt to find out the impact of Kerala deluge on the elderly population. Study revealed that flood has devastating effect on the personal and material life of the population, especially the aged. Many have not heard about the deluge in their life time. Alappuzha

is one such area in the state of Kerala, which is always getting affected by the rain during the monsoon seasons. But this particular deluge was a far cry from those situations. Loss of land, place of dwelling itself is a matter of concern for all, as a house is a onetime investment that an ordinary person can think about in his/ her lifetime. Damage and loss of that itself has resulted in many other associated problems in the families and personal front of the samples. It is quite natural too that, all these had a hard hit on the economic stability of the samples and finally to their quality of life too. Though majority of the samples ventured to have a medium level of stress and mental health, experts in this area proposes as high-risk people who have the chances to fall in to a low level of mental health and stress related complications. As a researcher, elderly is a time zone where we need to invest much on to ensure an active ageing, as senior brains are the best short cuts for connecting lives together.

**Plate 2: Condition of house immediately after the flood (Shared by the sample to the investigator)**

**Plate 3: House given by the government to the severely affected samples**

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**The Indian Journal of Home Science 2020: 32(2)**

# DECISION MAKING IN PARTNER SELECTION AND RELATIONSHIP MATTERS

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## ABSTRACT

The present study aims to provide an insight into factors that influence our decision-making ability on partner selection in a romantic relationship. Some of the factors are attractiveness, emotional states, preferences, and set of values an individual has. The current study is on emerging adults, N= 120 participants ranging from 18-25 age group. The research design is a mixed-method research design, which provides insight into depths of thoughts an individual goes through while selecting a partner. The methodology consisted of a social experiment using the decoy effect adapted from (Ariely, 2008), a questionnaire and an interview. The decoy is when we add a third option that is designed to influence the decision of the participants to a predictable choice. Sixty-eight percent women and 55% men were influenced by the presence of decoy. Quantitative data revealed that there was influence of peers and society in partner selection process which contrasted with qualitative findings where the participants revealed peers and society did not play a major role in partner selection process, perhaps indicating that one is not aware of the extent and degree of different influences on one's own decision. The study implies that recognizing the role of untapped forces in influencing decisions can help one to pay attention to these aspects while making a decision and hence improve the process of decision making. Findings are discussed using judgment and decision-making frameworks.

**Keywords-** Romantic Relationship, Partner Selection, Decoy, Decision Making, Emerging Adults

## INTRODUCTION

Aristotle submitted that man is a rational animal. And we believe that when it comes to decision making, especially in matters that are very important such as, selecting a partner for marriage, we make a rationale choice. But do we, really? The origin of the research problem lies in the ground work that was done in a doctoral project on romantic relationships in the Indian context (Gala & Kapadia, 2012). The conclusions from the study clearly indicated a need for building relationships efficacy skills in young people. Decision making is one such important skill, which can change the course of a person's life, and having more insights into the process is likely to improve our decision-making skills and therefore improve our life.

The assumption that humans are in control of the decisions that they make, actually is not true. Factors like social norms, emotions and expectations hugely enslave the individual in deciding one way over the other. The focus of this study is to understand the process of decision making in matters of partner selection among emerging adults.

## REVIEW OF LITERATURE

Close relationships cannot be taken for granted, even though, we as a species, are hard-wired to form them. Romantic relationships entail overwhelming engagement of the involved individual at all levels of one's existence. Positive outcomes include discovering aspects of one's own self, experiencing meaning and purpose in life, improving temperament, enhancing pro-social skills and accepting more responsibility in work and life. Plausible negative outcomes such as choosing a 'wrong' partner, overwhelming emotions making one incapacitated to do anything else and turbulent breakup with its aftermath are some serious concerns for romantically involved individuals (Gala & Kapadia, 2012).

In a series of studies conducted on decision making in the area of behavioral economics, Ariely (2008), observed that humans are irrational and also predictablyso. These irrational behaviors are not absurd or pointless. Humans rarely choose things on absolute terms. Humans do not know the value of things because there is no internal value meter that tells about the worth. Unless they see something in context, they do not know what they want. An individual does not know what type of phone he wants unless he sees a better phone. Until we see our relatives or friends doing something we think we need to do, we do not know what we want to do with our life. This idea of context or relatively can be easily used to manipulate and individual into choosing one decision over the other.

**Relativity**

Figure 1 and Figure 2 clearly show that in of context of smaller circles the orangecircle appears bigger, whereas in reality they are of equal size.

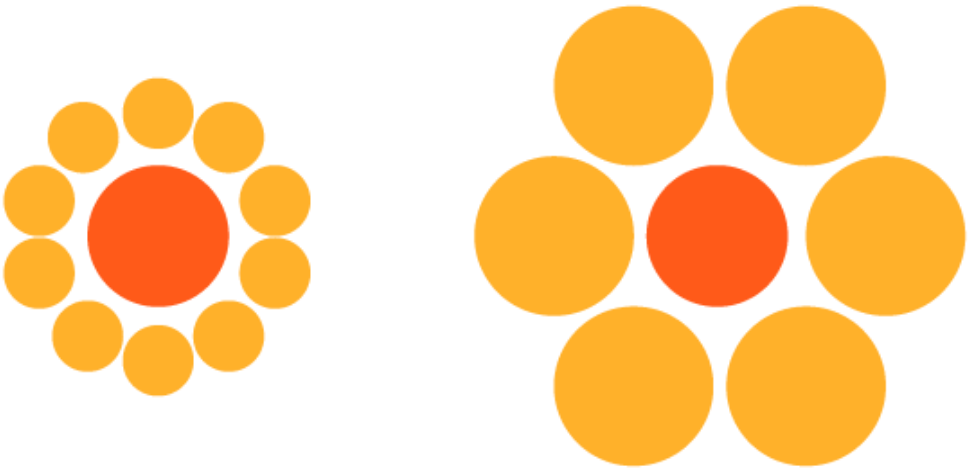

**Figure 1: Visual demonstration of relativity (Ariely, 2008)**

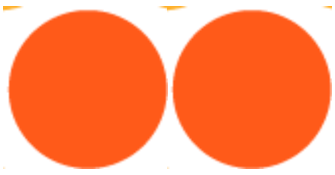

**Figure 2. Relativity without context**

**Factors influencing decision making in partner selection:**

Along with relativity, other factors influence our decision-making process consciously or sub-consciously.

**Emotions**

Emotions play a key role in the decision making process. Emotional self-regulation increases during emerging adulthood. In a happy mood, an individual tends to overestimate the possibility of positive and underestimate that of negative. A reverse outcome is observed for sad mood. The mood of an individual depends on how things go.Decider's feelings are affected by positive or negative outcomes of the decision. Regret and disappointment is experienced through adverse outcomes (Schwarz, 2000). In the heat of the moment, the most rational person completely changes the resolution. The boundaries become blur between wrong and right. Ability to understand the emotion does not improve with experience (Ariely, 2008).

**Social Media**

Intimacy and relationship stability are the core features of love during emerging adulthood (Sciaba, 2006). Arnett observed that the focus of dating was to explore sexual and emotional intimacy during emerging adulthood (2000). Social media provides tools for finding people online. Virtually one can choose from an entire gamut of mating options.Researchers like Wu and Chiou (2009), Sheena Iyengar (2000), Barry Schwartz (2004) suggest that more options lead to more dissatisfaction in choices made. Cognitive load is caused due to the options available (Wilson &Schooler, 1991).Media plays a role in constructing relational and gender expectations among individuals in a romantic relationship (Ribarsky, 2014).

**Family and society**

Familial expectations play a role while making life decisions. A study by Mitra and Arnett (2019), suggests that little importance is given to a romantic relationship as a life choice during emerging adulthood in India. There is a shift from arranged marriages to marriage by self selection. The study also shows that emerging adults necessitate gaining sexual experience and casual relationships before getting married. Decisions are influenced by the everyday situation, family, neighbor, jobs relatives, co-workers (Sinha &Verma, 1987).

**Brain**

Research in decision making has notably expanded to neuroscience. The decision making has evolved from interaction at cognitive to motivational and behavioural processes. The decisions cannot be made in isolation but by understanding at system level (Balleine, 2007).Romantic love being a complex emotion, cannot be separated from impulses of physical desire. A number of areas of the brain light up when an individual looks at somebody, he/she is deeply in love with (Zeki, 2007).

## Understanding the hidden forces that Guide Decision Making

### The Decoy Effect

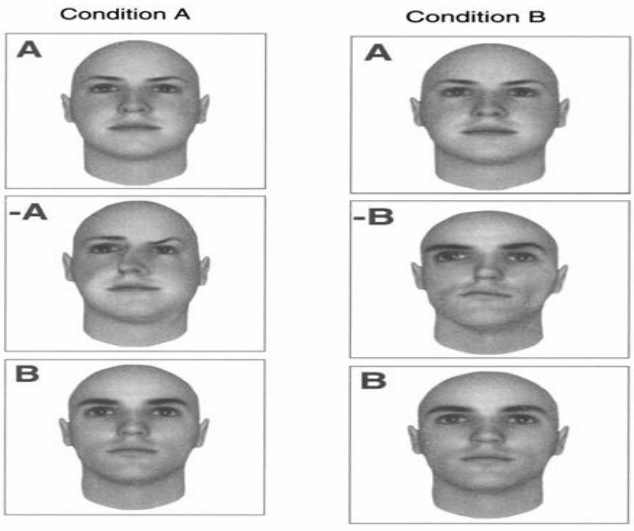


**Figure 3: Decoy Effect Dan Ariely (2008)**

Behavioral economics has explained the concept of decoy effect as the asymmetrically dominated choice', where the choice between two options is altered by adding a third option. The third option is the same as one of the options but altered to make it less attractive or made to look inferior (as shown in Figure 3).

Therefore the hypothesis is that in condition 'A' people would chose 'A' and the same people would 'B' in condition 'B' just because of the presence of the decoy.

## OBJECTIVES OF THE STUDY

**Broad research objectives**

- To uncover the forces that guide the decision making process in youth pertaining to partner selection.

**Specific research objectives**

- To understand the role of context and relativity that tilts our ability to make reasonable decisions.
- To understand the various factors that influence decision making
- To compare genders on the various aspects of decision making.

## METHODOLOGY

The section includes information about tools and sampling procedure.

The present study uses mixed methods research design, which includes both quantitative and qualitative tools (as shown in Figure 4).

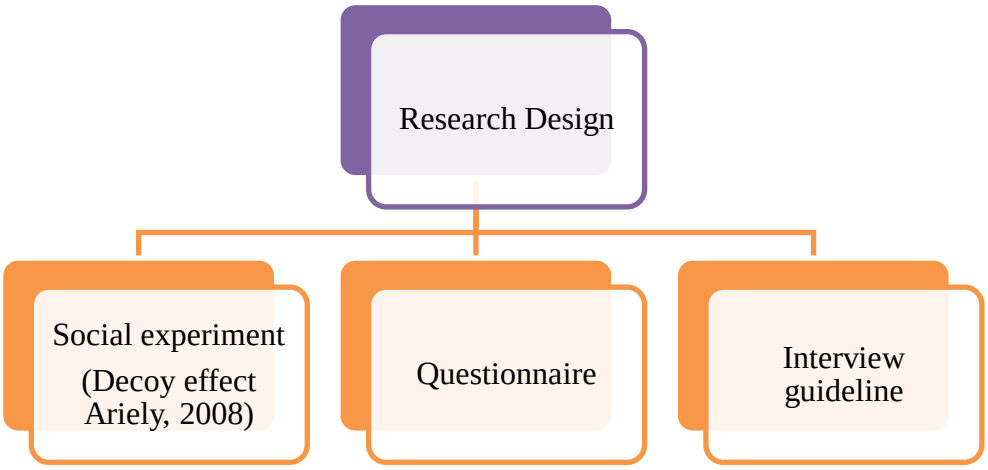


**Figure 4: Research design**

**Triangulation of methods**

Triangulation of methods was adopted; where different methods are used to understand the same phenomenon (Jick, 1979). The use triangulation in the present study unraveled the unknown forces in decision making. In the study following methods are used social experiment, questionnaire, and interview guideline.

**Tool for data collection**

The tool of the present study uses triangulation of method to tap into the factors of decision making. The present study used:

**Social experiment**

The decoy effect tool. Social experiments as defined by Riecken et al. (1974). "An experiment is one or more treatments (programs), representing intervention in normal social processes, that are administered to some set of persons (or other units) drawn at random from specified population; observations and measurements are made to learn how (or how much) some relevant aspects of their behaviors different from those of a group receiving either another treatment of no treatment, also drawn from the same population" (as cited in Archibald & Newhouse, 1980, p. 1 In our study, we wanted to see if the participants would get influenced from the presence of decoy.

The tool was divided into two parts: a picture tool where the participants had to choose from a picture and the second part was the background story of families, where a bad habit or bad debt was used as a decoy as further elaborated in the results section.

**Questionnaire**

Questionnaire covered the domains of decision-making preferences, influence of emotions and gendered differences.

**Open ended interview guideline**

Open ended interview guidelines coved the domains of preferences for selecting a partner, rationality, and deal breakers, role of society, friends and emotions in decision making.

**Sampling Technique and Size**

Technique used to collect the sample was snowball. Sample size for the current study was 60 men and 60 women currently staying in Vadodarabetween the age ranges of 18-21 with the relationship status being currently single.

**Procedure for data collection**

The participants were approached from different departments of university and debriefed. Written consent was taken from each participant. The tools were presented in the order that is shown in Figure 5. Each participant took an average of 45 minutes each.


**Figure 5: Procedure for data collection**

## RESULT AND DISCUSSION

### Results

### Social experiment: Decoy effect

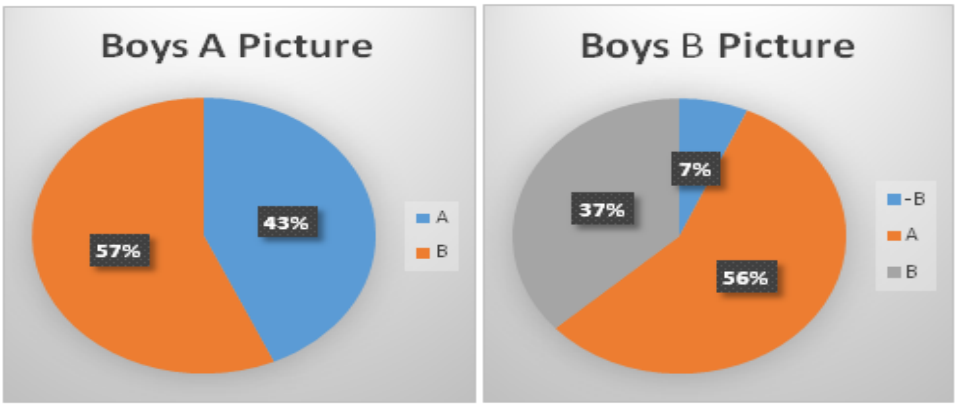


**Figure 6: Result of Decoy pictures on men**

### Decoy using Pictures

Figure 6 shows that in condition A for men, 43% men were influenced with the presence of decoy (-A). However, 57% men selected the other regular picture (B). In condition B, 56% men were influenced with the presence of decoy (-B). Other 37% men selected the other regular picture (A). Interestingly, 7% men selected the distorted image.

In condition A for women, 77% women were influenced by the presence of decoy (-A) and 3% women selected the distorted image. However, 20% women selected the other regular picture (B). In condition B, 63% women were influenced by the presence of decoy and 37% women selected the other regular picture (A).

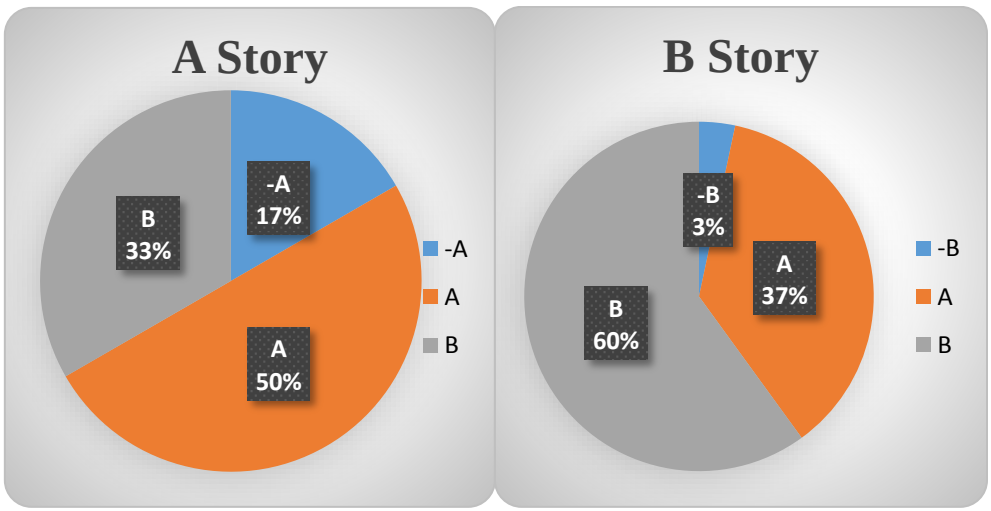


**Figure 7: Result of Decoy background story on men**

**Decoy using Background Story**

As with decoy, family variables such as SES, Education and family background were presented for choice, and while story A and B were similar in these variables and decoy as minus A and minus B were added with an addition of substance abuse or heavy loan. The predictable choice in the presence of minus A would be A and in presence of minus B would be B. Following are the results:

Figure 7 displays that in condition A for men, 50% men were influenced by the presence of decoy and 33% men selected the other regular story. However, 17% men selected the decoy or minus A, the person with an addiction. In condition B, 60% men were influenced by the presence of decoy and 37% selected the other regular story. Again, 3% men selected the decoy or minus B, or the person with loan.

In condition A for women, 50% women were influenced by the presence of decoy and 50% selected the other the other regular story. In condition B, only 30% women were influenced by the presence of decoy. However, 63% women selected the other regular story. Interestingly, 7% women selected the edited story.

It is visible from the results that presence of decoy plays a role in decision making. Review also discusses the role of decoy in decision making. Behavioral economists state that the presence of third option often leads to change in decision making and individuals are often not aware of the shift. In Indian context, a 'well-to-do' family background is given more importance.

**Quantitative results**

For 96.7 % of women and 18.3 % of men preferred using dating apps. For 61.7% of men and 38.3% women agreed that social media has led to confusion in selecting a partner. For 83.3 % women and 70 % men responded positively that their emotional state really influences their decision making. We have found contrasting results in the quantitative and qualitative results. In total 81.7 % both men and 73.3 % of women felt that peers don't influence decision making. However, 18.3% men and 26.7 % women agreed that there was peer influence in decision making.

**Qualitative results**

As shown in figure 8, major qualities that emerged while looking for a romantic partner were physical attractiveness, good nature of the other person and education. More emphasis was given to good nature along with education qualification by women as compared to men. Good nature according to both genders included loyalty, respect towards other, understanding, etc.

While both men and women gave importance to outer appearance while selecting a partner, when it came to ideal match for them, more importance was given to qualities like understanding and emotional support as seen in Figure 8. More of women wanted the ideal match to be understanding as compared to men. Questions about one's own readiness to be in a relationship, family and self-doubts were asked by the participants. It was observed that majority of questions were related to the doubts and thoughts were about the partner and not about self. The questions implied more about the future. More importance was given to the family background by women as compared to men. Bad habits like smoking and drinking were the major deal breakers according to the participants. Other deal breakers included factors like not understanding, no respect for the significant other, and not patient. Majority men reported that society does not influence the

decision making of selecting a partner whereas parents influence the decision. Women gave more importance to family's happiness and importance of family in decision making. Whereas, women also reported that society does play a role in influencing the decision before selecting a partner.

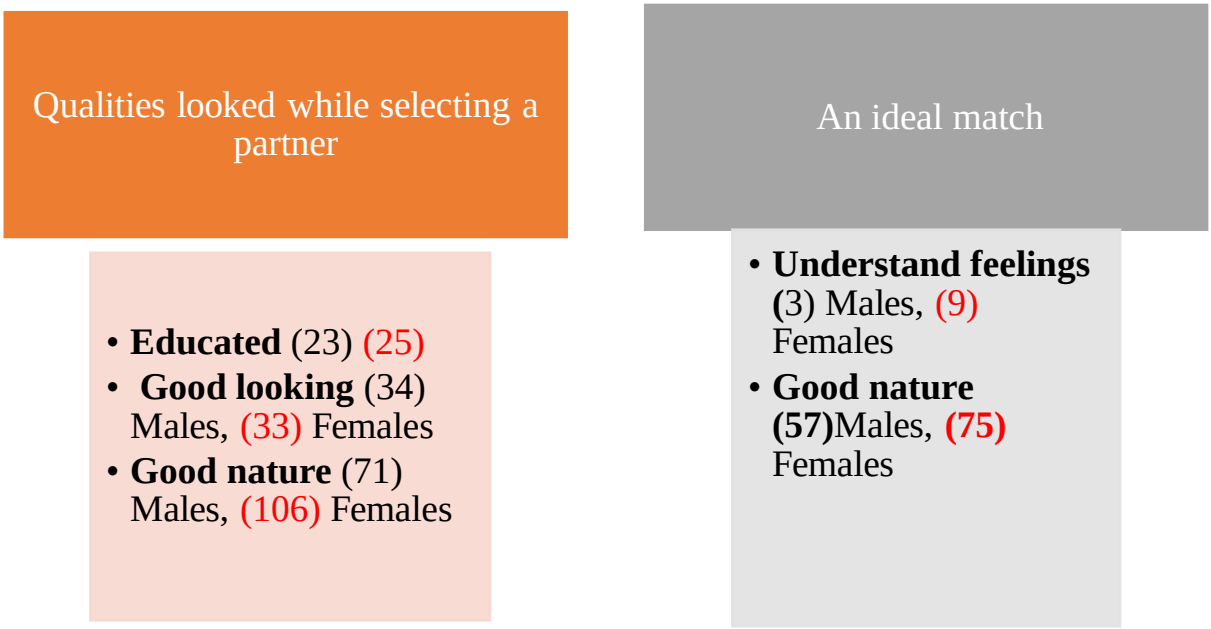


**Figure 8.Qualities while looking for a partner and Ideal match for participants respectively**.

Although the participants reported that they are aware of emotions playing a role in decision making, more women have regretted the decisions taken under an influence of heightened emotion. Participants also reported that they usually do not consider the influence of heightened positive emotion. Rational thinking according to participants included thinking about what is right and wrong. Maturity plays a role in rational thinking. Long term and short term implications also play a role in rational thinking. Women reported that thinking about family is also a part of rational thinking according to them.

## Discussion

### Peer and societal influence in partner selection

In our study we found contrasting result from triangulation of methods. When we looked at the quantitative part of our study, 81.7 % of men and 73.3 % of women reported that they are not influenced by their peers in partner selection. However, it was interesting to note that in the interview many participants mentioned that they do take opinion from their friends, especially from best friends. Thus, it was seen that 27 young women reported that they would take opinion from friends. Whereas only 20 young men reported they would ask their friends but end decision will be taken by them. Previous research demonstrates repeatedly that friendship influences romantic relationships. An approving social network of family and friends predicts romantic relationship stability and satisfaction (Sprecher & Felmlee, 1992), for instance, a perceived social support from family and friends associates positively with romantic involvement. Furthermore, approving networks facilitate relationship stability via social support.

**Emotions guiding our decision**

Our results from both quantitative and qualitative data shows that emotions guide the decision making process. The quantitative results show that majority of participants 83.3% of women and 70% of men agreed that emotions influence their decision making.Emotions play a central role in the development and maintenance of our interactions with our intimate partners. Specifically, emotions motivate us to establish intimate bonds, guide and coordinate and communicate our needs to our partner (Keltner & Haidt, 1999). Moreover, how we experience the availability and reliability of our intimate partner is immediately relevant to our wellbeing (Zaki &Williams, 2018).Many psychological studies have said that individuals are more likely to choose positively when they are in a happy mood as compared to another state of mind. The people in a happy mood are likely to overestimate positive outcomes and underestimate the negative once where it becomes the opposite when people are in a sad mood. With this, we can say that there is a shift in people's perspective on their current state of mood and emotions surely play an important role in decision making (Schwarz, 2000)

**Deal breaker**

Even though the participants have said that smoking and drinking is not acceptable to them studies have found that people tend to compromise these qualities once they are in a relationship. Compromises in love seems odd, as ideal love is perceived to be so intense that it has no need to compromise. Compromising about people can easily be perceived as degrading to people; however, compromising about a specific behavior of the people might be perceived in a somewhat better light, as the compromise refers not to the person as a whole, but to certain of his specific qualities. Considering the beloved as perfect, or approaching such perfection, does not necessarily mean that lovers are blind to their beloved's flaws, but just that such flaws have little, or greatly reduced, significance (Ben-Ze’ev, 2011).

**Humans are predictably irrational**

Ariely (2008) explains how expectations,emotions, social norms, and other invisible, seeminglyillogical forces skew our reasoning abilities.Not only do we make astonishingly simple mistakesevery day, but we make the same *types* of mistakes, Ariely discovers that we consistently overpay, underestimate, andprocrastinate. We fail to understand the profound effectsof our emotions on what we want, and we overvalue whatwe already own. Yet these misguided behaviors are neitherrandom nor senseless. They're systematic and predictable—making us *predictably* irrational. We assume that we are in control of our decision, but we are not. The result is that we are presumed to be making logical andsensible decisions. And even if we make a wrong decision fromtime to time, the standard economics perspective suggests thatwe will quickly learn from our mistakes either on our own orwith the help of "market forces."

## CONCLUSION

The study revealed the untapped factors which come in the way of decision such as emotions, personality type, gender difference, personal values, physical attractiveness, and relativity. Findings from the study also reflected the gender difference in some of the aspects of decision making. The current study has addressed the gap in the literature by tapping into the forces which

humans are rarely aware of, forces that make them irrational decision-makers. The emotions often influence the most when one is not aware of the current emotions they are going through. Awareness of one's own emotions might help us to make better and wise decisions (Engelmann, Hare, Fox, Lapate, Shackman, & Davidson, 2018). Hence, the study implies that recognizing the role of untapped forces in influencing decisions can help one to pay attention to these aspects while making a decision and hence improve the process of decision making.

**Implications**

The study implies that recognizing the role of untapped forces in influencing decisions can help one to pay attention to the untapped aspects while making a decision and hence improve the process of decision making.

**Future recommendations**

Further research can have focus on the aspect of heightened state of emotions playing a role in decision making.

**Funding**

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# RELATIONSHIP BETWEEN STRESS, COPING AND HEALTH IN ARMY SPOUSES DURING FIELD POSTING

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## ABSTRACT

The current research is part of the doctoral research on 'Relationship Between Stress, Coping and Health in Army Spouses During Field Posting' conducted on Indian army- spouses living in separated accommodation while their husbands are posted in a field. This paper focuses on the coping strategies used by Officer, JCO and NCO army- spouses and its relationship with number of deployments they have faced (NoDF). The participants were randomly selected from the doctoral research conducted. Equal distribution of participants was done. Descriptive research design analyzed the data using multivariate analysis of variance for this paper. Survey results indicate that age has significant association with denial of the situation and suppression of competing activities as coping strategies, as is the case for years of marriage. Type of commissioning (ToC) has significant association with seeking societal support, avoiding the problem and praying coping strategies indicating that army spouses prefer using above mentioned coping strategies. NoDF has significant association with problem solving and acceptance coping strategy. Indicating seasoned army spouses tend to accept the situation and utilize energy in solving the issues. The interaction effect of ToC-NoDF was on avoiding the problem coping strategy indicating that it is equally used by all levels of army spouses and it doesn't matter if they are facing deployment for the first time or have faced it more often.

**Keywords:** Coping strategies, army spouse, type of commissioning, deployment

## INTRODUCTION

The current paper is aimed at finding the difference between ToC/rank and NoDF by army spouses in the way they use coping strategies. The paper assumes there will be difference in the use of coping strategies based on rank and based on NoDF by army spouses. This paper is extracted from a doctoral research work done by the researcher on understanding the relationship between stress, coping and health of army spouses during deployment.

Women experience stress in all circumstances and situations. The army context however, induces greater stress, especially in situations of deployment. Spouses of army personnel are

involved in our defence services but are never focus of it. They have a very important role to play in terms of taking care of home and children, apart from performing the social duties so that the officer is able to concentrate well on his job.

Lt. Col. Jyoti Prakash is the only psychiatrist in the Indian army who has conducted research on these brave hearts. In his own words, "It is not easy to get permissions to do a study on families of officers, and thus difficult to research on this population, (Bavdekar & Joshi, 2011). Women have recently won the battle of having permanent commission in Indian army but they demonstrated their courageous presence during various wars. They displayed the same valour their spouses showed on the border by taking care of the family and keeping the whole unit intact and functioning in uncertain times. The present research is an effort to know the coping experiences of women (army spouses) whose husbands are currently deployed.

## LITERATURE REVIEW

The literature review includes following topics, stress, coping strategies, army context, women in army context and the relationship among these concepts. It includes the theoretical and conceptual frameworks of the research.

### Stress

Stress is a run-of-the-mill term of everyday life today. The term has lost the gravity it used to command in the 40s or 50s. The commonality of this term has resulted in many studies on the topic covering the effect and impact of it. This vast research base states that stress leads to physical and mental health troubles. In India, Dalal and Misra (2011) documented ancient Vedic texts mentioning physical and mental health issues stemming out of stress. The relationship of certain societal conditions with mental, physical, and moral deviations was brought to notice by Mondal (1996). His study talked about the ways to treat the bodily processes as much as the supernatural spirits (Mondal, 1996). Apart, from Vedas mentioning the remedy of these disorders, Ayurveda, which is the traditional medicinal system of India, emphasizes dealing with psychological problems for better treatment of physical health issues (Dalal & Misra, 2011).

It is interesting to note that the body-mind relationship, characteristic of modern stress studies, is emphasized in the Ayurvedic system of medicine as is in ancient scriptures. Ayurvedic therapy, aims at correcting the 'doshas' or the imbalances and derangements of the bodily humors and restoring equilibrium (Dalal & Misra, 2006).

In modern Western psychology, the term stress was coined by Hans Selye (1956). He then modified it to, "Stress is any external event or internal drive which threatens to upset the organismic equilibrium" (Selye, 1956, p.12), which is similar to what Ayurveda states.However, Lazarus's (1966) cognitive appraisal theorygives importance to appraisal of the stressor. The model is presented in Figure 1.

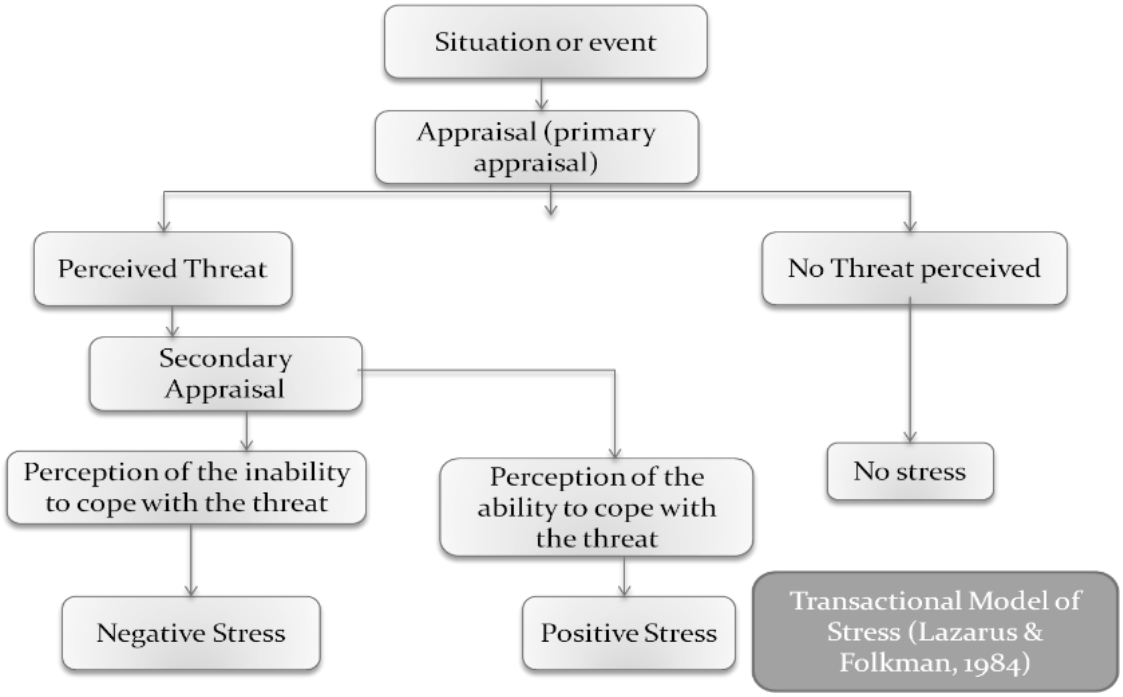


**Figure 1: Transaction Model of Stress**

[Adapted from: Lazarus, R. S., & Folkman, S. (1984) Stress, appraisal and coping. Springer: New York].

**Coping strategies**

Coping refers to active efforts to master, reduce, or tolerate the demands created by stress (Weiten & Lloyd, 2005). Once coping begins the situation changes, either in terms of its objective characteristics (if the person actually does something to help deal with the situation) or in terms of how the individual subjectively views the situation (Mehta, 2012). Coping strategies are the mechanisms which individuals use to deal with/ process or resolve situations which disturb their homeostasis. Lazarus (1984) categorized coping strategies into two major categories, problem-focused and emotion-focused; and further divided them into eight strategies. Coping strategies used at the right time in the right situation can help one lead a healthy lifestyle.

**Army context**

Worldwide, there have been many studies focusing on the health of defence personnel, their spouses, and exploring ways to help them lead a better life. One such study was done by Dimiceli and colleagues (2009) to identify their most stressful experiences in the last five years. They found that the length or NoDF experienced was a source of stress for civilian spouses of the deployed.

Similarly, a review of medical records of spouses of active duty army soldiers showed a significant increase in mental health diagnoses in spouses with deployed husbands compared to undeployed. Those experiencing prolonged deployment (greater than 11 months) had a higher number of diagnoses (Mansfield, Kaufman, Marshall, Gaynes, Morrissey, & Engel, 2010).

### Women in Indian army context

A pioneering study by Prakash (2008) to know the psychiatric morbidity in temporarily separated wives revealed that certain factors contribute for separated wives to be psycho-protective. Few of these factors were shorter period of separation, more number of years in military, longer duration of visit of husband, andbetter perception and coping of the stress. Seeking resolution and expression of feelings, establishment of independence and dependence upon religion were some of the effective coping patterns used (Prakash, Bavdekar, & Joshi, 2011).

There is, however, limited research on stress in the army context in India, this dearth of research work creates a gap in knowing the areas to be addressed to make the family front well-adjusted. Hence a study was conducted by the first author as a doctoral research. The current paper is drawn from that.

## OBJECTIVE

The purpose of this research was to find the relationship between Type of Commissioning (ToC) and Number of Deployments (NoDF) on the use of coping strategies by the spouses of Indian army personnel during deployment.

## METHOD

### Theoretical framework

The theoretical framework (Figure 2) used in the present study is adapted from Lazarus and Folkman's (1984) Transactional Model of Stress.According to this framework, when aperson is faced with a stressor, she or he evaluates the potential threat (primary appraisal).

Primary appraisal is a person's judgment about the significance of an event as stressful, positive, controllable, challenging or irrelevant. Secondary appraisals address what one can do about the situation.

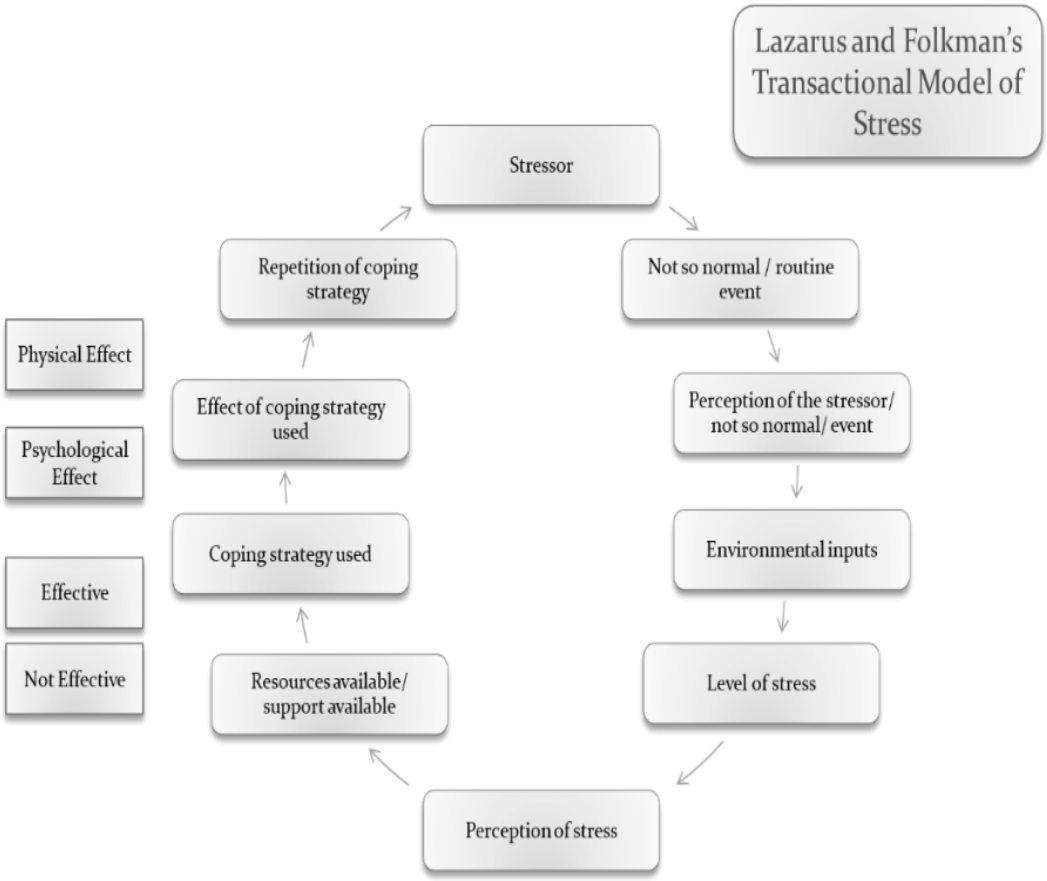


**Figure 2: Theoretical framework of the research**

Actual coping efforts aimed at regulation of the problem give rise to outcomes of the coping process.

**Conceptual framework**

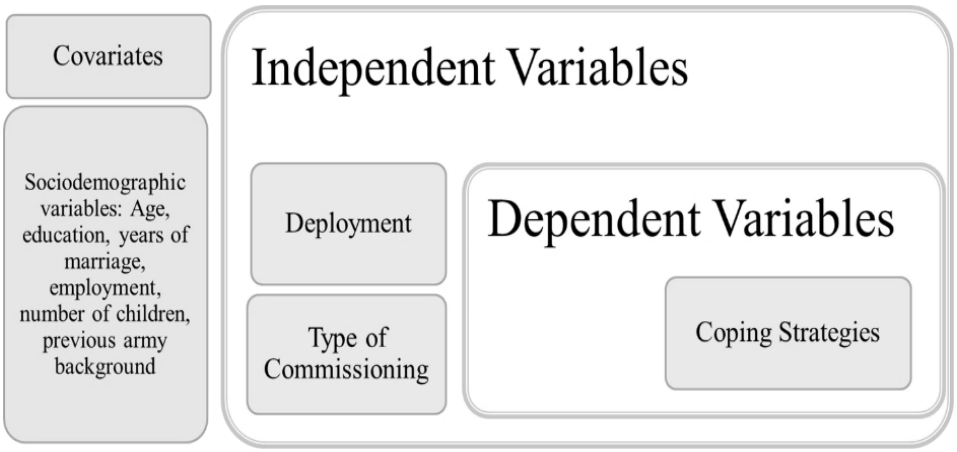


**Figure 3: Conceptual framework of the research**

**Procedure of data collection:**

The process of data collection started with taking prior permissions from the head of separated army quarters.The data was collected from ten stations/areas in India. The stations were Mumbai, Pune, Ahmedabad, Vadodara, Kirkee, Nasik, Kamptee, Delhi, Ambala, and Jalandar.

**Participants**

All data was drawn from spouses of officer rank, junior commissioned rank (JCO) and non-commissioned ranks (NCO) of Indian Army living in separated family accommodation (SFA) or field area family accommodation (FAFA) as their husbands were on field posting and they had no other support system in terms of extended family accessible to them, distribution of sample is shown in Table 1.

**Table 1: Distribution of Sample - Quantitative Data**

| | | NoDF | | |
|---|---|---|---|---|
| Number of Participants | | Faced field posting once | Faced field posting more than once | Total |
| ToC | Officer | 7 | 7 | 14 |
| | JCO | 7 | 7 | 14 |
| | NCO | 7 | 7 | 14 |
| Total | | 21 | 21 | 42 |

**Participant inclusion criteria**

- Women whose husbands have been posted in high risk field operations. (High risk field operations are those in which the life of the soldier or officer is at risk).
- Women whose husbands have faced deployment to high risk operation at least once but not more than eight times.
- Women who are living in SFA/ FAFA.
- Women who do not have any (extended) family support while living in FAFA.
- Women whose husband has been away for at least 5 months.

Research was conducted abiding all ethical standards (Human Subject Protections).

**Tools**

The researcher developed a questionnaire to gather data on (i) current rating of stress experienced, (ii) awareness of variation in level of stress, (iii) perception of stress, (iv) coping strategies adopted. The questionnaire is an adaptation and amalgamation of multiple tools, modified to include the cultural aspects and the context of the army. The questionnaire is based on Lazarus' Way of Life questionnaire (Folkman & Lazarus, 1980), Carver's COPE Inventory (Carver, 1989), David L. Tobin's Coping Strategies Inventory (Tobin, 1985, 1995), Cohen's Perceived Stress Scale (Cohen, 1994).

### Analysis

The quantitative data analysis was done using IBM SPSS Statistics 22 windows version. Descriptive statistics was computed for all the variables and multivariate analysis of variance was carried out between independent variables ToC and NoDF with dependent variable coping strategies (all 16).

## RESULTS

The study aimed at finding differences and relationships among variables and to achieve this quantitative analysis was done. The covariates in the study were demographic variables – age, education, years of marriage, employment, number of children, previous army background. Multivariate analysis of covariance (MANCOVA) was done to find the difference in coping strategies in Officer, JCO, NCO spouses and NoDF.

**Table 2**: **Participant Socio-demographics**

| Demographics | Categories | Frequency | Percentage |
|---|---|---|---|
| Age in Years | 35 - 40 | 35 | 83.3 |
| | 41 - 45 | 07 | 16.7 |
| | Total | 42 | |
| Education | Under Graduate | 20 | 47.6 |
| | Graduate | 11 | 26.2 |
| | Post Graduate and above | 11 | 26.2 |
| | Total | 42 | |
| Years of Marriage | Less than 10 years | 06 | 14.3 |
| | 11 years to 20 years | 30 | 71.4 |
| | 21 years and above | 06 | 14.3 |
| | Total | 42 | |
| Number of Children | </= 2 | 37 | 88.1 |
| | >2 | 05 | 11.9 |
| | Total | 42 | |
| Participant Occupation/Employment | Employed | 04 | 9.5 |
| | Homemaker | 35 | 83.3 |
| | Self Employed | 03 | 7.1 |
| | Total | 42 | |
| Defence Background | No | 30 | 71.4 |
| | Yes | 12 | 28.6 |
| | Total | 42 | |
| ToC | Officer | 14 | 33.3 |
| | JCO | 14 | 33.3 |
| | NCO | 14 | 33.3 |
| | Total | 42 | |
| NoDF | 1 | 21 | 50 |

| | | | |
|---|---|---|---|
| | More than 1 | 21 | 50 |
| | Total | 42 | |

Table 2 enumerates the demographic descriptives of the research participants. Responses from total 42 participants were taken in consideration for the research.

**Table 3: MANCOVA of denial of the situation coping strategy with ToC and NoDF**

| Denial of the situation | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| Age | 21.61 | 1 | 21.61 | 4.98* | 0.03 | 0.14 |
| Education | 0.08 | 1 | 0.08 | 0.02 | 0.9 | 0 |
| Years of Marriage | 8.2 | 1 | 8.2 | 1.89 | 0.18 | 0.06 |
| Number of Children | 2.28 | 1 | 2.28 | 0.52 | 0.47 | 0.02 |
| Employment | 1 | 1 | 1 | 0.23 | 0.64 | 0.01 |
| Background | 4.14 | 1 | 4.14 | 0.96 | 0.34 | 0.03 |
| ToC | 23.38 | 2 | 11.69 | 2.69 | 0.08 | 0.15 |
| NoDF | 6.58 | 1 | 6.58 | 1.52 | 0.23 | 0.05 |
| ToC * NoDF | 5.06 | 2 | 2.53 | 0.58 | 0.56 | 0.04 |
| Note. *p<0.05; **p<0.01 level. | | | | | | |

Table 3 shows that age score is significantly different [F (1,41) = 4.98 (p<.05)], for denial of the situation coping strategy. ToC was higher than the NoDF on age (mean difference = 21.61, p <0.05), ηƨ=.14.

**Table 4**: **MANCOVA of problem-solving coping strategy with ToC and NoDF**

| Problem Solving | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| Age | 2.23 | 1 | 2.23 | 0.13 | 0.72 | 0 |
| Education | 32.67 | 1 | 32.67 | 1.96 | 0.17 | 0.06 |
| Years of Marriage | 3.75 | 1 | 3.75 | 0.23 | 0.64 | 0.01 |
| Number of Children | 20.95 | 1 | 20.95 | 1.26 | 0.27 | 0.04 |
| Employment | 71.93 | 1 | 71.93 | 4.32* | 0.05 | 0.13 |
| Background | 35.67 | 1 | 35.67 | 2.14 | 0.15 | 0.07 |
| ToC | 42.48 | 2 | 21.24 | 1.28 | 0.29 | 0.08 |
| NoDF | 86.43 | 1 | 86.43 | 5.19* | 0.03 | 0.15 |
| ToC * NoDF | 16.2 | 2 | 8.1 | 0.49 | 0.62 | 0.03 |
| Note. *p<0.05; **p<0.01 level. | | | | | | |

Result in Table 4 shows that employment and NoDF score is significantly different [F (1,41) = 4.32 (p<.05)], and [F (1,41) = 5.19 (p<.05)] respectively for problem solving coping strategy. NoDF was higher than ToC on employment (mean difference = 71.93, p <0.05), ηƨ=.13 and NoDF (mean difference = 86.43, p <0.05), ηƨ=.15.

**Table 5: MANCOVA of seeking societal support coping strategy with ToC and NoDF**

| Seeking Societal Support | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| Age | 30.4 | 1 | 30.4 | 1.52 | 0.23 | 0.05 |
| Education | 0.08 | 1 | 0.08 | 0 | 0.95 | 0 |
| Years of Marriage | 27.1 | 1 | 27.1 | 1.35 | 0.25 | 0.04 |
| Number of Children | 0.72 | 1 | 0.72 | 0.04 | 0.85 | 0 |
| Employment | 0.01 | 1 | 0.01 | 0 | 0.98 | 0 |
| Background | 36.29 | 1 | 36.29 | 1.81 | 0.19 | 0.06 |
| ToC | 158 | 2 | 79 | 3.95* | 0.03 | 0.21 |
| NoDF | 26.68 | 1 | 26.68 | 1.33 | 0.26 | 0.04 |
| ToC * NoDF | 9.33 | 2 | 4.67 | 0.23 | 0.79 | 0.02 |
| Note. *p<0.05; **p<0.01 level. | | | | | | |

Result in Table 5 shows that ToC score is significantly different [F (2,40) = 3.95 (p<.05) for seeking societal support coping strategy. ToC was higher than NoDF on employment (mean difference = 158, p <0.05), η2=.21.

**Table 6: MANCOVA of avoiding the problem coping strategy with ToC and NoDF**

| Avoiding the problem | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| Age | 49.43 | 1 | 49.43 | 4.37* | 0.05 | 0.13 |
| Education | 0.45 | 1 | 0.45 | 0.04 | 0.84 | 0 |
| Years of Marriage | 24.65 | 1 | 24.65 | 2.18 | 0.15 | 0.07 |
| Number of Children | 2.1 | 1 | 2.1 | 0.19 | 0.67 | 0.01 |
| Employment | 16.82 | 1 | 16.82 | 1.49 | 0.23 | 0.05 |
| Background | 0.87 | 1 | 0.87 | 0.08 | 0.78 | 0 |
| ToC | 93.73 | 2 | 46.87 | 4.14* | 0.03 | 0.22 |
| NoDF | 23.74 | 1 | 23.74 | 2.1 | 0.16 | 0.07 |
| ToC * NoDF | 81.56 | 2 | 40.78 | 3.6* | 0.04 | 0.19 |
| Note. *p<0.05; **p<0.01 level. | | | | | | |

Result in Table 6 shows that age, ToC and interaction effect of ToC and NoDF score is significantly different [F (1,41) = 4.37 (p<.05)], [F (2,40) = 4.14 (p<.05)],and [F (2,40) = 3.6 (p<.05)] respectively for avoiding the problem coping strategy. NoDF was higher than ToC on age (mean difference = 49.43, p <0.05), η2=.13, on ToC (mean difference = 81.56, p <0.05), η2=.19 and on interaction effect (mean difference = 93.73, p <0.05), η2=.22.

**Table 7: MANCOVA of praying coping strategy with ToC and NoDF**

| Praying | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| Age | 11.29 | 1 | 11.29 | 1.12 | 0.3 | 0.04 |
| Education | 0.29 | 1 | 0.29 | 0.03 | 0.87 | 0 |
| Years of Marriage | 18.22 | 1 | 18.22 | 1.8 | 0.19 | 0.06 |
| Number of Children | 4.5 | 1 | 4.5 | 0.45 | 0.51 | 0.01 |
| Employment | 2.23 | 1 | 2.23 | 0.22 | 0.64 | 0.01 |
| Background | 2.4 | 1 | 2.4 | 0.24 | 0.63 | 0.01 |
| ToC | 77.11 | 2 | 38.56 | 3.82* | 0.03 | 0.2 |
| NoDF | 0.67 | 1 | 0.67 | 0.07 | 0.8 | 0 |
| ToC * NoDF | 3.43 | 2 | 1.72 | 0.17 | 0.84 | 0.01 |
| Note. *p<0.05; **p<0.01 level. | | | | | | |

Result in Table 7 shows that ToC score is significantly different [F (2,40) = 3.82 (p<.05)], for praying coping strategy. ToC was higher than the NoDF on age (mean difference = 77.11, p <0.05), ɳ2=.2.

**Table 8: MANCOVA of acceptance coping strategy with ToC and NoDF**

| Acceptance | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| Age | 3.17 | 1 | 3.17 | 0.53 | 0.47 | 0.02 |
| Education | 21.39 | 1 | 21.39 | 3.59 | 0.07 | 0.11 |
| Years of Marriage | 4.11 | 1 | 4.11 | 0.69 | 0.41 | 0.02 |
| Number of Children | 0.11 | 1 | 0.11 | 0.02 | 0.89 | 0 |
| Employment | 0.06 | 1 | 0.06 | 0.01 | 0.92 | 0 |
| Background | 0.68 | 1 | 0.68 | 0.11 | 0.74 | 0 |
| ToC | 12.72 | 2 | 6.36 | 1.07 | 0.36 | 0.07 |
| NoDF | 23.86 | 1 | 23.86 | 4* | 0.05 | 0.12 |
| ToC * NoDF | 2.48 | 2 | 1.24 | 0.21 | 0.81 | 0.01 |
| Note. *p<0.05; **p<0.01 level. | | | | | | |

Results in Table 8 shows that number of deployment score is significantly different [F (1,41) = 4 (p<.05)], for acceptance coping strategy. ToC was higher than the NoDF on age (mean difference = 23.86, p <0.05), ɳ2=.12.

**Table 9: MANCOVA of suppression of competing activities coping strategy with ToC and NoDF**

| Suppression of competing activities | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| Age | 76.96 | 1 | 76.96 | 22.09* | 0 | 0.42 |
| Education | 1.07 | 1 | 1.07 | 0.31 | 0.58 | 0.01 |
| Years of Marriage | 18.48 | 1 | 18.48 | 5.31* | 0.03 | 0.15 |
| Number of Children | 0.83 | 1 | 0.83 | 0.24 | 0.63 | 0.01 |
| Employment | 2.08 | 1 | 2.08 | 0.6 | 0.45 | 0.02 |
| Background | 0.58 | 1 | 0.58 | 0.17 | 0.69 | 0.01 |
| ToC | 16.47 | 2 | 8.24 | 2.36 | 0.11 | 0.14 |
| NoDF | 2.34 | 1 | 2.34 | 0.67 | 0.42 | 0.02 |
| ToC * NoDF | 11.12 | 2 | 5.56 | 1.6 | 0.22 | 0.1 |
| Note. *p<0.05; **p<0.01 level. | | | | | | |

Result in Table 9 shows that age and years of marriage score is significantly different [F (1,41) = 22.09 (p<.05)], and [F (1,41) = 5.31 (p<.05)] for suppression of competing activities coping strategy respectively. ToC was higher than the NoDF on age and years of marriage (mean difference = 76.96, p <0.05), η2=.42, (mean difference = 18.48, p <0.05), η2=.15.

**Table 10: MANCOVA of self-control coping strategy with ToC and NoDF**

| Self-control | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| Age | 6.94 | 1 | 6.94 | 1.88 | 0.18 | 0.06 |
| Education | 22.33 | 1 | 22.33 | 6.05* | 0.02 | 0.17 |
| Years of Marriage | 0.53 | 1 | 0.53 | 0.14 | 0.71 | 0 |
| Number of Children | 1.27 | 1 | 1.27 | 0.34 | 0.56 | 0.01 |
| Employment | 15.24 | 1 | 15.24 | 4.13* | 0.05 | 0.12 |
| Background | 0.24 | 1 | 0.24 | 0.07 | 0.8 | 0 |
| ToC | 32.32 | 2 | 16.16 | 4.38 | 0.02 | 0.23 |
| NoDF | 0.7 | 1 | 0.7 | 0.19 | 0.67 | 0.01 |
| ToC * NoDF | 6.57 | 2 | 3.28 | 0.89 | 0.42 | 0.06 |
| Note. *p<0.05; **p<0.01 level. | | | | | | |

Result in Table 10 shows that education and employment score is significantly different [F (1,41) = 6.05 (p<.05)], and [F (1,41) = 4.13 (p<.05)] for self-control coping strategy respectively. ToC was higher than the NoDF on age and years of marriage (mean difference = 22.33, p <0.05), η2=.17, (mean difference = 15.24, p <0.05), η2=.12.

However, there was no significant difference between ToC, NoDF, demographic variables and coping strategies – cognitive restructuring, expressing emotions wishful thinking, self-

criticism, social withdrawal, humour, substance use, behavioural disconnection among army spouses.

## DISCUSSION

The results of the analysis done indicate that age has significant difference with ToC and NoDF in using denial of the situation and suppression of competing activities coping strategies. This could be the result of natural age-related maturity or familiarity with the environment which makes the army spouses differ in the use of these coping strategies.

Years of marriage has significant difference with ToC and NoDF in usingsuppression of competing activities coping strategy. This may be because army spouses might have gone through many stressful experiences and have learnt to prioritize and attend to pressing situation at hand.

ToC has significant difference with seeking societal support, avoiding the problem and praying as coping strategies. This indicates that army spouses of Officer, JCO and NCO prefer using above mentioned coping strategies. Army spouses find it helpful to mingle with spouses in similar situation and have faith in God to deal with the stress of husband being in the stressful terrains/risky situations. The NoDF has significant association with problem - solving and acceptance coping strategies. This could be due to army spouses learning to accept the situation and utilize energy in solving the problems of being a homemaker.

The interaction effect of ToC and NoDF is on avoiding the problem coping strategy. This indicates that this coping strategy is equally used by all levels of army spouses and it doesn't matter if they are facing deployment for the first time or have faced it more number of times and which was also found to be stressful by the research done by Dimiceli (2009).

## CONCLUSION

This paper helped in understanding the difference between ToC and NoDF in the way they use coping strategies to deal with the stressors. There was difference found in the newcomers and those who have been in military life for a long time. There is no one answer to which coping strategy is best at what time, however, it was found that having a support system, expressing what they are feeling and belief in God helped army spouses sail through tough times.

### Limitations

The study assumes that army spouses experience stress.

- The study assumes that the respondents have the ability to report the information requested in an accurate and forthright manner.
- The study is based on the personal perception of the participants.
- No professional screening was done to check for physical or psychological illness.

### Implication

- Although the present investigation was largely exploratory, its findings provide an important context for further research and analysis.

- The study will be helpful for women who get married into an army family and are clueless, helping them lead a better life.
- The study will help in developing a therapeutic model specific to army spouses to be able to better help them cope with stresses of army life.

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# STUDY OF ATTITUDE AND ANXIETY IN POPULATION OF BIHAR DURING CORONA PANDEMIC

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## ABSTRACT

Novel Corona Virus Disease (COVID-19) originating from China has rapidly infected people throughout the whole world. The current pandemic has resulted in loss of predictability, loss of routine, loss of classroom learning, and loss of exposure to space. This phenomenon has led to a massive public reaction; the media has been reporting continuously across borders to keep all informed about the pandemic situation. All these things are creating a lot of concern for people leading to heightened levels of anxiety. Pandemics can lead to heightened levels of stress. Anxiety is a common response to any stressful situation. This study attempted to assess the attitude and anxiety among adult population of Bihar during the COVID-19 pandemic. An online survey was conducted using a semi-structured questionnaire using a non-probability snowball sampling technique. A total of 300 responses were received. More than 80 % of the participants thought infection leads to death. Nearly 85% agreed to adopt quarantine/ isolate themselves if they had a fever and cough. A wide majority (96 %) of the participants thought social distancing is essential to stop the virus from spreading. The anxiety levels were identified as 'high' in the study. In this study, more than 80 % of the participants were feeling anxious with the COVID-19 pandemic over the last months. Nearly 64% were not able to stop worrying. About 72 % of participants reported being worried for themselves and their close ones during the ongoing pandemic. In conclusion, the COVID-19 pandemic is associated with increased level of anxiety of our sample, even though the COVID-19 pandemic is still ongoing. Increased anxiety level may affect mental health of population. So, there is a need to intensify the awareness and address the mental health issues of people during this COVID-19 pandemic. These findings would need to be verified in larger population studies.

**Keywords-** Awareness, Attitude, Anxiety, COVID-19 pandemic.

## INTRODUCTION

COVID-19 started in December 2019, like a viral outbreak in Wuhan city of central Hubei province of China (Holshue *et al*., 2020). On 11th January, China announced its first COVID-19 related death of a 61-year-old man, exposed to the seafood market (WHO, 2020a). Over a period of few weeks, the infection spread across the globe in rapid pace (WHO, 2020b). Looking at the stretch this outbreak spread to countries, WHO declared it a Public Health Emergency of International Concern on 30th January 2020 (WHO, 2020b, 2020c). On 11th February, WHO announced a name for the new corona virus disease: COVID-19 (WHO, 2020c) and on the 11th of

March, WHO declared COVID-19 - a pandemic, as, by then about 114 countries were affected (WHO, 2020c).

The governments, media, doctors, researchers, celebrities, police and other stakeholders of the society appealed to the public to avoid public gatherings including sports, religious ceremonies, family functions, meetings as well as classes in school, so as to prevent the global spread of corona virus infection (McCloskey *et al*., 2020). Despite these efforts, many people ignore the importance of social distancing due to attitudinal issues. The anxiety and concerns in society are globally affecting every individual to variable extents. Recent evidence suggests that individuals who are kept in isolation and quarantine experience significant distress in the form of anxiety, anger, confusion and post-traumatic stress symptoms (Brooks *et al*., 2020). The attitude of the individual are expected to largely influence degree of adherence to the personal protective measures and the anxiety they feel. Hence, it is important to study attitude and their anxiety level, which are expected to increase day by day during this epidemic.

## OBJECTIVE

To Study Attitude and Anxiety in Population of Bihar During Corona Pandemic

## MATERIALS AND METHODS

The present study was a cross-sectional, observational study carried out in Bihar. A non-probability Snowball sampling technique was used. An online semi-structured questionnaire was developed by investigator. It contained the two sections related to attitude and anxiety during the pandemic of the novel corona virus. There were 8 multiple choice questions in the attitude section that were to be rated in the 5-point Likert scale format. The other section on Anxiety related to novel corona virus infection had 17 items that were rated on a 5-point Likert scale ranging from never, occasionally, sometimes, often and always. The study was conducted in the month of April 2020. Descriptive statistics have been used in the study to analyze the results. Mean and standard deviation and proportions have been used to estimate the results of the study.

## RESULT AND DISCUSSION

After online survey, related to attitude and anxiety experience in the community, a total of 300 responses were recorded. All the participants were above 18 years of age. The study included only those participants who understood English and had access to the internet. Hence, by default individuals with a higher level of education were included in the study. The lowest educational level in this study was observed to be standard 10th. The highest qualification of more than 80 % of the population was graduation and above. The mean age of the participants was 29.09 ± 9.63 years. Among the participants, 59 % were males and 41 % were females. More than 80 % of participants were from urban areas.

**Attitude towards COVID-19 pandemic**

More than 80 % of the participants thought infection leads to death. Nearly 85% agreed to quarantine/ isolate themselves if they had a fever and cough. Most (96 %) of the participants thought social distancing is essential to stop the virus from spreading. However, 82 % of them considered traveling within the city with taking precautions to be safe during the pandemic. Only 40 % of participants believed that patients recovered from COVID-19 infection, should be allowed to stay within the community at this time.

***Anxiety related to Corona pandemic:***

Anxiety is a common response to any stressful situation. The findings regarding anxiety related to corona virus pandemic are presented in table 1.

**Table: 1: Anxiety related to COVID-19 pandemic**

| Sr. No. | Item | % of responses who feel anxious (often and always) (N=300) |
|---|---|---|
| 1. | Over the last one month, feeling anxious due to COVID-19 pandemic | More than 80% |
| 2. | Over the last one month, not able to stop worrying | 64% |
| 3. | Over the last one month, being worried for themselves and their close ones | 72% |
| 4. | Over the last one month, easily annoyed | 70% |
| 5. | Over the last one month, sleeping difficulty due to being worried about the pandemic | 18% |
| 6. | Over the last one month, reduced social contact | 82% |
| 7. | Over the last one month, avoided meeting or gathering along with neighbours | 80% |
| 8. | Over the last one month, avoided entry of maid servant/helper | 90% |
| 9. | Over the last one month, repeatedly discussed the pandemic with the friends | 80% |
| 10. | Over the last one month, feeling scared when someone in their social circle became sick | 81% |
| 11. | Over the last one month, felt the need to use sanitizers and gloves | More than 85% |
| 12. | Over the last one month, frequently washed my hands | 90% |
| 13. | Over the last one month, worry for economy in future | 33% |
| 14. | Over the last one month, have worry for loss of business or job due to pandemic | 35% |
| 15. | Over the last one month, worried about food and nutrition security in future | 46% |
| 16. | Over the last one month, felt panic by the reports of COVID-19 pandemic on the electronic and print media | 50% |

More than 80 % of the participants were feeling anxious with the COVID-19 pandemic over the last month. Nearly 64% are not able to stop worrying. About 72 % of participants reported being worried for themselves and their close ones during the ongoing pandemic. About 70% participants were easily annoyed during pandemic. Approximately, 18 % of the participants had sleeping difficulty due to being worried about the pandemic in the last month. Among the participants, 82 % had reduced social contact, and about 80 % avoided meeting or gathering along with neighbours also. Around 90 % of the participants avoided entry of maid servant/helper. A total of 80 % of participants repeatedly discussed the pandemic with the friends during this period. In our study, 81 % of the people affirmed feeling scared when someone in their social circle became sick. More than 85 % felt the need to use sanitizers and gloves. Almost 90 % agreed that they frequently washed their hands. About 1/3rd participants reported having worry for economy in future. Almost 35 % of the people have worry that they may loss business or job due to pandemic. Nearly 46% of participants are worried about food and nutrition security in future. Nearly half the participants felt panic by the reports of COVID-19 pandemic on the electronic and print media over last month.

## CONCLUSION

During this corona virus pandemic, most of the educated people are aware of this infection, possible preventive measures, the importance of social distancing and government initiatives were taken to limit the spread of infection. However, there are increased worries and apprehensions among the public regarding acquiring the COVID-19 infection. There is a need to intensify the awareness program and for planning effective intervention strategies for improving their mental health.

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