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FROM THE EDITOR'S DESK

The educational institutions giving Home Science education have been excellent in their academics, research and extension. They have been reviewing, re-visiting, revising and upgrading their curriculum to keep pace with the world.

Research are being conducted in each of the sub-specialization, the results of which are linked with society and industries. Increasingly the designs and products developed by Home Science researchers are obtaining Patents and copy rights. More such researches need to be encouraged. Such research papers are published in this journal.

The extension works or community out- reach programmes are inbuilt in the curriculum of Home Science. Concentrated and constant efforts need to be continued for the upliftment and empowerment of those adolescent girls who are the future of the nation. Those who could not pursue their formal education after secondary school, need to be helped to obtain necessary skills for being an efficient home maker and to develop entrepreneurial skills.

The students of Home Science need to be made increasingly sensitive to the specific group of the society- the children with special needs, the senior citizens –especially those who live alone. They should visit the old-age homes and orphanage- with due permissions- to become more sensitive to their lives. Need based programmes can be organized for betterment of their living.

As the curriculum are being redesigned for being inter disciplinary- which is in line with NEP, - some short-term courses can be offered by Home Science to the students of other fields focusing on the needs and care of such groups of the society.

Wishing the best for further growth of Home Science….

DR. MANEESHA SHUKUL

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NATURAL PRODUCTS FOR NATURAL FABRICS: ECO-FRIENDLY DYEING AND ANTIBACTERIAL FINISHES FOR SILK

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ABSTRACT

In recent years, research exploration on eco-friendly products has gathered immense attention worldwide. With the growing awareness amongst consumers about environmental issues and hygienic lifestyles, these perceptions lead to the maximum consumption of the Natural-Products now-a-days. Keeping in mind the natural product innovation concept, many firms and companies are now producing eco-friendly products for consumer's well-being as well as for environmental concern. Thus, in the present study, silk fabric was treated with Indian madder roots as dye by using bael fruit rinds as mordant. 100% madder dye concentration (owf) was used to dye silk fabric with 20% mordant concentration (owf) by using pre, post and simultaneously mordanting techniques. After dyeing, dyed samples were assessed for colour measurement by using Data colour 650 spectrophotometer. Further, dyed samples were tested for colour fastness to washing, crocking (dry and wet), artificial perspiration (acidic and alkaline) and light fastness properties. It was found that pre-mordanted dyed sample showed good fastness properties. The antibacterial property of the control sample, un-mordanted and pre-mordanted dyed samples were tested against *Staphylococcus aureus* bacteria. The assessment was carried out by using quantitative antibacterial activity assessment for textile material AATCC 100-2004 test method. The results indicate that by using bael fruit rinds as mordant with madder roots dye exhibits good fastness properties as well as significant antibacterial activity.

Keywords: Eco-friendly dyeing, madder, bael fruit rind, antibacterial finish.

INTRODUCTION

The environmental harm caused by the haphazard use of poisonous and carcinogenic chemicals has escalated in recent decades, posing a threat to mankind. The world's second biggest polluter industry after oil is textile industry which creates air, water and noise pollution at every step of manufacturing. Emission of hazardous gases into air during textile operations including printing, dyeing, finishing, drying operations etc., pollute water bodies by discharging untreated wastewater effluent and excessive noise by machines (Parvathi, Maruthavanan and Prakash, 2009). The typical pollutants present in textile effluent are toxic heavy metals, Bio-chemical oxygen demand (BOD), Chemical oxygen demand (COD), Residual chlorine, Total dissolved solids (TDS), hazardous chemicals and dyes etc. (Kohli and Arya, 2009). The foremost contributor of the raw effluent is textile wet processing section which includes sizing and desizing, scouring, dyeing and finishing processes. It is also an important section of textile manufacturing which contributes towards the value additions: aesthetic, comfort and functional properties in the textiles. However, a

huge quantity of water is used throughout the processing and wastewater effluent gets contaminated with unfixed dyes, chemicals or auxiliaries which is very complex to treat, recycle or biodegrade. Consequently, the enduring sustainability of the textiles industry is under significant menace from a wide range of social, human rights, environmental and commercial governance factors. Therefore, there is a need to adopt eco-friendly wet-processing sustainable practices such as environment friendly bleaching, dyeing and printing processes, low impact dyes or natural dyes, using phthalates free or bio based printing techniques to prevent the further contamination of water with toxic substances and to lessen the environmental and social impact of textile production around the world (Sharma, 2013 and Saxena, Raja and Aeputharaj, 2017).

The textile processing industry is one of the major users of dyes. However, dyeing methods are often associated with water waste, energy generated with fossil fuel, toxicity and contamination, hence posing a serious threat to the environment and human health. Thus, a renewed international interest for natural colored substances is increasingly intensifying, as these are non-toxic, biodegradable and eco-friendly in nature (Carvalho and Santos, 2015). Through the ages, application of natural dyes for colouring textile material, food substrate, leather and wood were recorded. Ancient Egyptian hieroglyphs comprehend a thorough description of natural dyes with their process of the extraction and application in dyeing. The cave paintings of Ajanta, Ellora, and Sithannvasal, as well as ancient Indian Vedic literature such as the Atharveda, demonstrate the usefulness of prehistoric natural dyeing art in India. It is also stated that dyes can be obtained from nature as an extraction from various parts of plants that include roots, bark, leaves, flowers and fruits; or from insect/animal origin namely cochineal, kermes, shell-fish, mollusks, urine of cow and camel dung as well as from minerals sources like oxides of iron and tin, salts like copper and iron sulphate that are also used as auxiliaries or as mordants in dyeing (Vankar, 2016).

In 1856 W.H. Perkin discovered first synthetic dye and subsequent upsurge in exploration, production and application of synthetic dyes marked the initial step in the decline of the natural dyestuff (Bechtold and Mussak, 2009). Synthetic dyes were not only accepted by textile industries but also used by paper, paint, cosmetic, food and pharmaceutical industries. These dyes gained popularity due to wide range of colour availability as well as excellent fastness properties. But with time it has been noticed that these dyes have toxic or carcinogenic complex and have a massive impact on aquatic ecosystem and human well-being (Merdan, Eyupoglu and Duman, 2017). Due to an increased environmental alertness and harmful effects to human well-being like skin allergies, cancers and various health issues to dyers, various azo dyes and amine releasing dyes were banned in all over the world (Choudhury, 2006). Thus, many companies and firms have started relooking to make maximum use of natural or low impact dyes for targeting niche market. Along with ecological benefits, many natural dyes also have multi-functional properties like flame retardancy, insect repellency, deodorizing, antimicrobial and UV protection properties etc. (Saxena, and Raja, 2014). Hence, natural dyes with therapeutic properties are gaining more interest in many fields.

Textile industry is also now constantly working on novel finishes to provide high value addition to textile fabrics in an eco-friendly way which is highly appreciated by the consumers. These finishes can be applied to apparel fabrics, home textiles and technical textiles to enhance their performance or functional appeal to the consumer and to stimulate the growth in niche markets (Paul, 2015). Amongst novel or functional finishes, textiles finished with antimicrobial agents have varieties of application in apparel, household textiles, medical textiles as health and hygiene products, skin-friendly clothes and numerous medical purposes as infection control, barrier material, control of microorganisms etc. With the growing demand for functional textiles,

there is an increase in new antimicrobial textile technologies and wide range of textile products are developed based on synthetic antimicrobial agents such as metal and their salts, phenols, triclosan, quaternary ammonium compounds, and organometallics. Even though, these synthetic antimicrobial agents confirmed significant efficacy against various micro-organism, but they also pretense a threat to the human well-being as well as to the environment. They cause side effects to human skin, have action on non-targeted microorganisms and pollute water bodies also. Therefore, eco-friendly antimicrobial agents are in demand which not only lessen microbial growth on textile material but also act in accordance with legal requirements obligated by regulating agencies for protecting environment (Babu and Ravindra, 2014).

OBJECTIVES

Thus, the present study was undertaken with the following objectives

(i) Eco-friendly dyeing with Madder (*Rubiacordifolia*) root as a dyeing agent and rinds of Bael (*Aegle marmelos*) as a mordant,

(ii) Assessment of colour fastness properties and colour strength of dyed samples, and

(iii) Quantitative Antibacterial Activity Assessment of untreated and treated silk samples.

LITERATURE REVIEW

- **Synthetic dyes- Their usage and Environmental impact**

China's largest industrial centre for producing and applying benzidine derived dyes is Shanghai. You et al. (1990) conducted case study on seven dyestuffs factories in which respondents were divided into two groups according to job i.e. pre-synthesis group (exposure to benzidine) and post-synthesis group (exposure mainly to benzidine derived dyes). The results showed that the key cause of bladder cancer is occupational exposure, especially to benzidine during pre-synthesis stage of dye manufacturing.

Tsuboy et al. (2007) tested commercial dye CI Disperse Blue 291 for genotoxicity and cytotoxicity in the human hepatoma cell line HepG2. In mammalian cells, the dye CI Disperse Blue 291 was shown to be genotoxic and mutagenic. As a result, non-toxic and natural dyes must be created, as well as better handling of dye effluents, to avoid adverse effects on humans and aquatic bodies.

Pierre (2013) studied that there is significant relationship between occupation and cancer amongst the workers who are working in leather industry. The results showed the buccal cavity, pharynx and larynx cancers presence in them. It was found that the processes and agents used in leather processing are carcinogenic materials, including azo and other synthetic dyes that stimulate cancer in laboratory animals.

Khan and Malik (2014) studied that untreated textile wastewater effluent in water reduces the oxygen concentration and also blocks the way of light in water which is harmful to the water ecosystem. Textile industry also cause air pollution through emission of hazardous gaseous during processing which may cause allergic reactions to human skin and, impairment of important functions like respiration, osmoregulation, reproduction, and even mortality.

- **Natural Dyes from Indian Madder (*Rubiacordifolia*) roots and Bael fruit (*Aegle marmelos*) rinds**

Yusuf et al. (2011) studied the application of two natural dyes i.e. powdered henna leaves and Indian madder roots on woolen yarn by using stannous chloride as mordant. Sixteen shades were developed with good colour strength in all samples. The color fastness was quite satisfactory for both dyed samples. Only Henna leaves extract exhibits a high level of antifungal activity in solution as well as after application on woolen yarn.

Patkar et al. (2012) reviewed about a potential of medicinal tree i.e. Aegle marmelos commonly named as Bael or Bel. Different parts of plants were investigated and results showed that varied classes of compound viz., alkaloids, coumarins, terpenoids, fatty acids and amino acids were present in it. It was reported in the study that fruit rind contains up to 20% tannin and limonene rich oil distilled from rinds which were also used to scenting hair oil.

Das and Mondal (2012) highlighted the uses of natural dyes by the local people in two famous handicrafts viz. 'Patchitra' and 'Mat craft' in West Bengal. In this research, they investigated 15 dye yielding plants belonging to 11 families out of which one of dye is extracted from fruit shell of *Aeglemarmelos*(Bael). It was explained that fruit shell was crushed and boiled in water to get yellow colour.

Devi and Siril (2013) made an attempt to identify the pharmacognostic features of various parts of R. cordifolia. The powder of stem, roots and leaves were tested for organoleptic characters, proximate analysis, physio-chemical behavior. The phytochemical analysis showed more intensive red colour in root powder compared to stem and leaves indicating the presence of more amount of anthraquinones in the roots. Hence, it is evident that R. cordifolia have therapeutic values and can be used in making health care products.

One of the oldest used natural dyes is Madder which is also considered the queen of the reds. Jahan and Datta (2015) investigated various coloring effects of madder dye on cotton and silk with alum and copper sulphateasmordants. The dyed silk samples showed deeper shades as well as mordanted silk sample with alum exhibited greater color fastness to wash than cotton samples. Finally, the test concluded that silk fabrics can be made more sophisticated with strong versatile shades of madder.

MATERIALS AND METHODS

- **Plant material:** For the present study dried Indian madder (*Rubiacordifolia*) roots were purchased from local market and used as a dyeing agent whereas Bael (*Aegle Marmelos)* fruits were collected from the garden and their rinds were used as mordant.
- **Substrate:** Pure silk fabric was used for dyeing.
- **Aqueous extraction of dye and mordant:** The aqueous extraction method was used to extract dye from the dried roots which were firstly washed, dried in shade and converted into powder form. The powder was taken according to the 100% concentration (conc.) of dye multiply by the weight of fabric (owf) and then soaked in a known volume of water for overnight. The extraction process was carried out for 2 hours by maintaining the level of solution at 60°C in the container followed by filtration using muslin cloth to obtain a clean dye solution.

For mordant, rinds of bael fruit were separated from seeds and pulp. Then these were dried for few days and crushed with hammer into small pieces and then grounded into fine power. This powder was taken according to the 20% conc. of mordant multiply by the weight of fabric (owf). The extraction process was carried out for 3 hours by maintaining the level of solution at 100°C in the container and followed by filtration through muslin cloth to get a clean solution.

- **Mordanting:** Mordanting was carried out by treating the silk fabric with solution of rinds of bael fruit (20% conc. owf) at 80°C for 30 minutes with known volume of water. The process was carried out at three stages i.e. pre-mordanting (mordanting followed by dyeing), simultaneous mordanting (dyeing and mordanting is carried out together) and post-mordanting (dyeing followed by mordanting).
- **Dyeing:** Dyeing of silk fabric was done by solution of madder roots (100% owf) maintaining the known volume of water at 100°C for 30 minutes. After dyeing, samples were washed with water and then dried.
- **Measurement of Color Strength:** The color characteristics of the dyed samples were determined based on the CIELAB system via the Data colour 650 spectrophotometer with illuminant D65 and 10° observers.
- **Color Fastness Test**
    - Color fastnesses to washing of dyed samples were tested according to ISO 105 CO2 by using Laundr-o-meter.
    - Color fastnesses to crocking (dry and wet) were tested according to ISO 105 -X12 by using Crock meter.
    - Color fastnesses to artificial perspiration and light of dyed samples were tested according to ISO 105 E04 and ISO 105 BO2 by using Per spirometer and Xenotest Light fastness apparatus.
- **Quantitative Antibacterial Activity Assessment of Textile Materials:** The antibacterial activity of selected dyed samples of silk fabric was tested against *Staphylococcus aureus* with AATCC-100:2004 test method. The visible bacteria colonies on agar plate were counted and the percentage reduction of bacterium was calculated. The formula used for calculation is as follow:

$$R\ (\%) = \frac{(B-A)}{A} \times 100$$

Where, *R* is the percentage reduction of bacterium, *A* is the number of bacterial colonies recovered from the inoculated treated test specimen swatch and *B* is the number of bacterial colonies recovered from the inoculated untreated control test specimen swatch.

RESULTS AND DISCUSSION

- **Preparation of aqueous extract of dye and mordant:** It was observed that madder roots powder extract was boiled for two hours and dark red color was obtained whereas dark yellow color was obtained from bael rinds powder extract by boiling it for three hours.
- **Color measurements of dyed silk fabric:** Silk fabric dyed with madder root and mordanted with Bael rind gained darker shade in pre and post mordanting techniques whereas lighter shades in simultaneously mordanting techniques shown in Table 1. It was also observed that there is increase in colour strength with post mordanting in comparison to pre and simultaneous mordanting technique.

Table-1: Color characteristics and color strength of dyed samples

Dyed samples	ΔL	ΔC	ΔH	ΔE	Description
M	Standard				--
MB_1	-0.43	-0.10	.79	.90	Darker more green more yellow
MB_2	0.82	-0.33	1.24	1.53	Lighter more red more yellow
MB_3	-0.30	-3.55	-9.39	10.04	Darker more green more blue

(M- Madder root dyed sample, MB_1 –Pre mordant sample, MB_2- Simultaneously mordant sample, MB_3- Post mordant sample)

- **Color fastness properties of dyed samples:** Dyed samples were tested for various colour fastness properties according to IS methods as shown in Table 2. With regards to color fastness for washing, it was found that sample showed good fastness in pre mordanting whereas fair fastness properties in post and simultaneous mordanting technique. It was also observed that, there was slightly colour staining on cotton and wool of multifibre fabric. Pre mordanted sample showed good fastness in wet and dry crocking too. All dyed samples showed almost same colour fastness to light i.e. average. Artificial perspiration fastness was also tested under acidic and alkaline condition and it was observed that pre and post mordanted sample showed similar results in both conditions i.e. average to good. It was concluded that pre mordanted sample showed good fastness properties to washing, crocking and artificial perspiration.

Table-2: Colorfastness' properties of dyed samples

Dyed samples	**Washing ISO 105 CO2**		**Crocking ISO 105 -X12**		**Light ISO 105 E04**	**Perspiration ISO 105 BO2**			
			Dry	Wet		Acid		Alkaline	
	CC	CS	CS	CS	CC	CC	CS	CC	CS
M	2/3	4	3	2/3	2	3	3/4	2/3	3
MB_1	4	4/5	4	3/4	2/3	4	4	3/4	3/4
MB_2	3	4/5	3/4	3	2	3	3/4	3	3
MB_3	3/4	4/5	3/4	3/4	2/3	4	4	3	3/4

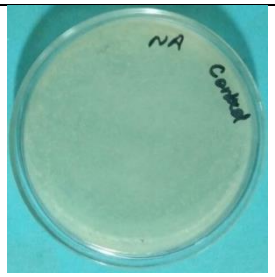
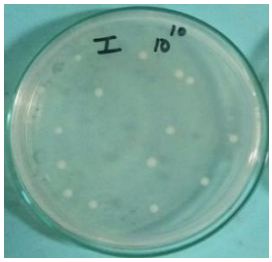
CC- Color Change, CS- Color Staining

(M- Madder root dyed sample, MB_1 –Pre mordant sample, MB_2- Simultaneously mordant sample, MB_3- Post mordant sample)

- **Quantitative Antibacterial Activity Assessment of Textile Materials**

It has been found that pre-mordanted dyed sample showed good washing and crocking fastness properties, on the basis of this pre-mordanted, un-mordanted dyed sample and untreated silk sample were tested against *Staphylococcus aureus***.** The results were calculated and tabulated below as shown in Table 3. It was found that untreated silk fabric sample showed 100% bacterial growth whereas samples dyed with madder root extract (un-mordanted) and pre-mordanted with bael rinds showed 89.79% and 84.69% bacterial reduction. Hence, both dye and mordant i.e. Indian madder roots and rinds of bael fruit extract exhibits significant antibacterial activity.

Table-3: Quantitative Antibacterial Activity Assessment of samples against *Staphylococcus aureus*

Control sample (C)	Un-mordanted sample (M)	Pre-mordanted sample (MB_1)
		
	Bacterial Reduction Percentage 89.79%	Bacteria Reduction Percentage 84.69%

(C- Untreated silk fabric, M- Madder root dyed sample, MB_1 –Pre mordant sample)

CONCLUSION

Silk is hygroscopic proteinous fibre which is usually more susceptible to biodeterioration by microbes during usage and storage. Hence, antibacterial treatment can be a solution to this deterioration. Thus, the present study was under taken where silk fabric was dyed with madder roots by using bael fruit rinds as mordant. The results indicated that colour strength was considerably improved by using mordant and post mordanted sample showed highest colour strength value. In terms of colour fastness to washing, crocking and artificial perspiration, pre-mordanted sample showed good fastness properties than simultaneously and post mordanted samples. In order to achieve eco-friendly dyeing and antibacterial finish, the present study confirmed a significant approach by using natural dye i.e. madder root with bio-mordant i.e. bael fruit rind, to reduce the pollution with substitution of metal salts to accomplish the requirement of the world in current scenario. This paper will also draw attention to the possibilities of using these bioactive materials for treating fabrics with novel or functional finishes for developing multi-functional products.

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ANALYSIS AND COMPARITIVE STUDY OF RETTED UNDERUTILIZED BAST FIBERS

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ABSTRACT

Ecological concerns by the textile consumers have resulted in a resumed interest in renewable resources-based products. Global concern on the green environment has made various developments of the textile plant fibers. The efforts were taken up to develop eco-friendly and biodegradable fibers without using any kinds of chemicals to control the polluting environment.Many potential sources of natural fibers are available for use in diversified fields, which can be explored for the benefits of environment and the grower. The three medicinal underutilized bast fibers (Castor, Turmeric and Neem) were extracted by the process of retting in this study.The main aim of the study is to explore and evaluate the underutilized fibers for a sustainable development in the textile areas.

Keywords: green environment, retting, underutilized, bast fibers, sustainability

INTRODUCTION

Nature has a diverse field of fibers. They are available almost everywhere, renewable, low cost, fully biodegradable in nature and numerous benefits to the environment and the user as well. Several eco-fibers have been progressively used in various fields of Technical textiles. Natural fibers were mainly focused for the development of green environment (Konwar and Boruah,2018)

Different fibers are used in and around for the daily use. The natural plant fibers have many classifications depending upon the source and from which part the fiber comes from the plant. The fibers which come from the stem portion of the plant are mainly cellulosic and known as the bast fibers. The bast fibers have increase importance for its potential use in many technical textile applicationsin recent years (Belachew et al., 2021). There are several underutilized bast fibers which are not utilized at its fullest. Some of them are Castor stem fibers, Turmeric stem fibers and Neem twigs. Bast fibers are usually long, more strength, durable and not affected by moisture (Tahir et al., 2011). In the present study, the three plants stem (Castor, Turmeric and Neem) were selected and have been used to extract fibers through the process of Water retting and Mechanical decortication. Retting is microbial process which removes the unwanted non-cellulosic components. It plays an important role in influencing the quality of fibre. The word “underutilized” is used as they are not utilized fully and below their potential use of the selected three therapeutic plant stems.

OBJECTIVE OF THE STUDY

- To extract and evaluate its antibacterial activity for the underutilized bastfibers (Castor, Neem and Turmeric)

MATERIAL AND METHODS

1) Selection of the source: A pilot study was conducted for the selection of the source of the plants. The three plants were selected after a thorough literature survey of the study. The plants were sourced in and around Coimbatore City, Tamil Nadu. The fibers were extracted through the methods of pool retting and mechanical decortication in the Department of Textiles and Clothing, Avinashilingam Institute, Coimbatore, Tamil Nadu.

1a) Castor stem fiber: The castor plant is scientifically known as the *Ricinuscomunis* L. of the spurge family (Euphorbiaceac). The plant possesses several therapeutic properties which are helpful in several pharmaceutical uses and applications. The extraction of fibers from the castor plant stem with different extraction methods has been investigated (Bakaret al., 2018). The stem consists of three layers. The first is the epidermis, second is the phloem then lastly the xylem or the core. The fibers were obtained mostly from the phloem layer (Balachew et al., 2021).

1b) Neem twigs Fiber: One of the most important and well-known trees in India is the Neem tree which is botanically known as *Azadirachtaindica*of the family Meliaceae. It has several biological compounds and substances extracted from the various parts of Neem which are very useful for different treatments (Sharmaet al., 2011). Here in this study, the fibre were extracted from the twigs of the branches of the neem tree by the process of pool retting.

1c) Turmeric stem fiber: The turmeric plant is a rhizomatous, perennial flowering plant native to Indian of the ginger family, Zingiberaceae. The plant is scientifically known as *Curcuma longa* which possess anti-inflammatory that contains bio-active compounds (Amalraj et al., 2017). Turmeric fibers were extracted from the stem of the Turmeric plant by a rolling method for the preparation of composites (Babu et al.,2010). For the present study, turmeric stem fibers were extracted through the process of pool retting. The stems were collected, submerged in water in the same position in the pool.

METHODOLOGY

1) Retting (Extraction of Fiber)

There are different types of retting process. Retting can be defined as the process to dissolve the cellular tissues, pectin's, waxes, dirt's present in the bundle of the bast fibers by the action of micro-organisms and moisture on plants to help in the separation of the fiber from the stalk of the plant. Water retting is the most common and reported to be the most useful among other types of retting and resulted in better quality grades of the fiber. (NIIR Board, 2005)

2) Water retting: The three plant stems (castor, neem twigs and turmeric) were submerged in the water. The process was carried out for 17 days by changing the water in alternate days. In this

process, certain bacteria which are responsible for the retting mechanism enter through the stomata for breaking substances that binds the fiber bundles in the plant stalk. The stalks were beaten by a wooden hammer for better separation ofthe fibers till it becomes loose.

3) Mechanical Retting: Decortication is the process of separating the long outside bast fibers from the inner woody core, or hurd, of the plant. Decorticator is the machine mainly used for the extraction of fibers mechanically by diesel, petrol and electrical. The electrical decorticator which is available in the production Laboratory at Avinashilingam Institute was used to extract the three stem fibers. In this study, it was found that among the selected three plant stems, turmeric stems were most suitable for the mechanical extraction by the electrical decorticator. It consists of feed rollers, an electric motor and a beater. The stems were fed to the beater by holding manually (Josef Vill S. Villanueva, 2018):

3)Antimicrobial studies:

Textile materials have a higher chance of exposure to various kinds of micro-organisms which are present in the atmosphere. Many products have been given anti-microbial finishes to protect from various carriers of microbes like pathogenic bacteria, moulds and fungi. Several plants possess its own natural anti-microbial property that can protect unwanted growth of the micro-organism in the textile fibers (Jayapriya and Bagyalakshmi,2013). Some of the bast fibers like Castor, Neem and Turmeric were tested for antibacterial activity in Advanced Laboratory at Avinashilingam Institute, Coimbatore. The organisms used for the study are Staphylococcuss aureus and Escherichia coli, also known as E.coli.

RESULTS AND DISCUSSION

The extraction of the three respective fibers was carried out by two different types of retting process. It was observed that the fibers were seen separated from the outermost layer, epidermis of the castor plant as seen in the figure 1.b. The retting process of castor is shown in figure 1.a. An attempt was made for the extraction of Neem fiber from the Neem twigs. It was seen that during the period of water retting for the Neem twigs, the fibers were separated from the centre part, Cortex of the Neem twigs. The turmeric stem were extracted successfully after beating slowly with the help of wooden hammer. Proper extraction and separation of the fiber was carried out by manual process. After the separation, all the fibers were dried in the shade for 24 hours at room temperature.

Table 1.Evaluation of the Fiber Extraction Methods

Method of Fiber Extraction	Quantity of stems collected (kg)	Duration	Quantity of extracted fiber obtained (grams)
Sample Castor stalk			
Water pool Retting	15 kg	14 days	550
Mechanical Decortication	10 kg	7 hours	475
Sample Neem twigs			
Water pool Retting	15 kg	17 days	480

Mechanical Decortication	10 kg	7 hours	344
Sample Turmeric stem			
Water pool Retting	15 kg	15 days	595
Mechanical Decortication	10 kg	7 hours	417

The comparison of the extraction method conducted for the extraction of the three plants (Castor, Neem, Turmeric) were given in the table no.1. It revealed that the fiber extraction was much faster in case of the mechanical decortications as compared to the water pool retting. Mechanical decortications of sample C yields 375 gram, sample N yields 244 gram and sample T yields 317 grams of their respective fibers in 7 hours. The extraction of fibers through pool retting usually takes around 14 to 17 days for the three fibers. After the extraction process, the fibers were dried properly for 24-48 hours.

Table 2. Visual Inspection of the three fibers

Sl.no.	Type of fiber	Colour	Texture	Lustre	Appearance
1.	Castor stem Fiber	Bright	Smooth	Medium	Good
2.	Neem twigs Fiber	Medium	Medium	Medium	Fair
3.	Turmeric stem fiber	Medium	Medium	Medium	Good

Fig.1.a: Neem twigs fiber,

Fig.1.b: Turmeric stem fiber

Fig. 1.c: Castor stem fiber

The visual inspection of the three fibers was carried out in the Department of Textiles and Clothing at Avinashilingam Institute, Coimbatore. Among the three fibers, the majority of the juries have rated a good overall appearance for Castor and Turmeric stem fibers as compared with Neem twigs fiber which was considered as fair. The colour, texture and lustre of the Neem twigs fiber and Turmeric stem fiber were rated as medium. As compared with the other two fibers, the Castor fibers were reported to be brighter in colour and smooth in texture.

The fibers were tested forthe anti-bacterial activity in the Advanced laboratory at Avinashilingam Institute, Coimbatore. The samples S-C,S-T & S-N shows good antibacterial

activity against *Staphylococcus aureus and E.Coli* organisms. Out of the three samples, castor shows the least anti-bacterial activity when compared with the two samples. The zone of inhibition was quite higher for the neem twigs fiber as the fiber shows a greater area in the disk diffusion technique which is widely use for the evaluation of antimicrobial activity of plant activity or any microbial extracts. As the fibers possess its own antibacterial activity, any textile materials made from it will prevent the growth of micro-organism and protect from further infections.

Table 3. Zone of inhibition of the three retted fibers

Samples	**Zone of inhibition (mm)**	
	Staphylococcusaureus	Escherichiacoli
S – C	9mm	7mm
S – T	29mm	20mm
S – N	30mm	24mm

Fig.2a) Staphylococcus

Fig.2b) E. Coli

SUMMARY AND CONCLUSION

In view of the global population for the concern of environmental friendliness, it is quite important to promote the recycling and to explore the potential resources. In the area of textiles, one approach is to develop new environmental- friendly fibre materials and to utilize the naturally existing fibers. Certain agricultural waste has immense and promisingqualities for the applications in Technical textiles. Plants like Castor, turmeric, Neem have enormous benefits in every parts of the plant. The stems were usually thrown and not used. The fibers were then extracted from the underutilized stems and evaluated for its properties. It was found that the fibers were successfully extracted by mechanical and water retting process. The mechanical extraction was quite faster but the fibers extracted from water retting showed a good lustre and texture. The overall appearance was good. The three fibers were extracted from therapeutic plants which possess several medicinal properties that can regulate the biological pathways. So they can be use in the applications as the potential source of developing wound healing materials. The fibers also possess antibacterial activity which will be quite useful for the diversification of end-products to meet the increasing needs and demands of the customer.

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A COMPARATIVE STUDY ON TANGKHUL, KABUI, AND MAO TRIBE OF MANIPUR AND THEIR TRADITIONAL COSTUMES

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ABSTRACT

The Tangkhul, Kabui, and Mao tribe are major ethnic Naga Tribes of Manipur which occupies large population in Naga tribe of Manipur. The origin of Tangkhul, Kabui, and Mao is still a mystery till now. However, it is believed that they came through Burma. Ukhrul, Tamenglong, Senapati are the home of Tangkhul, Kabui, and Mao respectively. Later, they spread to other parts of Manipur. The Tangkhul have rich culture and tradition which cover the whole in festivals and custom practices. Festivals and special occasions are celebrated every season in the village and traditional costumes are there in accordance with the festivals and occasions, but their traditional costumes got mixed with the western ones. Things are not same as before after the Christianity came into their traditional lives. To get extensive knowledge about the socio-cultural background of the tribe, this study was conducted which dealt with the investigation and documentation of the traditional costumes of the three tribal community of Manipur, viz., Tangkhul, Kabui, and Mao. It was found that they still used traditional wear during their festivals and special occasions but found mixed with contemporary wear. There were slight changes in raw material, colour, and ornamentation in traditional costumes.

Keywords: Christianity, Ethnic, Naga,Tangkhul, Kabui, Mao, Traditional costumes

INTRODUCTION

Majorly India has a contribution in weaving textiles from huge range of different materials for the functional as well as aesthetic purpose- having varieties of weaving techniques. The North-East India is a region of rich culture and traditions. This land is considered by many scholars as a cultural corridor between India and South East Asia and has a tremendous strategic importance not because of its geography but because of its history, demography, and culture.

Manipur belongs to one of the northeastern states of India. It is a beautiful state surrounded by hill ranges. It was called 'The Land of Jewel' by the first Prime Minister of India, Pandit Jawaharlal Nehru and known as Kangleipak or Sanaleipak (golden land) to its inhabitants. The population of Manipur is divided into two classes of people such as (a) the non-tribe and (b) the tribes. Manipur has 33 recognized tribes falling in categories under two major tribal groups- Naga and Kuki.

Manipur enjoys a distinct place amongst the handloom zones in India. Handloom industry is the largest cottage industry in the state. This industry has been flourishing since time immemorial. One of the special features of the industry is that women are the only weavers. Tribal

costumes are highly colourful having aesthetic and religious values associated to them. Christianity has brought a drastic change in the cultural life of the tribes of Manipur.

The present study was conducted to document the traditional costumes of the Tangkhul, Kabui and Mao. The data collected from primary and secondary source would be available to the people all over the globe.

OBJECTIVE

The objective of the research was to study the origin and history of the three tribes and their traditional costume.

METHODOLOGY

The purposive sampling method was adopted for the sample selection. Initially the details of the total population of all the three tribes were collected from the census office of Manipur. Data was collected through interview schedule from selected families i.e. 20 families from Tangkhul in Ukhrul district, 20 families from Kabui of Imphal east, 20 families from Mao in Senapati district. Primary and secondary sources were involved for the collection of data on the traditional and contemporary costumes of the tribes.

RESULTS AND DISCUSSION

Origin and history of Tangkhul

The origin of Tangkhul is still unidentified. In conversation with some local elders they said that they came from eastside i.e. through Myanmar. History was traced from the folk song culture and traditions of the people. They belong to the Mongoloid race. The Tangkhul people are settle in Ukhrul district, some in Senapati, Kakching, Chandel, Thoubal and Imphal East district (plain area). The main origin of this particular tribe is Ukhrul district, later on they got spread over a period of time.

Luiraphanit is one of the major traditional festivals of Tangkhul which was celebrated during the seed sowing season. It was celebrated during full moon of last week of March each year. Luira remains the greatest agricultural festivals celebrated by the Tangkhul till today. The other festivals are Yara Phanit, Mangkhap Phanit, Chumpha phanit, etc. Other than the traditional ones, they also celebrated every festival of Christian, as they were converted to Christianity. Christmas and New Year were the main festivals celebrated with great zeal and enthusiasm every year.

Origin and history of Kabui

Kabui known as Rongmei in Manipur was also major tribe which occupied 2nd largest population after Tangkhul in Naga group. The Rongmei is a scheduled tribe under the constitution of India having a population of 170,000. Earlier Kabui was consisted of Liangmei, Inpui, Rongmei or Marongmei. Later on, they scattered to different group. However, Rongmei still remain as indigenous Kabui.

According to one of the legends, the word Kabui came from 'Koubru' the king of god in Manipur. The people of Kabui came from their origin across the hills towards the Koubru hill (Place of Koubru) to search a bull (sandang in Manipur) which helped them in different way in their day to day living. From this incident of searching the bull, they scattered and formed groups to search the bull in different direction. Later on, different groups were named according to the direction they followed from their place of origin. Rongmei means southern people and they only are considered as Kabui.

Agriculture was their main occupation in the village. In plain area, i.e. in Imphal east they were more into business and services. Their dream was to send their children to others parts of country for other jobs. They were very pro for the changes in technology and modernization. Their living style had changed over a period of time. They were already towards the technologies and fashion lifestyle.

Gaan-Ngai (post harvesting) was one of the major festivals of Kabui in Manipur which was celebrated on 13th day the wakching or Gaanngaibuh which follows lunar calendar and happens between December and January every year. They also followed customs and festivals of Christianity like New Year, Christmas and Easter Sunday etc. Among other communities, Kabui were famous for their dances. Their textiles had vibrant designs with lots of extra weft which they used for traditional wear.

Origin and history of Mao

The name 'Mao' is the official name of the Mao tribe of Manipur. It was yet to be confirmed about where the name came from. Some scholars shared their views on origin of the term 'Mao'. A Zemi version (a group of Mao) had said Maos grew very good pumpkins and so they came to be known as Ommüi (pumpkin men), with the period of time it became 'Mao'. However, the most acceptable endogenous term happens to be 'Shüfomei. In earlier times, they were collectively known as 'Shüfomei' in their dialect. The term shufomei came from a person named who lead the group of Naga settling in Makhel as this community. Although the term 'Mao' still continues for official purposes.

The Mao tribe occupied the Indo-Myanmar region, and belonged to 'Naga' ethnic group. The hometown of Mao was originally from Senapati district at the border of Manipur and a neighbor to Nagaland. Mao Youngster are spread to plain area of Manipur as well as other parts of India for studies and works. Though many have migrated and settled permanently in other parts of the state and country there were few families who still lived in their place of origin Mao Village of Senapati district. Mao people called themselves as 'Ememei'. The origin of Mao still argued between the legends, there were no official agreement. The language spoken by Mao people was believed to have come from Tibeto-Burman (Sino-Tibetan)

The people were still conservative to their culture and traditions even after ages of conversion to Christianity. Chiithuni festival was one of the main festivals of Mao. It happens every year which was a celebration of human life for six days on first month of the year (lunar calendar).

Loin loom (KhwangIyong) of Manipur

The tribes in Manipur still used loin loom for weaving their traditional textiles. All the weavers were found female and they took weaving as their domestic activity. All the textiles of the tribe were woven in loin looms. First the textiles were made into pieces since it was not possible to weave such a large size on loin loom later the woven pieces were joined together by hand stitching to make a whole complete cloth.

The traditional costumes of Tangkhul, Kabui, and Mao

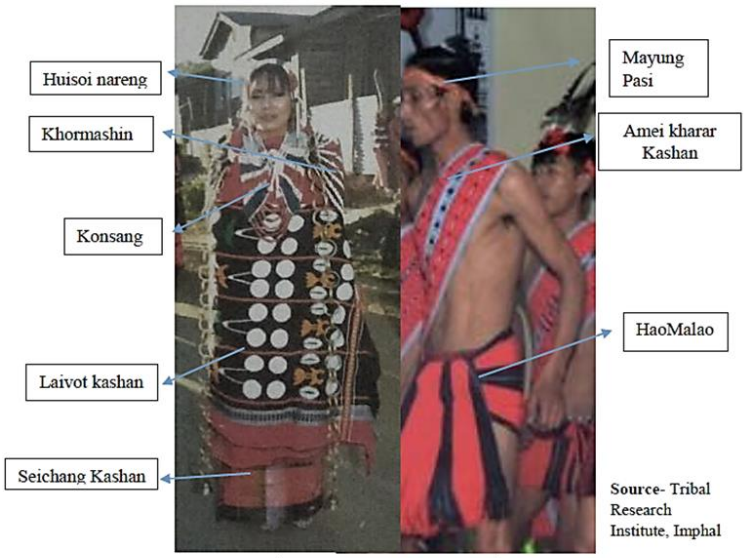

Fig. 1: Traditional Costumes of Tangkhul

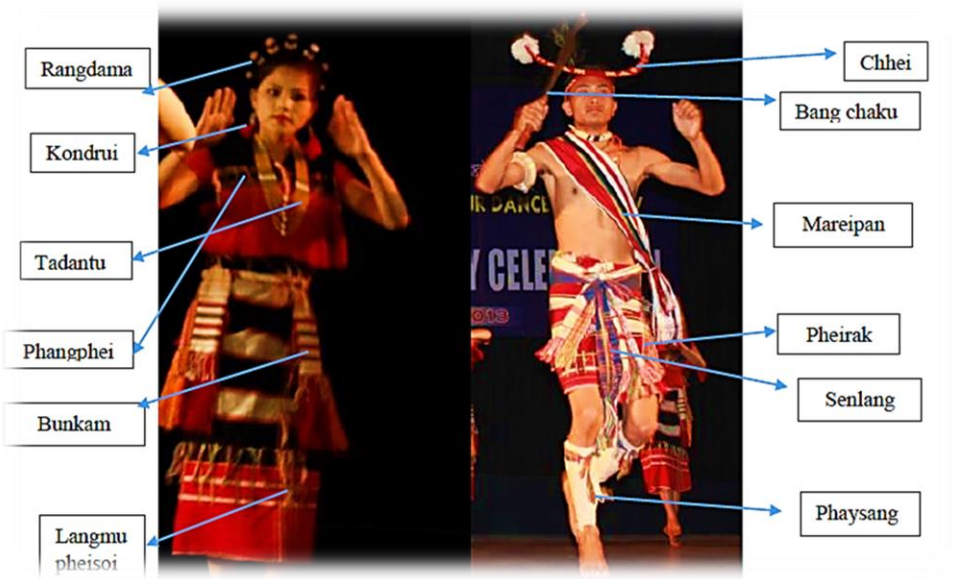

Fig.2- Traditional costumes of Mao

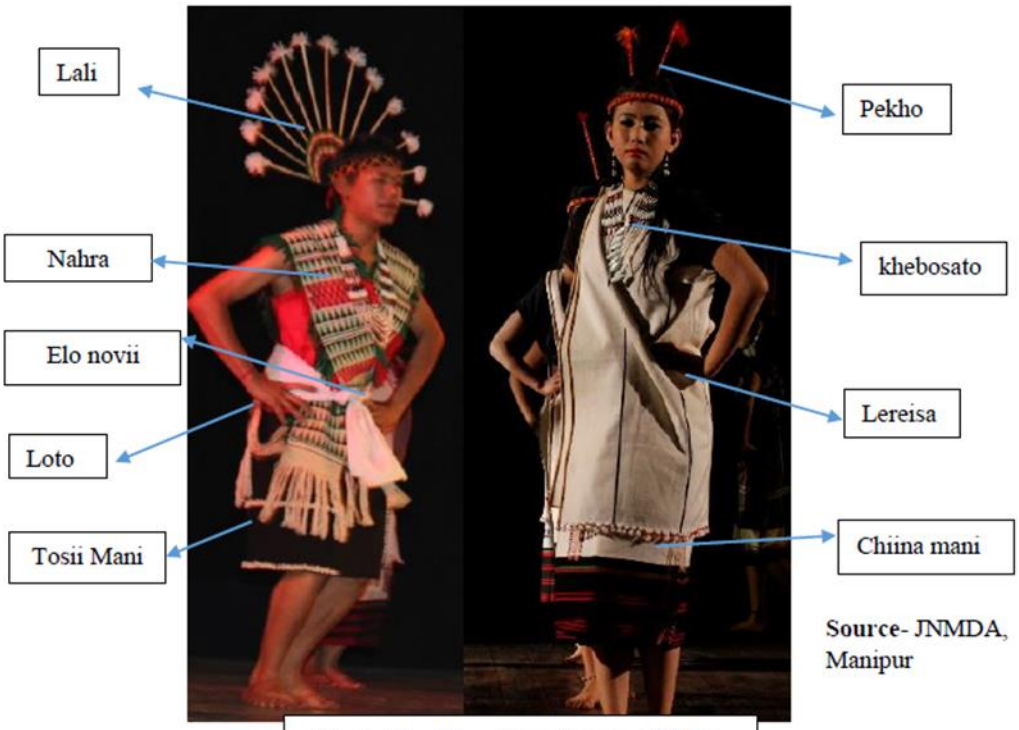

Fig.3: Traditional costume of Mao

Comparison between the costumes of the tribes (Tangkhul, Kabui and Mao)

All the above three tribes under the study belonged to Naga tribes of Manipur. On documentation of costume it was found that traditionally there were no stitched garments. Both men and women used wrapped garment. The textiles used were woven textiles with exquisite motifs. Weaving was the inherited trait amongst all the tribes. Loom used were loin loom. The textiles used were woven into small widths and then later joined (stitched) together to form a bigger piece. Draping style of upper garment was found to be different whereas for lower garment it was same. Table (1) gives the comparison of material, colours, draping style and surface ornamentation used for the costumes by the selected tribes (Tangkhul, Kabui and Mao).

Table 1: Comparison of raw material

	Tangkhul	**Kabui**	**Mao**
Yarn (Textile)	-Cotton - Acrylic and -Metallic yarn. - Water reed (plant) for rain coat.	-Cotton - Acrylic - Silk - Water reed (plant) for rain coat.	-Cotton - Acrylic -viscous rayon - Water reed (plant) for rain coat.

Accessories	- Bamboo -Acrylic yarn -Feather -Bead -Stone -Bone -Cane -Shell -Hair - Metal (brass, iron, and silver).	- Bamboo -Acrylic yarn -Feather -Bead -Stone -Bone -Cane -Shell -Hair - Metal (brass, iron, and silver).	- Bamboo -Woolen yarn -Feather -Bead -Stone -Bone -Cane -Shell -Hair - Metal (brass, iron, and silver).
Others (Spears and Shield)	-Acrylic yarns -Iron -Silver -Bamboo -Cane.	-Acrylic yarns -Iron -Silver -Bamboo -Cane.	-Acrylic yarns -Iron -Silver -Bamboo -Cane.

For weaving, yarns were same in the textiles of all the three tribes. Traditionally cotton yarn was used. With the scarcity in supply the cost also increased. Acrylic wool suited to their climate also and so the popularity of cotton went down. The introduction of acrylic provided the warmth of the wool with lesser cost. The finish obtained in textiles using acrylic was better than wool so acrylic became choice of the weaver as well as the wearer. Kabui tribe used silk yarn also. Tangkhul tribe was using metallic threads also which they got from market. Rain coat was an essential part of the costume because of the weather condition of place. All the three tribes used water reed only for rain coats.

There was no difference in raw material for accessories but it was made differently. The assembling and combination of raw material developed different accessories in all the tribes. Selection of raw material depended on the type of accessories to be made. Head gears were typical of the tribes which differentiated the tribe and within the tribe according to the status and occasion. Accessories were the part of the costume with traditional wear, but, with the contemporary wear it has been parted away -especially with the men. Basic custom of using spear and shield was there in all three tribes. Spears were made both for men and women. The spears for men were same in all three tribes. The uses for spear were hunting and wars. Nowadays, there is no use for this purpose but they used as a part of their costume. The spears for women were found in Tangkhul. Unlike men, the top of the spear was flat.

Table 2: Comparison of Colour

	Tangkhul	**Kabui**	**Mao**
Traditional	- Red (war/hunt), black (death) and white (peace). - Mainly used red and black. - Bold - War/hunter	- Red (war/hunt), black (death) and white (peace). - Equally used red, black and white. - Balancing both.	- Red (war/hunt), black (death) and white (peace). - Mainly used white and black. - Peace loving
Contemporary	- Orange, black, red, white, bluish white, golden thread.	-Pink, orange, yellow, green, purple, brown, blue.	- Pink, grey, orange (different shades), green.
Ornamentation	- White, black, green, red, orange, yellow.	- White, black, red, green, orange, yellow.	- White, black, red, green, orange, yellow.

The colours used in traditional textiles of these three tribes were originally red, black and white. But the amount of using these three colours was found different among them. According to them, red- represents war/hunt, black represents death, and white represents peace. Tangkhul were mainly dealing with red and black which represented bold, war and hunt. Kabui equally balanced all three colours. Mao mostly used white and black colour with much pattern. It can be said that Mao are peace loving.

The contemporary colours used were shifted to various colours available in the market which was more found in Kabui textiles. The contemporary colours used in Tangkhul textiles were slightly changed. Only the shades of original colours were found in their clothing. While comparing the contemporary colours used in both traditional and contemporary wear, it was found that Mao mostly dealt with light and pastel colours. Varieties of bright colours were found used in Kabui textiles.

The colours used for ornamentation of their costumes were same in all the three tribes. But it created different patterns which can identify themselves from others. Lots of ornamentations were seen in Kabui as compared to Tangkhul and Mao. The extra weft designs used in Kabui were more prominent.

Table 3: Comparison of draping style

	Tangkhul	**Kabui**	**Mao**
Women	*Sahup* – Wrapped around under arm or draped over left shoulder then wrapped around underarm.	*Phangphei* –On front, wrapped underarm then bring at the back overlapped each other to create crisscross effect then take the both ends at front draped over the chest and pinned.	*Sapu*- Two piece, first draped underarm of left then tied at right shoulder and other draped underarm of right then overlapped over the first one and tied at left shoulder.
Women	Textiles for lower garment-: -Wrapped from underarm reached up to calf or wrapped around waist reached up to ankle. - The way of wrapping was started from right side then tucked in at left side.	Textiles for lower garment-: -Wrapped around the waist which was same as Tangkhul and Kabui - Length was up to calf or ankle when wear from waist. - Nowadays, also had different draping style for girls which was wrapped the waist but created asymmetrical effect.	Textiles for lower garment-: -Same as Tangkhul, wrapped from underarm reached up to calf or wrapped around waist reached up to ankle. - The way of wrapping was started from right side then tucked in at left side.
	The above description shows the draping style of textile for lower body of all three tribes. The common draping style of all the three tribes was wrapped around the waist and the length reaches at the ankle.		
Both Men & women	**Textiles for upper garment-:** -Both men & women wrapped around their body same as the way of	**Textiles for upper garment-:** - Same as Tangkhul, both men & women wrapped around their body same as the	**Textiles for upper garment-:** -Same as Tangkhul and Kabui, both men & women wrapped around their body

	wearing shawl.	way of wearing shawl.	same as the way of wearing shawl.
Men	-The draping of *Haomalao*was different. Both ends tied at front. One end brings it back under groin and tucked in at waist. -Also, wrapped around waist nowadays like Mao and Kabui.	- Way of draping was same as women wrapped the body but the length was different. It reaches Up to knee.	- Same as Kabui. Wrapped around the waist with same length of Kabui.
	The draping style of men was found same among them except for the *haomalao*of Tangkhul.		

The draping of cloth used as their upper garment before blouse and top came into existence. All the styles of draping were different in all the three tribes which is described above.

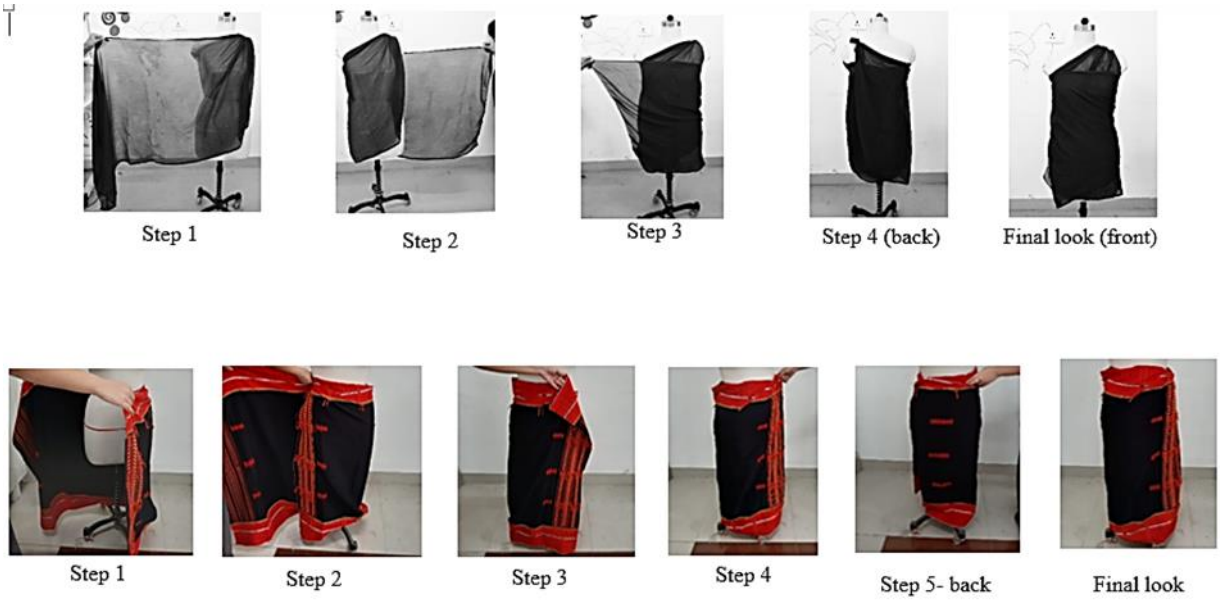

Fig. 4: Draping of Sahup and lower garment by the author

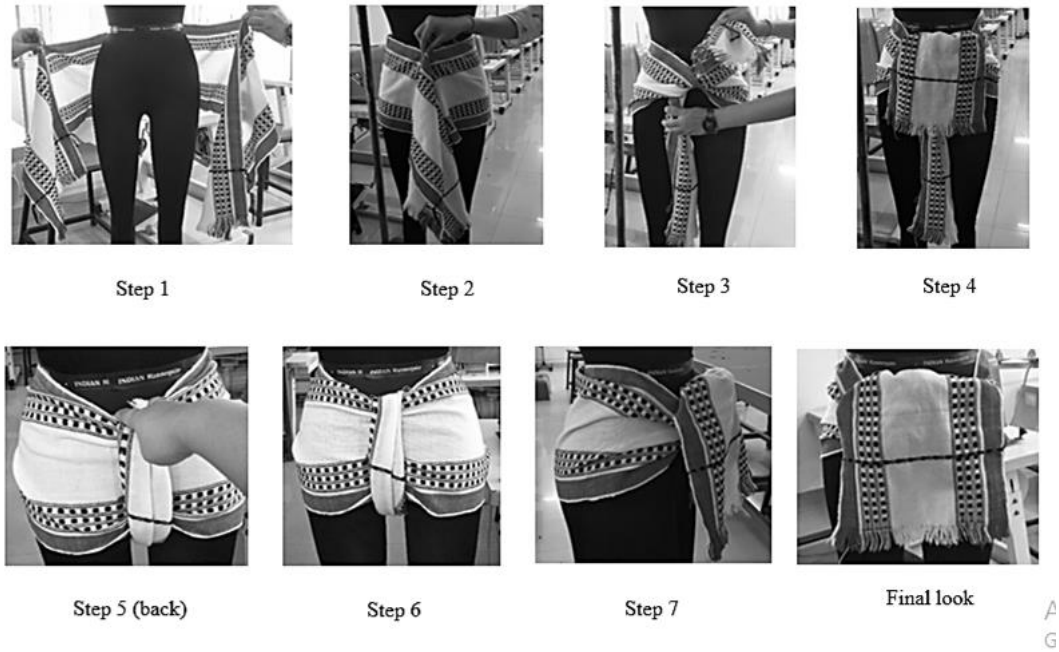

Fig. 5: Draping of Phangphei by the author

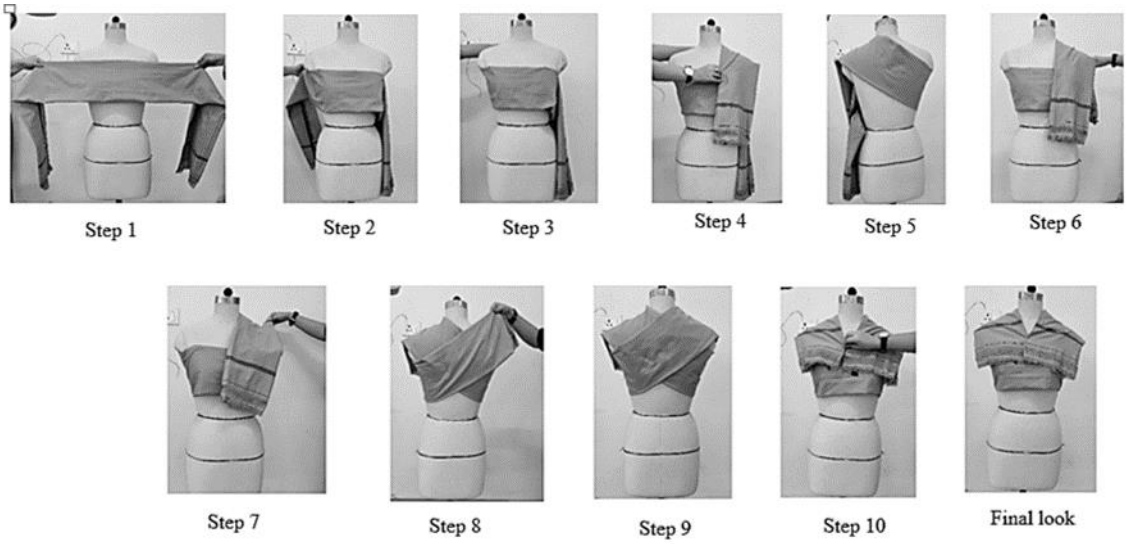

Fig. 6: Draping of Hao Malao by the author

Table 4: Comparison of Surface ornamentation

	Tangkhul	**Kabui**	**Mao**
Embroidery	Motifs on*kashan* (Textile)– Huisoinareng motifs - Birds and animals (cock, elephant, cow, peacock, fish etc.) -stylise motifs (akoibi, coin motifs) -arrow head motifs, Cucumber seed -Contemporary wear motifs (spear motifs, zigzag motifs). - Headgear of Tangkhul Motifs.	- Arrow head motifs on traditional wear.	-Spear motifs -Traditionally plain -Motifs of their headgear - Shield motifs on waist coat (contemporary wear).
Extra weft design weave	- *Pungri (*Interlock weave) design 2-3 at the border across the width. - Shield motifs - Dotted line - Line pattern.	- *Pungri*design design on both border (all side). - Hanging twisted yarn from excess after making pungri weave. - Pompom at ends across the length. -Dotted line. - Line pattern.	- *Pungri*design2-3 at the border across the width. - Line pattern.
Others	-None	-None	- Sea shell stitched to create pattern on men's textile for lower garment.

The embroidery work was more seen in Tangkhul which was famous of Manipur embroidery. Only the arrow head motifs were seen in Kabui. Mao also traditionally used plain textiles where the embroidery work was found only in contemporary work.

Pungri, an extra weft design was common in all the textiles of the three tribes. It was found in every textile of them. Dotted line pattern and line pattern were also found common. Lots of extra weft design pattern were seen in Kabui textiles.

CONCLUSION

The clothing of Tangkhul, Kabui, and Mao has changed over a period of time. People who settled in the plain area were more affected by the modernization than who were living in the hilly area. They still used traditional wear during their festivals and special occasions but found mixed with contemporary wear. There were slight changes in raw material, colour, and ornamentation in traditional costumes.

All the textiles were woven into piece then later joined (stitched) together to form a complete textile. The traditional colour of all the three tribes was red, black and white, where, red represents war and hunt; black represents death; and white represents peace. In Tangkhul textiles, red and black combination was mostly used. In Mao, white and black combination was the most used. And in Kabui, the traditional textiles mostly deal with all the three colours i.e. red, black and white in equal distribution.

The draping style of women's textiles used as upper garment, namely, Sahup for Tangkhul, Sapu for Mao, Phangphei for Kabui -were found to be different from each other. The textiles for lower garment of all the three tribes had one common way of wearing i.e. wrapped around the waist. Lots of extra weft design in Kabui textiles was observed as compared to other two tribes. The simpler designs of textiles were found in Mao. The other motifs like arrow head, shield etc. were similar as they come under same Naga group.

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DEVELOPMENT OF ECO-FRIENDLY, VALUE -ADDED BAGS WITH 3D MOTIFS OF HAIRSTYLING USING DIFFERENT TECHNIQUES OF FABRIC ORNAMENTATION

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ABSTRACT

The emergence of globalization, competitive atmosphere & quality consciousness during previous five years, has led to higher consumer's demands. Nowadays, fashion & style are important component of human life, and as number of consumers who need something new & unique are growing rapidly, there is an urgent need of maintaining & adding value to pre-existed product in order to meet evolving & ever-changing demands. A value addition always increases either the price or value of the products. Bags are an important accessory, both for its functional and aesthetic purpose. In order to fulfil the rising consumer's demand, the designers must add more quality & uniqueness to their bag for sustainment of designs. Mostly the bags are made up of leather. The leather industry has commonly been associated with high water consumption caused during traditional manufacturing processes, which have negative impacts on the environments. So, the aim of this research is to produce cost effective, eco-friendly, biodegradable casement bags to save the environment from harmful waste generated from leather industries. In order to add value to these casement bags motifs of different hairstyle were designed using Corel Draw & Richpeace Fashion CAD software. On a total of 5 casement bags were produced using screen printing and hand embroidery of motifs of different hair styles. All the bags were highly accepted in the evaluation.

Keywords: Value Addition, CAD Software, Screen Printing, casement Bag

INTRODUCTION

Fashion and style are important component of human life, and as numbers of consumers who need something new & unique are growing rapidly, there is an urgent need of maintaining & adding value to pre-existed product. Bags are an important accessory, both for their functional and aesthetic purpose. A bag is important in every person's life whether he or she is toddler, teenager, adult or old. It improves our styling quotient & also required for its functional usage. The bags are mostly made up of leather. The leather industry transforms animal hides/skins into a physically and chemically stable material by subjecting them to chemical and mechanical sequential processes to produce leathers that badly effect to people's health and environment. Rexine is another material used for bags and is also known in other words, as artificial leather cloth or coated fabrics, which is becoming increasingly popular all over the world. This industry has commonly been associated with high water consumption caused during traditional manufacturing processes, which have negative impacts on the environments.

To lower down these harmful effects on environment of processing of leather & rexine there is requirement of an alternative which is eco-friendly aesthetically pleasers, convenient to use & value-added product. The fabric casement is an alternative with above mentioned requirements.

Casement is a medium weight cotton fabric made of closely packed thick warp yarns. Generally, it is used for curtains, table linen, upholstery, bags, and rarely used for garments. It is an ideal fabric for a printing, embroidery, or usage as dress marquees because of its low cost and whole range of colours. It is light in weight, but it's plain weave texture makes it slightly heavier than cotton. Designing in textile is an important component of textile production. The relationship between a design and production is the planning and execution of a conceived idea or plan.

Various techniques like embroidery & screen printing can be used to add value to casement fabric to make bags more aesthetic. Embroidery is one of the oldest and beautiful ways to add value to any fabric. It can be defined as the decoration of an existing fabric with ornamental stitches **(Ganderton, 1996)**. It basically utilizes two components, a base fabric and a coloured thread, to decorate it **(Naik and Wilson, 2006)**. Therefore, it is one of the most satisfying and interesting art which is gaining more and more popularity day by day due to its minimum requirement regarding equipment & space **(Snook, 1972)**.

Screen printing is one of the oldest printing techniques whereby a mesh is used to transfer ink onto a substrate, except in areas made impermeable to the ink by a blocking stencil. Traditionally the process was called screen printing or silkscreen printing because silk was used in the process. Among the numerous printing techniques, screen printing gives flexibility in designing and printing process.

Therefore, the study was planned with the following objectives:

OBJECTIVES

- To design and create innovative hair styling motifs using CAD and develop environment friendly, user friendly and cost effective printed and embroidered bags

MATERIAL AND METHODS

The step-by-step procedure conducted for the study is mentioned under the following headings:

Development of motifs and bags:

A total of 15 hair styling motifs and 15 different casement bags were designed using Corel Draw software according to their suitability. These motifs and casement bags were coded and got assessed by a panel of 30 members including professors, teachers, research scholars, students and staff members of Department of Family and Community Sciences, University of Allahabad, Prayagraj, Uttar Pradesh. A total of 10 motifs and 5 articles were selected for further product. The developed motifs and casement bags are presented in fig. 1 (M1-M15) and fig.2 (B1-B15).

Assessment on the basis of placements and colour combinations:

After selection of bags and motifs, two different placements of motifs for each bag were developed by using Corel Draw software. These were again coded and got judged by the previous panel. A total of 5 bags were selected for development on the basis of placement. Collection of bags on basis of motif placement is presented in fig.3 (A-E). After selection of 5 casement bags for

different placement of motifs, illustrated two different colour combinations of each bag and these were again coded & got judged by the previous panel. A total of 5 bags were selected for development on the basis of colour combinations. Collection of bags on basis of colour combinations are presented in fig.4 (A-E).

Development of product:

For developing casement bags, different coloured casement fabrics and other functional and decorative accessories were purchased from local market of Katra and Chowk, Prayagraj. The process of printing of previously selected motifs, embroidery and production of bags was done in Textile Laboratory of Department of Family and Community Sciences, University of Allahabad, Prayagraj. All the prepared bags were further subjected to visual evaluation by the same panel of members to access the acceptability of these bags and found out most acceptable casement bags.

Statistical analysis:

The acceptance of the product was analyzed using weighted mean score (W.M.S). The weighted mean score was calculated from the scores given by the judges with the given formula:

$$\text{W.M.S} = \frac{\text{No. of respondent (MP) x3 + No. of respondent (P) x2 + No. of respondent (LP) x1}}{\text{Total no. of respondent}}$$

Finally, W.M.S was analyzed for the acceptance level in the following ranges **(Gogoi *et al.*, 2016)**.

- Most Preferred (MP) : 2.34-3.00
- Preferred (P) : 1.67-2.33
- Low Preferred (LP) : 00-1.66

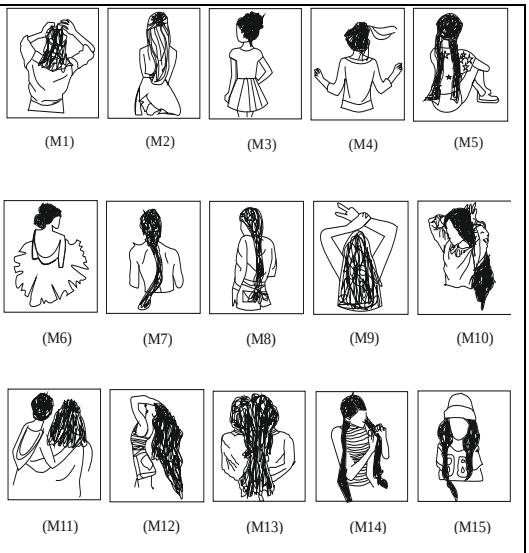

Fig. 1: Motifs for Assessment

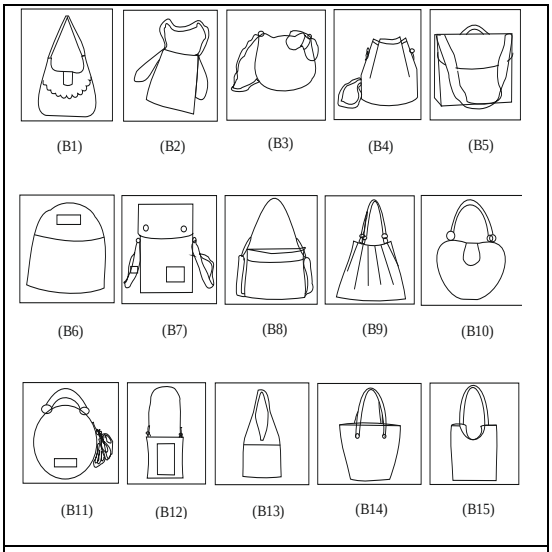

Fig. 2: Casement Bags for Assessment

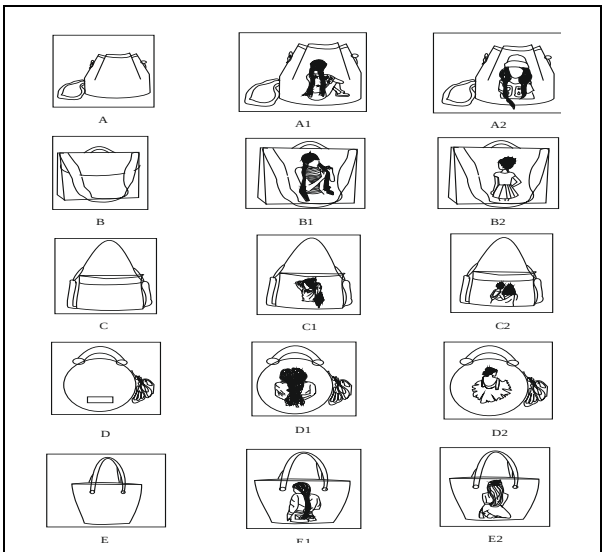

Fig. 3: Motif Placement for Assessment

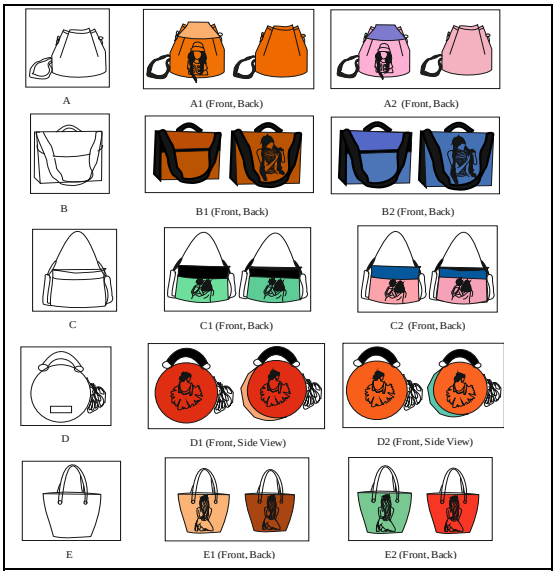

Fig. 4: Color Combination for Assessment

Fig. 5: Collection of Developed Product

RESULT AND DISCUSSION

Preferences for Selection of Motifs:

15 motifs were developed using Coral Draw software. These motifs were assessed by the panel of 30 members for selection of motifs for further printing on casement bags. The weighted mean score as per preferences of members for motifs which are suitable for further printing work were presented in Table-1. It was revealed that motif M2 (fig.1) got Ist rank (2.60). motif M6 got IInd rank (2.53) followed by M11, M14, M15, M3, M5, M7, M10 and M13 got IIIrd to Xth rank. The top 10 motifs were selected for further screen development.

Preferences for Selection of bags:

15 bags were designed using Corel Draw software. These designs were assessed by the panel for selection of bags for further printing process. The weighted mean scores as per preferences of panel members were presented in Table 2. It revealed that B4 (fig. 2) got Ist rank (2.53). B5 got IInd rank (2.46) followed by B8, B11 and B14 got IIIrd to Vth rank. The top 5 designs of bags were selected for further value adding process.

Preferences for Selection of bags on Basis of Motif Placement:

After selection of design of bags and motifs, two different placements of motifs for each bag were illustrated. These placements were created by using Corel Draw & Richpeace Fashion CAD software. These placements were evaluated and assessed by the panel for the best suitable product. The weighted mean scores as per preferences of members, presented in Table 3 revealed that A2, B1, C2, D2 and E2 got Istrank with 2.53, 2.56, 2.60, 2.43 and 2.36, respectively. The placements which got higher rank among two were selected for further development.

Preferences for Selection of Bags on Basis of Colour Combinations:

After selection of 5 designs of bags with different placements of motifs, two different colour combinations of each bags using Corel Draw and Richpeace Fashion CAD software were illustrated. These colour combinations were evaluated by the panel for the best colour combination according to selected design. The weighted mean scores as per preferences of members, presented in Table 4 revealed that A1, B1, C2, D1 and E2 got Ist rank with 2.46, 2.36, 2.43, 2.56 and 2.60, respectively. Ist rank holder for each bag was selected for further development.

Development of Product

After screen printing and doing hand embroidery, all these casement fabrics were stitched in different style of bags which were previously selected. The bags were developed in Textile Laboratory of Department of Family and Community Sciences, University of Allahabad. The developed products are presented in fig. 5.

Cost calculation

Cost of each prepared casement bags was calculated on the basis of money spent on raw materials including casement fabrics, lining materials and other functional & decorative accessories of bags, printing, hand embroidery and stitching. The cost of designing done through computer was not included in the actual cost. A total of 25 percent profit margin was added in the calculated cost for getting sale price. Cost of each product was calculated separately as presented in Table 5.

Preference for acceptability of new developed product:

All the prepared casement bags were further subjected to visual evaluation before the same panel of members to assess the acceptability of these bags. The weighted mean scores as per preference of members, presented in Table 6 revealed that FB3 got Ist rank (2.23), FB2 got II nd rank (2.09), FB4 got IIIrd rank (2.05), FB5 got IVth rank (2.04) and FB2got Vth rank (2.02). All the products were found "preferred".

Table 1- Preferences for Selection of Motifs

Motif	Frequency			W.M.S	Rank
	MP	P	LP		
M1	12	10	8	2.13**	XI
M2	**19**	**10**	**1**	**2.60*** **	**I**
M3	**14**	**11**	**5**	**2.30*** **	**VI**
M4	10	14	6	2.13**	XI
M5	**14**	**10**	**6**	**2.26*** **	**VII**
M6	**18**	**10**	**2**	**2.53*** **	**II**
M7	**11**	**15**	**4**	**2.23*** **	**VIII**
M8	10	12	8	2.06**	XII
M9	12	10	8	2.13**	XI
M10	**13**	**10**	**7**	**2.20*** **	**IX**
M11	**18**	**9**	**3**	**2.50*** **	**III**
M12	12	10	8	2.06**	XII
M13	**10**	**15**	**5**	**2.16*** **	**X**
M14	**17**	**10**	**3**	**2.46*** **	**IV**
M15	**16**	**10**	**4**	**2.40*** **	**V**

Table 2- Preferences for Selection of Designs of Bags					
Bag design	**Frequency**			**W.M.S**	**Rank**
	MP	**P**	**LP**		
B1	10	12	8	2.06**	VIII
B2	11	11	8	2.10**	VII
B3	12	10	8	2.13**	VI
B4	**18**	**10**	**2**	**2.53*** **	**I**
B5	**17**	**10**	**3**	**2.46*** **	**II**
B6	10	11	9	2.03**	IX
B7	12	10	8	2.13**	VI
B8	**16**	**10**	**4**	**2.40*** **	**III**
B9	13	10	7	2.20**	XI
B10	10	15	5	2.16**	X
B11	**16**	**9**	**5**	**2.36*** **	**IV**
B12	12	10	8	2.10**	VII
B13	10	17	3	2.16**	X
B14	**15**	**9**	**8**	**2.30*** **	**V**
B15	12	10	8	2.06**	VIII

Table 3- Preferences for Selection of Bags on Basis of Motif Placement					
Designs (Code)	**Frequency**			**W.M.S**	**Rank**
	MP	**P**	**LP**		
A1	15	10	5	2.33**	II
A2	**18**	**10**	**2**	**2.53*** **	**I**
B1	**18**	**11**	**1**	**2.56*** **	**I**
B2	14	11	5	2.30**	II
C1	13	12	5	2.26**	II
C2	**19**	**10**	**1**	**2.60*** **	**I**
D1	14	11	5	2.30**	II
D2	**15**	**13**	**2**	**2.43*** **	**I**
E1	10	17	3	2.23**	II
E2	**13**	**15**	**2**	**2.36*** **	**I**

Table 4- Preferences for Selection of Bags on Basis of Colour Combinations					
Designs (Code)	**Frequency**			**W.M.S**	**Rank**
	MP	**P**	**LP**		
A1	**16**	**12**	**2**	**2.46*** **	**I**
A2	13	12	5	2.26**	II
B1	**13**	**15**	**2**	**2.36*** **	**I**
B2	15	10	5	2.33**	II
C1	13	12	5	2.26**	II
C2	**15**	**13**	**2**	**2.43*** **	**I**
D1	**18**	**11**	**1**	**2.56*** **	**I**
D2	14	11	5	2.30**	II
E1	18	10	2	2.53**	II
E2	**19**	**10**	**1**	**2.60*** **	**I**

Table 5- Cost Calculation of Developed Bags						
Product	**Casement Fabric (₹)**	**Miscellaneous (₹)**	**Labour charge (₹)**	**Printing charge (₹)**	**25 % Profit (₹)**	**Total cost of product (₹)**
FB1	**70/meter**	**100**	**150**	**50**	**92.5**	**462.5**
FB2	**70/meter**	**100**	**200**	**50**	**105**	**525**
FB3	**70/meter**	**50**	**150**	**50**	**80**	**400**
FB4	**70/meter**	**70**	**200**	**50**	**97.5**	**487.5**
FB5	**70/meter**	**100**	**200**	**50**	**105**	**525**

Table 6- Preference for Acceptability of New Developed Product					
Product	**Frequency**			**W.M.S**	**Rank**
	MP	**P**	**LP**		
FB1	27	3	0	2.09**	II
FB2	10	16	4	2.02**	V
FB3	12	13	5	2.23**	I
FB4	18	9	3	2.05**	III
FB5	14	14	2	2.04**	IV

CONCLUSION

Leather industry is a very old manufacturing sector and heavy-polluting industry producing a broad range of goods. The consumption of leather products by the humans is very common and used almost every day. The leather industry consists of refining raw skin into leather products and this whole process requires number of complex chemical and mechanical process. Thus, leather industry consumes resources and produces high level of pollution which are toxic and hazardous to the environment and human health.

Bags are important accessory, both for its functional and aesthetic purpose. Mostly the bags are made up of leather. So, the aim of the study to produce cost effective, eco-friendly, biodegradable and user-friendly casement bags for save the environment from harmful waste generated by leather industries. Casement is an eco-friendly option and also reusable for a long period of time. In this study 5 casement bags were developed using hand embroidery and screen printing. All the 5 casement bags were found most acceptable and the costs of bags were found cost effective as the price ranges between the price of Rs. 200-550/. All the prepared casement bags through screen printing and hand embroidery were inexpensive and durable and were highly appreciated. These casement bags are lightweight, fashionable and soft to touch and easily replaced for regular leather bags. Besides Casement other eco-friendly and durable fabric like Cotton, Jute, Hemp, Bamboo can be used in bags to save the environment from leather and rexine consumption.

Suggestions for Further Study

- The applications of different hair styles motif can also be used on other article like apparels, home furnishing etc.
- Different techniques can also be used for printing of motifs like block printing, stencil etc.

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IMPACT OF PANDEMIC ON INDIAN KNITWEAR INDUSTRY AND SUSTAINABLE SOLUTIONS

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ABSTRACT

India is a treasure-trove of traditional textile crafts and exquisite artisanship. The other areas that our country excels in are availability of low-cost raw material, skilled labour, robust work ethics, customer-friendly approach and English-speaking skills. All these unique features make India a sought-after market worldwide both for manufacture of goods for domestic market and exports. However, the pandemic has had detrimental effects in certain areas and left us with important learnings. The research study is aimed to apprise about the status of knitwear industry, post pandemic, which in-turn shall help policy makers make interventions at different levels in order to revive the industry to its pre-pandemic level. In order to achieve this, a descriptive research design is adopted. Data collection has been done using primary sources such as –online interviews, questionnaires and secondary sources such as journals and newspaper reports. The study also puts forward suggestions to tide over the stiff competition with other countries through sustainable practices, which have become more than important in post-pandemic era.

Keywords-Knitwear industry, pandemic, interventions, policy-makers, sustainable practice

INTRODUCTION

India stands as the second largest producer in textile and apparel trade, only behind China. The apparel sector employs over 55 million people in the country. It is the largest manufacturing sector in the country, contributing greatly to the GDP and export earnings. This has been possible due to the availability of low cost raw-material, skilled labour, robust work-ethics, customer-friendly approach and English-speaking skills (Singh, 2011). Popular apparel giants like Wal-Mart, Tesco, Marks & Spencer, GAP and Zara have established their business houses in India, either directly or through joint ventures (Krishnan and Mondal, 2020). The apparel industry is composed of two sectors – Knitwear and Woven Sector. It is the knitwear sector, which has expanded at a rapid rate and is termed as ***sunrise industry***. The two important centres of knitwear production in the country are Tirupur and Ludhiana- termed as *Manchester of India*.

However, the recent pandemic has had detrimental effects on the ***sunrise industry*** and highlighted certain areas to be worked upon, so as to regain our country's foothold in the world knitwear-export arena. Interaction with industry experts and association personnel reveals the need for policy intervention, better supply-chain management, green practices and sustainable processes of production-all becoming more important than ever to support the knitwear production process. This shall help India in gaining a competitive edge in knitwear trade, over other countries worldwide.

The present study brings forth the overall impact on the knitwear industry, in the post-pandemic era. It had been undertaken with the following objectives.

OBJECTIVES

1.To identify the overall effect of pandemic on the knitwear production sector both for exports and domestic production.
2.To identify and suggest areas of improvement for the policy-makers for suitable interventions in order to uplift the knitwear trade.
3.To highlight green and sustainable practices for the knitwear manufacturing units so as to tide over the stiff competition worldwide

METHODOLOGY

Knitwear production is mostly centred around the cities of Ludhiana and Tirupur, for both the domestic and export trade. For the present study, purposive sampling technique had been followed. A total of 15 Export units and 10 domestic units had been selected in Tirupur and Ludhiana. The list of manufacturing units had been procured from Apparel Export Promotion Council (AEPC), Tirupur Exporters Association (TEA), Knitwear Club and Federation of Hosiery Manufacturers Association (FOHMA). The units had been selected based on their annual turnovers. Data collection had been done through online interviews and questionnaire, through google forms. A total sample size of 58 interviewees-- comprised of-- knitwear associations, owners at manufacturing and export units, marketing managers, merchandisers and production managers at knitwear units (Refer Fig. No.1). Data collection from secondary sources had been carried out through journal and newspaper reports.

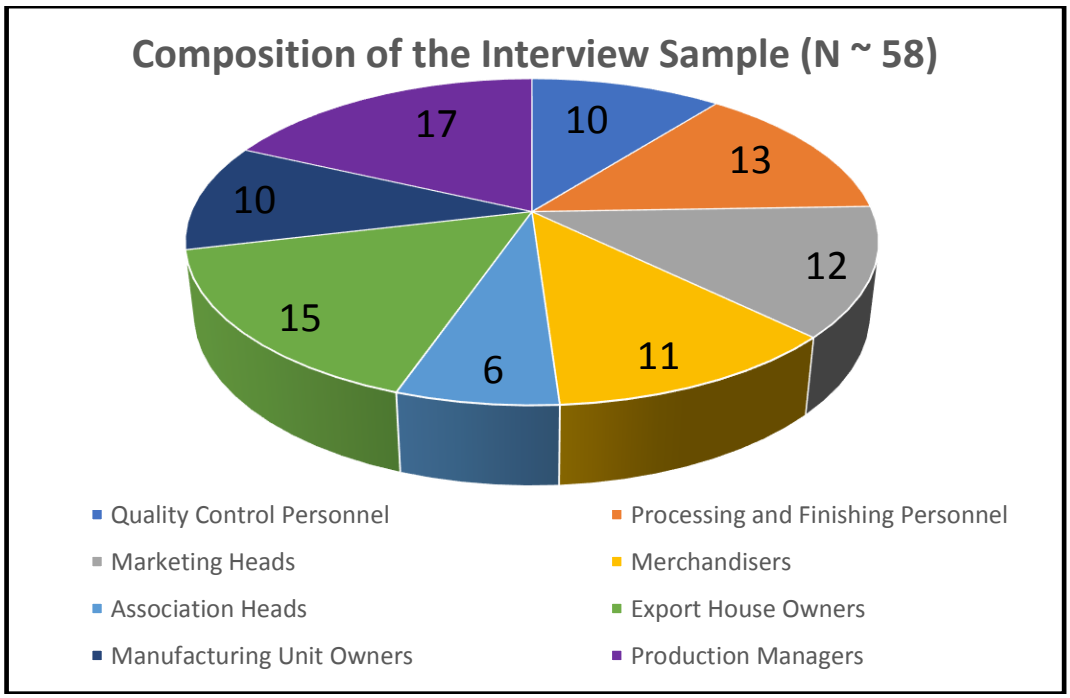

Fig. No. 1: Personnel interviewed from knitwear associations, export and domestic units

RESULT AND DISCUSSION

In order to have greater clarity, the responses collected from personnel through primary and secondary sources, have been divided in the following manner: -

- Implications of the pandemic on the knitwear sector
- Changing scenario and suggestions
- Adoption of sustainable practices

1. Implications of the pandemic-

The research conducted through questionnaire and interview revealed that the COVID-19 pandemic has had its impact on the Indian knitwear industry. About 90 % of the personnel interviewed said that there have been lot of orders getting cancelled and diverted to other countries as the pandemic led to a complete shutdown and loss of business. Business Standard reports that according to Tirupur Exporters' Association (TEA), the pandemic has had its effect on the knitwear industry, with approximately 10,000 crore worth *orders being diverted* to other countries, mainly because, the production had to be stopped, as Tirupur had been the epicentre of the COVID-19 cases (Jacob, July 2021). Aziz, (2021) in her research paper concludes that the pandemic has had *crippling effects on several global buyers*, who are expected to file for bankruptcy. A wide majority (85%) of the responses found that the retail sector has had a hit with smaller orders and lower margins. An export unit supplying to European Union said that *loom workers in backward districts and industrial areas like Bhiwandi in Maharashtra* have completely shut down, due to the pandemic. Indian express reports that the pandemic not only has affected exports but even the *domestic market has been affected* by the lockdown. According to TEA, the knitwear industry *largely relies on migrant workers* (Uchikawa, 2012). Those workers who went to their hometowns during lockdown, could not return, hence the production got effected (Jaiswal, March 2020). A large number of respondents (95%) reported that after their return to work, many of these workers haven't received their wages for couple of months, as, the production was still to pick up as it was at pre-lockdown period. The manufacturers on their front were doing their best though, by providing place of stay and food to these workers (ILO report, 2020). According to some of the respondents, the production units are seeking *government help and intervention* in the matter as these units have bank loans to pay and overall market seems to be at an all-time low. A study by Mehta and Kaur (2021) reveals that, concerns such as infrastructural bottlenecks, obsolete connectivity and stiff rules and regulations need to be looked into post COVID-19. The paper suggests policy intervention and a bigger role of organizations to infuse enthusiasm among various actors of industry. As per the responses received, 95 % respondents were in the favour of supportive government policies especially in the trying times of the pandemic. A small percentage of respondents agreed on infrastructural bottlenecks such as condition of roads, irregular power supply etc coming in way of prompt delivery schedules (Refer Fig. No. 2).

An important finding, during the pandemic has been the observation of *strong impact of supply chain disruption* felt on prices of products during COVID-19. All respondents felt the need for well managed and integrated supply chain and the need to identify closer sources for raw material supply (Refer Fig. No.2). Chakraborty et. al. feel this shall have strong implications for the garment manufacturers and exporters (2020).

Another impact felt during pandemic has been on synthetic fibre *raw-material supply*. As per the Clothing Manufacturers' Association of India (CMAI), Corona virus shutdown in China

had its direct effect on the Indian apparel industry, especially since the raw material such as synthetic yarns were supplied by China (Ghoshal, 2020).

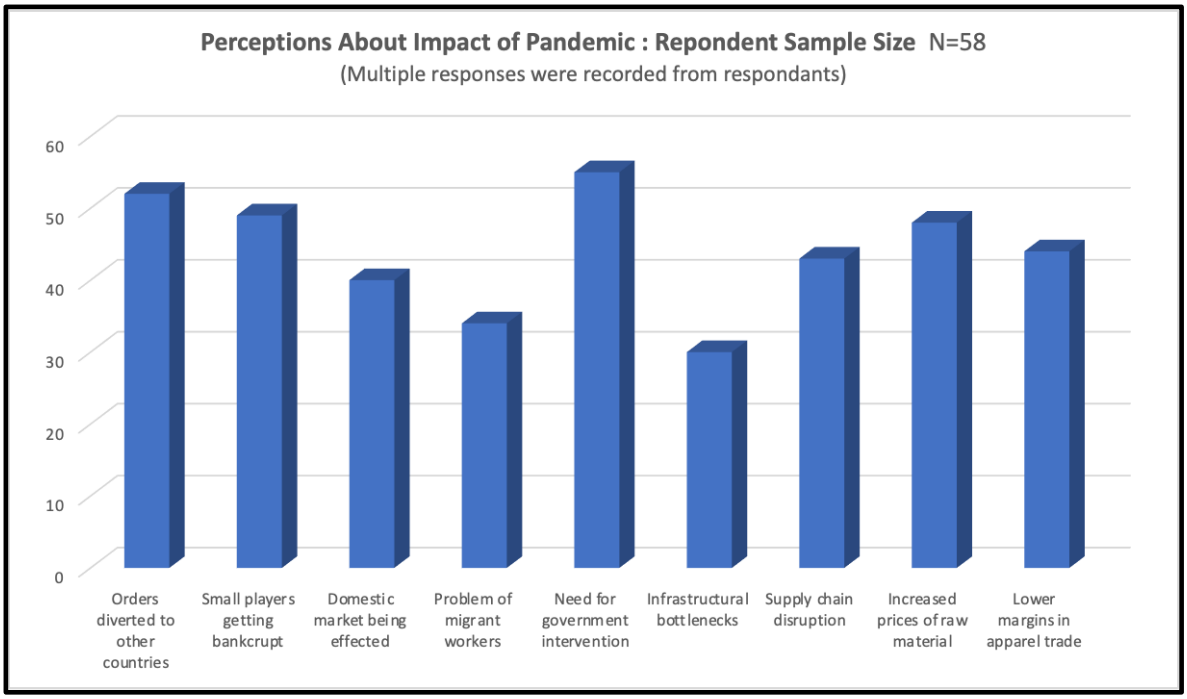

Fig. No.2: Responses showing implications of pandemic on knitwear industry

2. Changing Scenario and Suggestions-

The primary data has revealed some positive changes worldwide during pandemic. One such change felt by 75% of the respondents has been increased *consumer demand of casual attire* due to travel restrictions. With 'work from home' options for the consumers, fashion providers have a huge opportunity to fulfil this growing demand for comfort clothing. Further, during pandemic, online retail options have become successful as they provide convenience shopping and observation of social distancing.

Another development has been the *newly found PPE manufacture*, as reported by 95 % of the respondents. India today is the second largest producer of PPE in the world. The Head at TEA reported that 220 lakh PPE pieces are manufactured on a daily basis. Mahajan and Bains, in their review article have expressed optimism in the *newly found PPE manufacture*, production of isolation gowns and manufacture of masks, during lockdown. Key areas to look into are - sourcing alternative raw material, supply chain integration, and newer markets worldwide for the same (Mahajan and Bains, 2020).

A silver lining post pandemic is that experts feel the *rising anti-China sentiment across the world* could also lead to spurt in the direction of manufacturing within India (Krishnan and Mondal, 2020). Buyers like Marco O' Polo, are looking towards Tirupur knitwear manufacturers in the post COVID scenario, which is being sought as a big opportunity and a test against their Chinese counterparts (Chandramouli, September, 2020).

All the respondents felt the need of *supply chain management through local sourcing*. The research study by Baliyan and Diwan (2021) also puts forth the idea of local sourcing and usage of

real-time technology for aspects such as - monitoring, tracking, and responding to orders. According to the research, pandemic has led to this fact-finding as overall shorter time is required and lesser dependency is there on goods from other countries or regions.

In the words of President, TEA, the yarn prices have not increased in the international market whereas the raw material prices in India have gone up. Hence, as a step further, the export of raw material should be curbed and more emphasis should be there on *exports of finished products* (PTI, March 2021). According to 13 % of the respondents, this shall help in fetching a higher price in the export market paving way for greater foreign exchange.

Krishnan and Mondal (2020) report that, the local administration at Tirupur has been extending *soft loans with lower rates of interest*, to help in the trying times. According to personnel at associations, help has also been extended greatly through *Covid control rooms*-an endeavour set up to address labourers' grievances. As many as 90% of the production managers reported that the *labourers are being trained to maintain social distancing* while keeping masks on and regular washing of hands at work. The factories have markings on the floor to signify the physical distancing while at workplace.

Chitra et. Al (2020) in the review article have expressed optimism in the post pandemic era, since the *overall environment and pollution levels have undergone massive improvement*. The article highlights reduction in pollution in both- air and water, as well as proper disposal of domestic or biological waste after the lockdown, had been observed in the state of Tamil Nadu. Nearly all personnel reported a noteworthy aspect, that there seems to be movement towards circular economy, as people have started looking into recycling and finding additional usages for clothes to avoid overall wastage. *Sustainable clothing and circular economy as a concept is being looked into more seriously.* (Refer Fig. No.3)

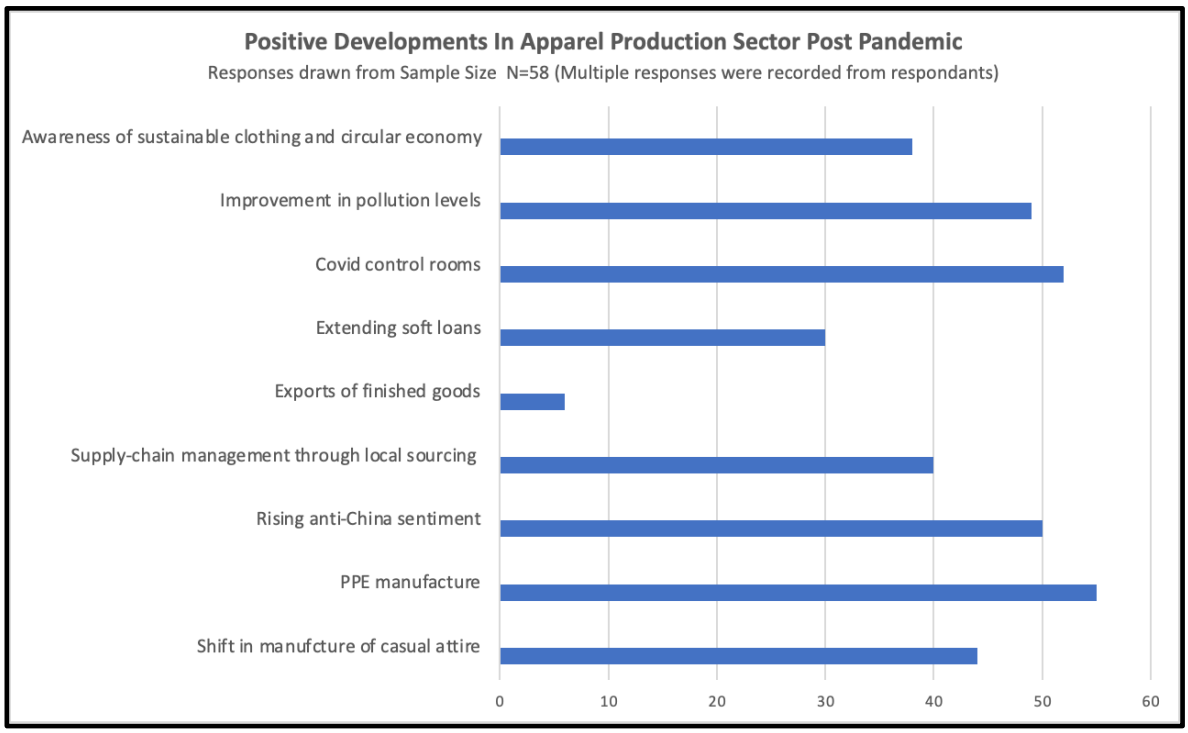

Fig.No.3: Positive developments in apparel production sector in post pandemic times

3. Adoption of Sustainable Practices -

In today's scenario environment consciousness, green practices, sustainability have become important aspects in apparel business and industries (Sareen, Sept.2021). Adopting green practices has become the need of the day and underlining aspects of the same are clearly visible in the shift in choices of using *organic and natural fibres* over chemical ones. Fashion influencers, leading fashion designers and apparel brands such as Mc Kinsey are promoting the use of sustainable practices and circular economy through different initiatives. The pandemic has been a green wake-up call. In this connection, with an increased awareness and inertia towards adoption of green practices, fashion footprint can be greatly reduced by creating *recycled fashions and lowered chemical and water usage.* The questionnaires revealed that several manufacturing units at Tirupur are supplying recycled cotton yarns on Trade India and IndiaMART. The recycled yarn is a re-purposed or re-claimed yarn which works on the concept of circular economy and sustainability. Brands like, Vera Bradley produce its range of cotton tote-bags using recycled cotton yarns. Interview with the association personnel suggested *recovery of textile waste* when done by local sources prove the most economical for the knitwear industry. This step shall help in overall movement in the direction towards circular economy (Baliyan and Diwan, 2021). Pesola and Bengs have converted this idea into reality at *Pure Waste Textiles.* This unit at Tirupur turns industrial waste which is collected from nearby units into a range of attractive clothing and accessories.

In a study conducted on Ludhiana Knitwear Industries, it was found that large scale knitting units adopt greener practices and are better aware as compared to medium and small-scale units (Kaur & Kaur, 2015). The personnel of knitwear units at Ludhiana were interviewed and the results indicated an increased awareness towards issues such as --pollution of water bodies due to effluents, having a company policy towards greener practices, following environmental standards as per the buyer's demands and specifications (Kaur, 2013).

In a study carried out on industrial units as well as surrounding villages in Tirupur by Govindarajalu, the plight of River Noyyal due to rising effluent levels especially from bleaching and dyeing units comes forth. It brings forth the effect of river pollution on production of crops such as paddy, oilseeds, sugarcane etc pre- and post-industrial development in Tirupur. The growing cases of health problems in the region, such as respiratory ailments, skin allergies etc. are also revealed (Govindarajalu, 2003). Velayutham Saravanan, in a study on increased export earnings of Tirupur knitwear industries versus environment sustainability, clearly brings forth burden on natural resources due to increased population of migrant workers, prevalence of environment acts passed by Tamil Nadu Pollution Board, such as- The Water Cess Act, The Environment Act, being revised from time to time but efficacy remains in question (Saravanan, 2008). However, over one decade, the picture has completely changed. Interviews with the personnel at knitwear units revealed that, there are *Zero Liquid Discharge Systems* in place to resolve the problem of water pollution. Though it is still at a nascent stage and expensive, however sustainable initiatives are getting popular in the hosiery town. Another heart-warming initiative at the Tirupur cluster is the supply of 1600 MW of *solar and wind energy* to the units. According to TEA, today about 40% of power consumed by the knitwear units comes from wind and solar energy.

In view of the strong shift towards sustainable practices, researches reveal that reducing chemicals of both dyeing and processing stages -such as Hydrogen Peroxide and Sodium Hydroxide, shall immensely help in saving water bodies. In a study carried out on *alternate techniques for wet-processing,* the results revealed nearly similar processing outcome without

compromising on overall strength or colour value (Hannan et.al, 2018). An alternative to chemical scouring was a study conducted using soap-nuts as scouring agents on knitted fabrics. This eco-friendly detergent treatment proved to enhance the overall strength and absorbency characteristics of the knitted fabrics (Hoque, et.al., 2018). Another research has been conducted for*bio-processing* cotton fabrics using enzymes. The tests on bio-scoured samples revealed the characteristics such as-enhanced absorbency, successful dyeing without loss in strength and an overall reduction in costs due to lowered chemical usage (Brishti et.al, 2019). Other significant research studies for lowering chemical usage reveal the successful use of *natural dyes on knitted apparel* (Ahmed, et al., 2019). Natural dyes are non-toxic, eco-friendly and these have a broad gamut of pleasing colour hues (Sareen, Dec. 2021). Questionnaire outcomes reveal that knitwear units in Tirupur, popularising the concept include of naturally dyed yarns and fabrics include -Nature Dye House, Sanmax Compacting, etc.

Further, *functional blend alterations* in knitted fabrics can also help to make the processing eco-friendlier. In a study carried out, acrylic has been blended with hemp in knitted construction to enhance the overall softness characteristics, which otherwise would have been achieved using chemicals. This also helped to lower the over-all cost as well as a step towards sustainability (Novakovic, et.al., 2020)

Hester, in the research explored along the idea of *on-demand production and supply of knitwear*, in order to address the important issue of sustainability and environmental impact of over-production (Hester, M.L.2021).

Some of the other sustainable initiatives, as revealed by personnel interviewed include, *Ecohike*- by Syndicate Impex, which is a range of knitwear recycled from Polyester bottles and recycled textile fabrics. Other examples are of *100% recycled polyester sportswear being made from PET bottles* for Australian Open by NC John & Sons, based at Tirupur. The range included leggings, jackets, tennis dresses, shorts etc. (Refer Fig.No.4)

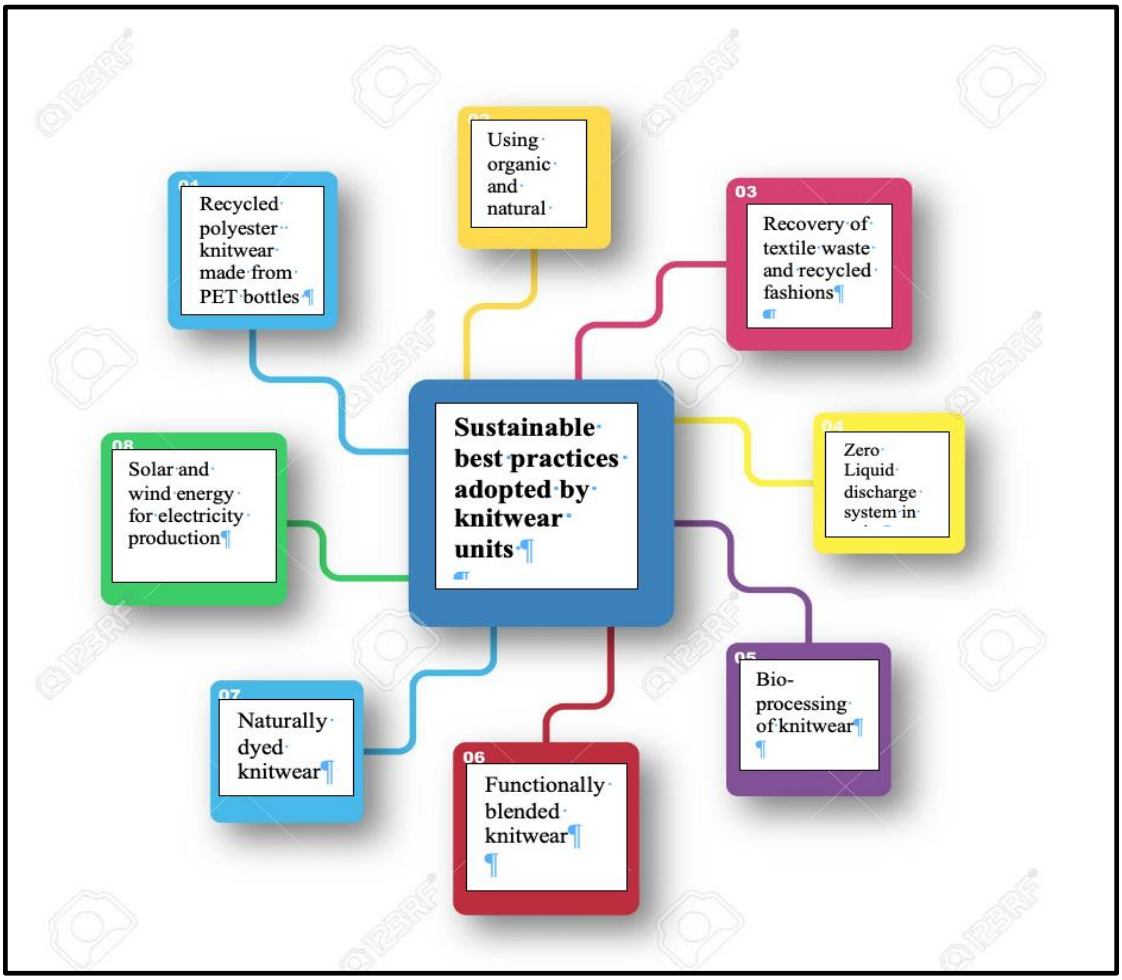

Fig. No. 4: Sustainable practices adopted by knitwear units

CONCLUSION

The Indian knitwear industry has come a long way and shows promising future as well. However, it requires supportive policies from both the Central and State governments to become more competitive in the global market., especially to regain its pre-pandemic glory. The "Skill India" and "Make-in India" initiatives are steps in the direction as they pave way for skilled manpower and good market for fashion products. It is an opportune moment for knitwear industry to upgrade its technology, streamline supply chain and adopt greener and sustainable practices, in order to surge ahead in the competitive global arena.

SCOPE FOR FURTHER WORK

The research study has found sustainability as a process to be picking up in the knitwear industry, at all levels of production. A similar study can be carried out for home textiles and woven garment industry, to understand the practices followed and recommendations if any for the policy makers, so that India can lead the world market in apparel production and sustainable practices.

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AN ANALYSIS ON MARKETING OF PRODUCTS BY BAMBOO CRAFTSMEN IN ASSAM

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ABSTRACT

The bamboo sector is regarded as the second largest job-creating sector after agriculture, with a large number of craftspeople working on a part-time basis in the present days. This article is a modest attempt to analyze the marketing strategies followed by the selected craftsmen of the bamboo handicraft sector in Assam. It also includes various products produced by the respondents, and challenges they have experienced in marketing of their products. This article is entirely based on primary data collected directly from selected rural bamboo craftsmen and secondary data collected from various sources like government websites, portals, record books and journals. This study was conducted in the month of August, 2021 in Lakhimpur district, Assam using random sampling technique. Through this study, the investigator recommends establishment of training programmes for the state's bamboo craftsmen on marketing ideas, especially through social media and also, other need-based training programmes on skill development and scientific knowledge so that the craftsmen can raise their profit in this sector.

Keywords: Advertisement, Bamboo, Craftsman, Challenges, Marketing.

INTRODUCTION

Bamboo has long been an important element of Assam's cultural, social, and economic heritage. This renewable flexible resource, which grows abundantly in the forests and is also farmed in homesteads, groves, or private plantations, is a key component of the State's natural riches. Many people in Assam still rely on it for a living as well as for domestic and utilitarian purposes.

Although Assam has been historically rich in bamboo since time immemorial, bamboo crafts from Assam do not feature substantially in India's handicraft market, and Assam's proportion of the export trade is tiny. Assam's overall bamboo acreage is around 2.23 million hectares, compared to India's total bamboo area of 15.70 million (GopalKrishna, 2020). Out of the 130 bamboo species accessible in India, 51 are produced in Assam and are utilised for a variety of uses, mostly for structures, furniture, and other contraptions. Muli (*Melocanna bambusoides*), Dalu (*Teinostachyum dalloa*), Khang (*Dendrocalmus longispatnus*), Kaligoda (*Oxytenanthera nigrociliata*), and Pecha are the most economically significant bamboo species (*Dendrocalamus Hamilton*-ii). Muli and Dalu have significant economic value, the former for pulping, building, and fencing, and the latter for the mat and basket industries. Bamboo has tremendous untapped resources that may be used for a variety of useful purposes aside from job development and livelihood generation.

The Global Industry Report, on the other hand, assesses the global bamboo market at USD 72.10 billion in 2019 and expects it to rise to over USD 98.75 billion by 2026, rising at a rate of roughly 5.5 percent per year between 2020 and 2026. Despite having 30% of the world's bamboo resources and the world's biggest growing area of more than 15.69 million hectares, India accesses barely one-tenth of its bamboo potential, accounting for only 4% of the worldwide market for bamboo goods. According to the Forest Survey of India (2017), the country's total bamboo bearing area is projected to be 15.70 million hectares. The annual bamboo output in India is around 14.60 million tonnes, and the bamboo and rattan sector in India is valued at Rs. 28,005 crores in 2017. During 2015-16 and 2016-17, exports of bamboo and bamboo products totaled Rs.0.11 crore and Rs.0.32 crore, respectively, while imports totaled Rs.148.63 crores and Rs.213.65 crores. Despite having a significant bamboo resource area, India is a net importer of bamboo. India accounts for only 4% of the worldwide market. This is due to the poor productivity of bamboo (4 tonne/ha.) in comparison to other nations such as China, Japan, and Malayasia, which together account for around 80% of the global bamboo market (Gogoi, 2020).

NEED OF THE STUDY

The Government of India since independence has been implementing various policies from time to time for the development of small and household industries. Unfortunately, these policies are not yet able to touch certain sections of people working and earning for themselves at the grassroots remote levels. One section of such people is the rural bamboo artisans in Assam. The artisans have sufficient raw materials, skills, new and innovative ideas in terms of production of items. But problems arise when it comes to marketing of their products. The artisans are not that well to do in terms of finance and hence, they are not able to start any formal established enterprise on their own with the help of which they can sell their products and earn efficiently. Since the artisans lack proper and stable marketing channels, they are bound to sell it to different stores or shops in the urban areas at a lesser cost, and hence, unable to yield enough profit out of their products. This whole process does not ultimately help them grow or improve the living conditions of the rural artisans. Therefore, this study was conducted by the researcher to find out the existing situation of the artisans and to assess the problems and challenges faced by them in marketing of products, also pointing out the importance and trend of social media marketing in the current scenario and how it can be expected to help the artisans.

OBJECTIVES

1. To study the demographic profile of the bamboo craftsmen and different bamboo crafts produced by them.
2. To assess the marketing practices followed by the craftsmen in terms of advertisement and sale.
3. To evaluate the challenges encountered by the craftsmen in marketing of their products.

LIMITATIONS OF THE STUDY

- Limited to one nature of enterprise only.
- Limited to local language to get first-hand information from the respondents.
- Limited by time.

- Subject area delimited to marketing of products and challenges only

METHODOLOGY

The investigator conducted the study in the state of Assam during August and September, 2021 and the district Lakhimpur was selected as the study area, since data showed that bamboo craft markets are predominantly found in larger number in this district.

North Lakhimpur Sub division was selected from Lakhimpur district, followed by the Boginadi block using random sampling method. The investigator has randomly selected two villages from the Boginadi block *viz*., Sariani Gaon and Maaz Gaon and a sample of 25 craftsmen were selected from each village randomly. Thus, the total sample size for the study is 50.

Primary data were collected through a structured interview schedule. Secondary data have been collected from various books, journals, government portals, websites relevant to the subject area and documented systematically in the study.

Analysis of data included frequency and percentage analysis.

FINDINGS AND DISCUSSION

Demographic Profile of the respondents

Table-1 Demographic Profile of the respondents

Category	Frequency (n=50)	Percentage (%)
Age (in years)		
Below 20	2	4
21-30	28	56
31-40	12	24
41-50	8	16
Religion		
Hindu	46	92
Muslim	4	8
Caste		
General	15	30
OBC/MOBC	27	54
ST	5	10
SC	3	6
Marital status		
Unmarried	5	10
Married	42	84
Widower	3	6
Type of family		
Nuclear family	36	72
Joint family	9	18
Extended family	5	10
Size of family		

Small (2-4)	30	60
Medium (5-7)	13	26
Large (8 and above)	2	4
Educational Qualification		
Primary school	3	6
Middle school	7	14
High school	14	28
Higher secondary	23	46
Graduate	3	6
Monthly income from bamboo craft (in Rs.)	28	50
10,000-20,000	10	20
20,001-30,000	7	14
30,001-40,000	3	6
40,001-50,000	2	4
>50,000		

Regarding demographic profile of the respondents, the findings in Table 1 reveal that most of the respondents (40%) included in the study were of 21-30 years. This is the age where the individuals are generally full of energy and enthusiasm to achieve more in life, having capacity of giving maximum mental and physical input in the process.

Also, it was reported that more than one half of the respondents belonged to OBC/MOBC caste (54%) and here the findings showed that the respondents of sample villages were from different castes of which OBC caste dominated the entire group.

Majority of the respondents were from Hindu community (92%) and married (84%) because unlike urban areas, rural girls get married at young age. Respondents belonged to nuclear families (72%) with small family sizes (60%). This finding is a clear indication of the present trend in the rural areas. This condition may be linked to the fact that, as a result of the fragmentation of the rural family system, the majority of families were discovered to be nuclear. These findings are consistent with Chetia's findings (2002). Furthermore, the lower family size may be attributed to increased knowledge of family planning through communication media, as well as family planning practices taken by rural families, which aid to minimize family size. This conclusion is consistent with the findings of Borkakoty (2013), who discovered that the majority of rural women came from smaller families.

A total of 46% of the respondents attained higher secondary in regard to educational qualification. This is a good picture for the respondents as higher secondary education, is expected to be enough to help them understand and learn new ways of marketing.

Half of the respondents (50%), from their bamboo craft, had monthly income of Rs. 10000- Rs. 20000, followed by 20% with income of Rs. 20001- Rs.30000. In this study, it is found that half of the whole respondents (50%) have low income considering the hike in prices of almost all good and commodities in the present days, for which adopting social media for marketing would be of great help to these people to raise their level of income.

Different bamboo-based crafts produced by the respondents:

The most common Bamboo craft since time immemorial has been baskets. Generally, men of the family indulge in making baskets. The basket size and shape determine its name (Assam State Portal, Govt. of Assam). Table 2 highlights the different products produced by the bamboo craftsmen.

Table 2. Different bamboo-based crafts produced by the respondents

Items produced*	Frequency (n=50)	Percentage
Sofa sets	30	60
Chair	45	90
Table	48	96
Stool	50	100
Bed	25	50
Baskets	50	100
Kitchen wares	40	80
Home decors	20	40
Jewellery	15	30
Lamp Shade	24	48
Sieve	50	100
Hand Fan	48	96
Jaapi	50	100

*****Multiple responses

It was found that baskets, sieve and 'Jaapi' (a traditional umbrella of Assam which is also used for decorative purpose) were produced by cent percent of the respondents. Hand fan and tables were made by 96 percent of the respondents, followed by 90 percent respondents that made chair. Kitchen wares like trays, spatula, ladle, bowls, plates etc. were made by 80 percent of the respondents. Similarly, sofa sets, bed, lamp shades and home décor items were made by 60 percent, 50 percent, 48 percent and 40 percent of the respondents respectively. Jewellery items like neck pieces, earrings, bangles were made only 30 percent of the respondents. Some of them had undergone training programmes in production techniques of different items, while some of them were very much untrained and had been producing items based on their own raw ideas and skills.

Marketing practices followed by the respondents in terms of advertisement and sale of products:

Table 3 depicts various marketing strategies followed by the respondents for advertisement and marketing of their products

Table-3 Marketing practices followed by the respondents in terms of advertisement and sale of products

Category	Frequency (n=50)	Percentage
Advertisement Practices*		
Word of Mouth	48	96
Exhibition	35	70
Print Media (leaflets)	20	40
Social Media Ads	5	10
Pattern of products sale*		
Selling from own shops	40	80
Exhibition sale	45	90
Getting orders from stores	38	76
Getting customized orders directly from customers	40	80
Direct selling to stores in urban areas	50	100
Exporting outside the state	17	34
Modes of marketing*		
Direct selling	50	100
Personal selling	30	60
Mobile marketing through texts and multimedia messages	10	20
Sales Promotion	28	56

*Multiple Responses

. Word of mouth technique was followed by a large majority of 96 percent of the respondents ;70 percent of the respondents used to advertise their products through exhibition, followed by 40 percent respondents who distributed leaflets and only 10 percent have social media accounts where they post ads of their products.

For sale of products, it was found that cent percent of the respondents used to sell their products to different stores in urban areas, followed by 80 percent who used to wait for exhibitions to be organized where they could sell their products. Only 34 percent of the respondents used to export their products outside the state with the help of phone calls or social media ads.

Cent percent of the respondents followed the method of direct selling to their customers, personal selling was followed by 60 percent of the respondents where they used to meet their customers personally for taking orders or persuading them to purchase some products. More than one half (56 percent) of the respondents used to give sale promotion frequently to sell their products where they would put offers or discounts for a fixed period of time to attract customers.

Challenges faced by the artisans in marketing of bamboo craft:

Table 4 indicates some of the major challenges encountered by the selected bamboo craftsmen in their business.

Table-4 Challenges faced by the artisans in marketing of bamboo craft*

Challenges encountered	Frequency (n=50)	Percentage
Stiff competition from plastic and fibre products	45	90
Soaring prices of bamboo	50	100
Irregular and scant supply of bamboo	40	80
Lack of proper linkages and platform for marketing and promotion	50	100
Lack of marketing skills	50	100
Lack of new and innovative ideas of production of items	36	72
Lack of skilled employees	30	60
Lack of scientific knowledge for higher yield of bamboo	50	100
Lack of capital for investment in machineries and equipments	50	100
Lack of proper knowledge regarding different schemes and institutions in support	35	70

*Multiple Responses

A large majority of the respondents stated that they faced with several challenges, including stiff competition from plastic and fibre products, lack of marketing initiatives and soaring prices of bamboo, these people were deprived of a decent living

They claimed that beautiful bamboo goods such as pachiya, dala (basket), binchani (hand fan), and kula (winnowing fan), which used to command a decent price, have now been replaced by plastic and fibre products. The demand for these things has decreased as a result of the lack of marketing ties. Nowadays, the business does not yield a lot of profit. The artisans are forced to offer their products at a lesser cost. What is missing is a good platform for artisans to display their talents, as well as a competent marketing channel to sell their products. These are the statements stated by almost all the selected respondents in the study.

Bamboo goods are often purchased by urban customers through middlemen or local market places, and craftsmen have extremely limited options to reach new consumers in metropolitan regions through retail platforms such as departmental stores or shopping malls. In that case, the use of relevant technology, manufacturing processes, and market connections may all help to expand the bamboo industry and enhance the economic situations of those involved in bamboo farming and value addition.

Furthermore, owing to the widespread use of social media nowadays, practically all new online platforms include social elements such as profiles, rating, commenting, and sharing. Social media's power is characterized by its fast evolution. Every day, millions of social media conversations take place throughout the world, and many of them are likely to revolve on specific firms, workers, goods, or services, as well as rivals (Meerman Scott, 2015). This is a wonderful chance for bamboo craftsmen to acquire information about important people's thoughts. Businesses that use social media to their advantage get a competitive advantage. The truth is that there are a wide array benefits to making effective use of social networking. Social media not only serves as marketing channel but

used as a means of connecting with customers and other factors around the company (Richards, 2015). Social media helps successful, open and transparent companies build trust among the participants. Changes are inevitable, and companies that accept it can turn challenges into opportunities and preserve their future success (Kaplan and Haenlein, 2010).

Hence, it becomes imperative to empower the artisans technically by providing them with proper training on relevant needful updated contents of social media marketing as well as on skill developments and scientific knowledge so as to cope up with the changing times and productively utilize their free time and skill for sustaining enterprises.

CONCLUSION

With 136 species, India is one of the most bamboo-rich countries in the world. Because this is a developing industry with enormous potential, new opportunities will continue to emerge, necessitating the State Government's periodic development of comprehensive programmes and techniques in support of the State Policy's framework. This sector has a lot of room for growth since bamboo and cane can be used to make a variety of innovative items that appeal to current preferences. With the right social media marketing analytics, items may be designed to meet the needs of the consumer market, boosting the state's and country's economies.

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ANALYSING THE ADVANTAGE AND ATTITUDE TOWARDS NATIONAL SERVICE SCHEME AMONG THE VOLUNTEERS

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ABSTRACT

The youths of a country have many opportunities and responsibilities to actively participate in national growth and shape the destiny of a nation as well as their own. The concerns of youth are numerous, and their hopes are inevitably dashed strongly in a world with a fantastic history and more hope for the future. As a result, there is a need to establish growing chances to develop their personalities and capacity to work and to be more economically efficient and socially valuable. National Service Scheme (NSS) gives the chances to college and university students to develop their personalities through community service. NSS has its own identity and can be used in society by implementing it in higher education to enhance and instill social responsibility among students. Volunteers can be encouraged to participate in N.S.S. so that their energy can be put to good use in developing a strong nation. Hence, the present focused on to determine attitudes and benefits gained in NSS. A total of 600 NSS volunteers were chosen for the study through the proportional random sampling method. The findings suggest that when looking at the 15 components of the 1st-factor loading attitude toward NSS the participants had a favourable attitude toward NSS. The time duration is not adequate for the camp was respondents by the volunteers (1st rank) were mentioned when speaking about the obstacles faced by the volunteers in the NSS.

Key words: NSS, attitude, advantages, volunteers

INTRODUCTION

The National Service Scheme (NSS) is a turning point for volunteers because it allows them to focus on their overall development through community service. NSS connects the volunteers' minds with the all-around stroke of ethical values inculcation undertaken in higher education. Volunteers in the National Service Scheme gain the ability to analyze the concerns and demands of society and search for a solution through the knowledge gained from experience. Considering India's progress in higher education and research, the National Service Scheme has played a critical role in society, community involvement in social activities, and voluntary participation in social activities. The implementation of the National Service Scheme bridges the gap between volunteers and the public, as well as higher education and university research scholars.

According to Saha (2019), NSS volunteers took part in community projects like building roads, protecting the environment through plantations, building water-harvesting structures, etc. They organized themselves actively to raise money for the victims of natural disasters. NSS volunteers

may contribute to a decrease in crime against women, girls, and all other vulnerable groups in society by raising public awareness of the social and economic problems that exist.

Khandare and Desai (2016) stated that NSS camps give people and groups complete access to their individual and collective power, allowing them to use it to interact with others or the larger community. As a result, personal growth will be possible. The NSS camp activities will unquestionably strengthen the qualities of teamwork, cooperative working, and communication skills, and, above all, allow the student to be a part of the community and understand their needs, problems, and socioeconomic status, which will be helpful in their future practices.

It has been seen that the ideas of a higher intellectual level were the only emphasis of the educational system in prior decades, and this idea was revolutionized into a multi-faceted plan that focuses on each student's overall progress outside of the classroom with the advent of NSS. Individual success cannot be the major aim of education in a free nation that is dedicated to democracy, socialism, and secularism. The volunteers' logic of civic duty and patriotism should be instilled through education. It is a value that NSS works to impart to its students. It enables undergraduate students to spend their free time engaging in a range of social and personal growth activities through various activities inside and outside of the campus.

The NSS tries to close the knowledge gap between theory and practice. It is essential that NSS training provides the knowledge of compulsion to serve society and a few marketable skills such as socialization, cooperation, personality development, emotional management, negotiation skills, etc. The future prospect of the nation is extremely positive through the NSS young volunteers' unlimited energy, persistent dedication to their goals and beliefs, and indomitable youthful spirit. Students could be empowered by NSS to empower the country. *Anita et al.* (2022) stated that the national service programme gives college and university students the ability to develop their identities through community service. NSS has a distinct character and can be used to improve society by successfully promoting social responsibility among college students. Since youth energies can be better utilized to build a strong, healthy nation, more students should be encouraged to join N.S.S. The N.S.S. camp activities will undoubtedly enhance the ideals of volunteer leadership, teamwork, constructive activity, and communication abilities in the community. Students can conduct common social activities thanks to daily practice. The National Service Scheme has shown a critical role for society, community involvement in social activities, and voluntary engagement in social activities. The desires and priorities of aliveness in society are discovered among volunteers through their participation in national calamities.

Volunteers at colleges and universities learnt from the programme to develop their identities by volunteering in the community. NSS has its own identity and can be used to develop society by promoting social responsibility among students in higher education. More students should be encouraged to participate in NSS since their efforts can be better channeled towards building a strong nation. Through regular activities and the NSS special camp, volunteers improve their leadership qualities, team spirit, constructive activities, and communication skills.

Need of the present study: The National Service Scheme (NSS) is a significant programme in India that encourages youth to develop their personalities via volunteerism. Presently, a huge number of student’s volunteer in the NSS programme and help the local communities. Throughout

the year, they take part in a variety of activities, such as celebrating national and international events, volunteering for humanitarian activities, and running special campaigns. Through all of these activities, they will become more capable and able of taking leadership through various activities. NSS is not only an extracurricular activity in the true sense; it is a programme to study people and life through active participation. After reviewing the literature, it has been found that little research has been undertaken in evaluation of the impact of the NSS programme. The study will assist in the analysis of the factors that led volunteers to enrol in NSS as well as volunteers' positive and negative attitudes toward NSS. As the NSS is a nationalised scheme, the study will also help policymakers to identify the difficulties experienced by volunteers and it will enable them to more effectively develop the programme.

The objectives of the study are given below:

- To identify socio-economic status of volunteers.
- To recognise factors motivating volunteers to join NSS.
- To find the attitudes of volunteers towards NSS.
- To analyse challenges faced by volunteers in NSS.

METHODOLOGY

Research Design: Research methodology is the key to systematic research and solutions. It specifies the research design framework, sampling procedure, methods of collection, and analysis. The descriptive Survey Method was used for the conduct of the present study.

Selection of the area and sample: A total of 600 NSS volunteers were selected from two different states of India, Assam and Tamil Nadu. From Assam HPB girls' college and Assam Agricultural University and from Tamil Nadu Agricultural University and Avinashilingam Institute for Home Science and Higher Education for Women were selected as the area of the current research. The sample size was 358 female and 242 male volunteers of NSS.

Selection of the Methods Tool: The method of proportional random sampling was carried out for the study. The researchers applied a self-formulated 5-point Likert scale to rate attitudes and advantages of NSS among volunteers. The information was gathered through a questionnaire tool.

Analysis and interpretation of the data: To accomplish the objective of the current study, the data were coded, categorized, and tabulated. The data was tallied. The data were then subjected to statistical analysis. Percentage analysis was used to assess the factors that motivated volunteers to join NSS; factorial analysis was used to identify attitudes toward NSS among the volunteers, and ranking was used to examine the challenges that the volunteers faced in NSS.

RESULT AND DISCUSSION

A. Socio economic profile of the volunteers:

The details on Socio Economic Profile of the NSS Volunteers are shown in Table I

Table 1: Socio-Economic Profile of the Volunteers

		N=600
Aspects		**Percentage**
Caste- Community	OBC	55
	ST	15
	SC	30
Religion	Hindu	55
	Muslim	31
	Christian	14
Age	18-19 years	10
	19-20 years	40
	20-21 years	35
	Above 21	15
Home Location	Rural	38
	Urban	50
	Semi urban	12
Types of House	Bamboo house	20
	Cement house	30
Type of Family	Nuclear	48
	Joint	52
	Extended	7
Family Size	Up to 2 (Small)	44
	3 to 4 (Medium)	39
	Above 4 (Large)	17
Source of Income	Agriculture	26

Head of the Family	Business	40
	Private Sector	20
	Government Sector	15
Monthly income of the Family	Below – 10,000 Rs.	2
	10001-20,000 Rs	36
	20001-30,000 Rs	43
	Above 30,000 Rs	16

The demographic profile clearly reveals that forty percent of the respondents were in the age group of 19 – 20 years whereas ten percent of the respondents were in the age group of 18-19 years. Fifty percent of the respondents were from urban community and thirty eight percent of the volunteers were from rural community. Glancing the types of family fifty two percent of them were from nuclear family. Head of the family of fifteen percent respondents were working in government sector.

While looking into the family size forty four percent of the respondents were from small family followed by seventeen percent of the respondents from large family. Only two percent of the respondents' monthly income was below Rs.10,000 whereas forty three percent of the respondents' monthly income was between Rs. 20001-30,0000.

Table 2: Factors Motivating to Join NSS

	N=600
Characteristics	**Percentage**
NSS certificate	30
Develop leadership quality	60
To know rural problem	45
Interest to involve in community work	50
For personality development	77
For the sense of involvement in nation building	45
Extra-curricular activity	30
To improve self- dependency	20
To develop leadership skill	70
To acquire problem solving skill	65
To develop courage to manage field problems and situations	40

To develop self-determination	30
To improve communication skill	44
To acquire social and civic responsibility	30
To identify, utilise and maximise potentials	28
To realise own strength and weakness	43
Forced by Friends / family / teachers	5

*****Multiple responses

The data previews that seventy seven percent of the respondents had joined NSS for personality development followed by fifty percent of the respondents who had joined for serving community works to improve their self-confidence. Sixty five percent of the respondent stated that they joined NSS to acquire the problem-solving skill whereas five percent of the respondents joined NSS because they were forced by family, friends, or teachers. While looking into the data it was found that NSS plays an important role among the volunteers in overall development and motivating them towards NSS

Identification of Factor Related to Attitude towards NSS:

NSS plays a vital role in all round development of the students but they might have positive and negative attitude based on the individual perception. The researcher has tried to the find out the attitude towards NSS. Answers to the questions were analyzed by the factor analysis and the result was tabulated in the table.

Table 3: Cronbach's Reliability Test

Reliability Statistics	
Cronbach's Alpha	N of Items
.821	24

Source: Estimation based on Field survey

The Cronbach's alpha test was used to determine the reliability of using factor analysis in this study, and the results are shown in the table. The Cronbach's alpha value was.821 in the table, which is greater than 0.7, That is showing that the constructions were internally consistent. As a result, the tool utilised in this investigation exhibited a high level of reliability. The underlying dimensions of the constructs were determined using factor analysis explained in Table 5.

Table 4: KMO and Bartlett's Test Measures

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.724
Bartlett's Test of Sphericity	Approx. Chi-Square	3747.230
	Df	406
	Sig.	.000

Source: Estimation based on Field survey

Using factor analysis, this study attempted to determine the amount of significant difference in attitude among the volunteers. Two tests, Kaiser-Meyer-Olkin measures of sample adequacy (KMO) and Bartlett's Test of Sphericity, were used in the first phase to determine whether the association between the variables was significant. The estimated Kaiser-Mayer-Olkin sampling adequacy was 0.724, and the 2 value for Bartlett's test for sphericity 3747.230 indicates that factor analysis of the specified variables was judged to be suitable.

Table- 5: Factors Loadings for Attitude towards NSS

Inhibitors	Components			
	1	2	3	4
NSS is necessary for our society	.833			
NSS is not for necessary for college students	.894			
It is helpful for personality development	.948			
It develops self-confidence	.949			
It helps in socialisation	.907			
It provides wide experiences in life	.810			
NSS does not improve literacy	.798			
It helps to increases positive thinking	.924			
Feel proud for joining NSS			.926	
It is a part of the curriculum			.942	
It helps the NSS volunteers to lead independent life	.795			
NSS helps the volunteers to gain mental strength	.961			
It is camps provide an opportunity to adjust and get adapted to new, challenging situation			.880	
It does not provide a change from routine classroom learning	.711			
It helps to organise economic development activity in the community	.944			
It helps to realise the importance of hard work	.853			
It helps realize the value and importance of family				
It assists the NSS volunteers to develop their knowledge level	.900			
It helps the volunteers to improve their thinking skill		.862		
It does not help to change the behaviours		.908		
Provide awareness of all social issues				.926
Given an opportunity to learn and adapt others culture, language and food habit	.923			
Helping in social adjustment		.777		
Help to realize the importance of family		.887		
Its help to explore our inner talent		.942		

Eigen values	13.164	5.637	3.371	1.153
Percentage of variance	45.391	19.439	11.624	3.977
Cumulative percentage	45.391	64.831	76.455	80.432

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization,
Rotation converged in 4 iterations.
Source: Estimation based on Field Survey

Examining the factors influenced the selected NSS volunteers' attitudes toward NSS Factor I has significant loading for 15 variables, namely: the NSS is necessary for our society; it is not necessary for college students; it is helpful for personality development; it develops confidence; it helps in socialization; it provides a wide range of experiences in life; it does not improve literacy; it helps to increase positive thinking; it helps volunteers to live independent lives; it helps the volunteers to gain mental strength; it has not provided a change from routine classroom learning, It helped to organize economic development activity in the community, it helped to realize the importance of hard work, it has assisted the NSS volunteers to develop their knowledge level and it has given an opportunity to learn and adopt others' culture, language, and food habits. These factors explain about 45.39% of the variance.

While looking into the other counter parts (factor II), it shows that the 19.439 percent of variance in 5 variables, namely ,it helped the volunteers to improve their thinking skills, it has not helped to change their behavior, helped in social adjustment, helped to realize the importance of family, and it facilitates exploring the inner talent. Whereas factor III has significant loading on 3 variables, namely, they felt proud of joining NSS, it's a part of the curriculum, and NSS camp provides an opportunity to adjust and get used to a new challenging situation, and these variables explained about 11.624 percent of variance. The last cause (factor IV) revealed that only one significant loading where the percentage of variance was 3.977 with the variable was that NSS provided awareness of all social issues.

Chandrasekhar and Visheshwar (2000) undertook an assessment of students' attitudes regarding the National Service Scheme and national integration and developed a scale to assess post-graduate arts and science students' attitudes regarding the NSS, as well as its reliability and validity. The scale used to measure attitudes towards NSS is multi-dimensional, according to factor analysis, and the alpha coefficient indicates that the scale is very reliable. Students in the arts and social sciences scored higher on attitudes toward NSS and social integration than students in science and engineering. Scores on the attitude toward NSS measure were also found to be favorably connected with scores on the social integration scale. The implications are developed for the benefit of programme co-coordinators, officials, and those involved with the NSS and its programmes.

B. Challenges Faced by the Volunteers in NSS:

Respondents were asked to rank the Challenges faced by Volunteers in NSS in the current study, and their rankings were transformed into percent positions using the formula:

$$\text{Percent position} = \frac{100\ (R_j - 0.5)}{N}$$

Where Rj denotes the item's rank, and N is the number of things ranked. The Garrets' Rating scale is used to transform the percent position into a score, and the average score acquired for different causes is calculated and given in table- 6.

Table- 6: Garrets ranking for the Challengers faced by the Volunteers in NSS:

Items	Score	Rank
Lack of resources for NSS activity	52.04	6
Lack of fund from governments and non-government organization	32.54	14
Problem in developing rapport with the village people	47.13	8
Lack of co-operation among the team members	37.80	9
Absence of positivity of the team members	66.51	3
Lack of Self-confidence among the volunteers	33.72	12
Lack of co-operation with the community	62.20	4
Inappropriate guidance from coordinator as well as programme officers	36.44	10
Time duration is not enough for the camp	75.92	1
Activities done in outside the campus leads to problems	54.98	5
Conflict among the team members during the special camp	67.18	2
Faced food related problem while attending the camp	47.67	7
Regretting for participating in special camp	32.66	13
Difficulties in following NSS rules and regulations	36.26	11

Source: Calculated figures based on the data compiled

Regarding the challenges faced by the volunteers it was found majority (1st rank) of them stated that the time duration was not enough for the special camp because they have spent seven days in a special camp where they were unable to improve their talents or explore their capabilities. The statement conflict among team members at the special camp was the 2nd issue faced by volunteers. Absence of positivity of the team members stated as 4th rank by the volunteers, lack of co-operation with the community (12th rank), regretting for participating in special camp (13th rank), and lack of fund from governments and non-government organization(14th) were the challenges faced by volunteers, as they stated.

Recommendations to the Policymakers:

- The time duration of NSS special camp should be increased.
- Volunteership in the NSS should be increased till post-graduation.

- Best volunteers should get an extra opportunity while applying for any government job and allocate the seat reservation in higher education.
- Interested alumni should be allowed to follow NSS activities.
- NSS should be added in the curriculum from the school level so that the volunteers are able to understand the social value as well as community service.
- NSS activities should be carried out during working hours also.
- Fund allocation should be enhanced for regular activities and special camp.

CONCLUSION

NSS is a platform where the volunteers can explore their skills, knowledge, and creativity. The volunteers stated positive views on the advantages of NSS. NSS helps the volunteers to grow in a group as well as at individual levels. Though NSS imparts a positive vibe among the volunteers, on the other hand, volunteers stated they still faced many challenges in NSS activities and volunteers need appropriate policy strategy to make it effective as well as overcome all stated challenges in this study. Young Indians make up the majority of NSS volunteers, and they are the most energetic and vibrant segment of the organization. NSS special camps helped to expose the realities of life; NSS activities and programmes allowed the volunteers to improve their strengths, lessen their weaknesses, create possibilities for future development, and mould them to face life's obstacles. NSS provides volunteers with the opportunity to improve their social skills, such as group adjustment, cultural adaptation, and involvement in group activities, which all aid in their ability to socialize more effectively. India, like other countries, can use its youth's great potential to address the country's continuing and intergenerational developmental difficulties. Former volunteers in both rich and developing countries have a higher sense of community connection and feel more empowered to help and participate in community works.

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ASSESSMENT OF INFORMATION SEEKING BEHAVIOUR OF POST GRADUATE STUDENTS REGARDING E- RESOURCES

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ABSTRACT

This study is an attempt to find out the information-seeking behaviour of post-graduate students regarding electronic information resources. The study employed a survey research design, with data collected via a structured online questionnaire. As many as 464 questionnaires were distributed among post-graduate students who were randomly selected from eight faculties of the University of Rajasthan, Jaipur. Of those, 378 questionnaires were returned. Results of the study revealed that the Internet was the most dependable source of information and was ranked first based on the basis of RBQ value (83.44). Further study depicts that the majority of the respondents (74.1%) used the internet for literature search, followed by updating their knowledge (68.9%), and among various e-resources, website resources (84.7%) were the most used type of e-information source on the internet, followed by E-books (54.2%). Results regarding the extent of use of E-resources revealed that nearly 60 percent of respondents used e-resources mostly, nearly 30 percent used them fairly, and 10.6% used them rarely. Furthermore the present study found that the majority of those surveyed were satisfied with E-thesis (50 %), E-books (49.7%), E-newspapers (38.9%), E-journals (38.5%), as well as the major challenges that affect students' electronic information behaviour to a high extent are information overload on the internet (64.3%), lack of awareness about various e-sources (62.4%), and lack of technical guidance for search tools and documents (59.8%), network problem (57.1%) etc. The study recommended the subscription of more need-based e-sources in the university library and a user awareness/educational programme for the efficient utilisation of e-sources and services provided by the university.

Key Words: Information Seeking -Behaviour, Post-Graduate Students, E- resources, University

INTRODUCTION

Internet is a primary means for transmitting any type of information amongst students via its various platforms, including email, search engines, online portals, discussion forums, groups, web logs, and so on. An electronic environment allows for revisions and updates of original content, multiple views/ reads of the same document, integration of multimodal information sources, data exchange and online software support. Any information resource that may be accessed via a network or computers is called E- resource. Electronic resources are useful for studying, learning, and conducting research. Electronic resources have a number of plus points as compared to print sources; regular updation makes them updated, they come with advanced search options, flexibility in storage of results and content as well and information access is recorded with location and time. Higher education institutions' access to internet resources is quickly expanding. **Chinwe and Emezie (2020)** stated that post-graduate students preferred E- sources of information as these resources are convenient, simple to use and provide quick and easy access.

To explore how students in higher educational institutes, satisfy their information needs and to provide required and timely information, it is important to study the information needs and information seeking behaviour of students. Because effective information service largely depends on understanding of the information seeking behaviour of students. It is important to understand the information seeking behaviour of respondents in relation to the internet and internet-based resources (E-resources). This is the age of technology, which provides constant access to information. Information basket is overflowing, people have a storm of information around them, and their eyes are blind due to content available in excess amount. It is further leading to confusion regarding how and what to think, feel, digest, and the required reaction to what goes on. The information flow on all sides brought changes in the user's information needs and seeking behaviour.

The changing information needs of the user exert pressure in information dissemination process. The concord academic institute has a robust role to play in this context by ensuring a proper information management system to provide right and need based information at right time. This further depends on knowledge of information needs and information seeking behaviour of the end users. Hence the current study was undertaken to gain insight into the information needs and information seeking behaviour of students regarding E-resources.

OBJECTIVE

To assess the information seeking behaviour of post-graduate students regarding E-resources

REVIEWS OF LITERATURE

Chinwe and Emezie (2020) conducted a study on the identification of information sources preferred by postgraduate students at the Federal University of Technology, Owerri, Nigeria. The study revealed that postgraduate students preferred electronic resources among various information sources because these resources are easy to use, convenient, and provide easy and quick access. The study's findings also show that very few graduate students identified library database subscriptions as an available resource. The findings focused on the need for an information literacy campaign for graduate students to create awareness and use library resources and databases.

Raith (2019) conducted a study to assess students' use of informal and formal resources for academic (learning) purposes. The data was collected by the interview method. Findings indicated that students' use of information resources varied by academic age; the more experienced students were, the more focused they were on selecting an information source. UG students used a variety of sources, while other higher-level students (postgraduate/Ph.D.) focused mainly on scholarly material and news articles from Wikipedia, YouTube, and blogs.

Chodha and Gupta (2017) conducted a study at NIT, Jalandhar, India to assess the usage pattern, awareness, and satisfaction level of students with e-journals. They concluded that 70% of students knew about e-journals and databases. E-journals were highly preferred resources but accessed from other locations instead of the departmental library.

Maamiry (2017) studied the use of preferred electronic resources by students of the College of Business Administration (CBA) and the College of IT in Dubai. The study reported that 83 percent of students cited electronic resources as the primary source for meeting their daily information

needs and for completing academic assignments. The findings of the study are in line with the findings of Makgahlela and Bopape (2014), Tyner (2014), and O Farrel and Bates (2009), who stated that students lean towards internet sources to get academic information.

Nkoyo and Nsanta (2016) conducted a study to assess students' use of information resources and found that the majority (86.39%) of respondents use electronic resources. The study also showed that from various electronic sources, electronic magazines (60.53%) were most preferred source followed by Internet resources (23.7%), electronic books (12.65%) and databases (3.65%).

METHODOLOGY

The present research was conducted at the University of Rajasthan in Jaipur. The main reason for conducting this study on the RU campus was that Rajasthan University is the state's oldest (founded on January 8, 1947) and largest university (in terms of land area and number of students enrolled). The study included students from eight different faculties (Science, Arts, Commerce, Education, Fine Arts, Law, Social Science, and Engineering and Technology). All of the students were enrolled in the 2019-2020 PG degree course session. The data were gathered using a descriptive survey research design and an online survey questionnaire. Questionnaires were distributed to 464 randomly selected Post Graduate students from the University of Rajasthan Jaipur's eight faculties. Of these, 378 questionnaires were returned with a total response rate of 81.46%.

RESULTS AND DISCUSSION

The results are majorly based on multiple responses of the students regarding how and for what purpose and to what extent they use the internet-based resources. The study also looked at their level of satisfaction with internet sources and the challenges they face when using internet-based resources.

The students' responses to the primary source of information and their level of dependency were analysed, and the results are shown in Figure 1.

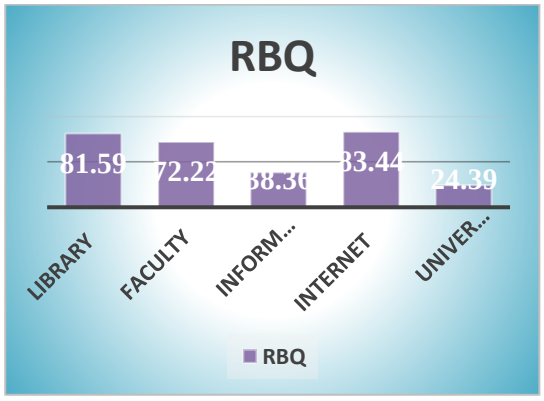

Figure1: Primary source of information and their level of dependency

Figure 1, shows the primary source that respondents rely on to acquire knowledge, as well as the extent to which they rely on it. The results of the study show that the Internet was the most

reliable source of information and was ranked first based on the RBQ value (83.44). Students preferred the Internet as their primary source of information and were constantly dependent on it. After that, the library was the next most preferred information source, followed by the faculty, taking second and third place. Informal sources as a source of academic information are preferred by students after graduating from the faculty and are assigned the IV position with the RBQ value (38.36). Among primary sources of academic information, students prefer university administration last.

According to the findings of the study, the Internet is the best choice for post-graduate students for gathering information. The reason may be that it provides easy and quick access to all the information related to their exams, syllabus, results, study materials, etc. It is affordable, keeps the subject information up-to-date, and is very useful for searching for queries, problems, or doubts. The findings of this study are in line with the findings of Chinwe and Emezie (2020), Ibrahim (2018), Maamiry (2017), Tilahun and Natarajan (2016), and Wijetunge (2016).

Table-1: Purpose wise usage of internet by students

Multiple Responses (N=378)

S.No	Purpose	N (%)
1	To update knowledge	260 (68.9)
2	Literature search	280 (74.1)
3	Means of communication	170 (45.0)
4	Employment/Entrepreneurship purpose	137 (36.2)
6	Research purpose	234 (61.9)
7	Reading	220 (58.2)
8	Database search	160 (42.3)

Table-1 shows that more than 70% of respondents used the Internet to search for literature, further to update knowledge (68.9%), for research purposes (61.9%), reading (58.2%), means of communication (45%), database searches (42.3%), and further for employment/business purposes (36.2%). The findings are in line with the findings of Rahaman (2021) and Ismaila (2019).

Different types of E-information resources assessed by the students are shown in Table 2.

Table-2 E-information resources browsed on the internet Multiple Responses (N=378)

S. No.	E-information resources	N (%)
1	E- Thesis	160 (42.3)
2	Online -Database	138 (36.5)
3	E-Periodicals (journals and magazines)	170 (45.0)
4	Website resources	320 (84.7)
5	Digital library	125 (33.1)
6	E-newspaper	170 (45.0)
7	E-Books	205 (54.2)
8	Other information sources	80 (21.2)

Table-2 reveals that among the various electronic sources, the most commonly used type of electronic information source on the Internet is website sources (84.7%), followed by E-books

(54.2%) and a similar number of respondents (45%) using E-periodicals and E-newspapers, followed by E-thesis (42.3%). While only 36.5% and 33.1% of respondents used online databases and digital libraries, respectively, this could be due to a lack of understanding and awareness of how to use these resources. 21.2% of respondents also used other sources of information. Thus, among the various types of E-information sources, website sources are primarily used, while E-books and E-periodicals are also preferred E-information sources. Website resources have become an integral part of student learning activities. They usually use relevant websites to satisfy their academic information needs. These websites may be related to course content, admission purposes, updating knowledge, employment or for further information. Students have mostly used these resources, and the reason may be that in the current age of information explosion, these resources are useful in fulfilling their daily information needs, updating knowledge, solving problems, clarifying things, and quickly fulfilling their curiosity in all aspects and easily without searching through various irrelevant websites. A similar study by Tariq and Waseem (2014) investigated the use of E-information resources by science students. According to the study, a significant percentage of respondents (90%) used web resources, followed by E-books, E-prints, E-journals, and then E-databases. The findings of the current study are also consistent with the findings of Nkoyo and Nsanta (2016), Gudiet *al*. (2014) and Husain and Parvez (2014). The graph (fig-2) shows the distribution of student responses based on the rate of use of electronic resources.

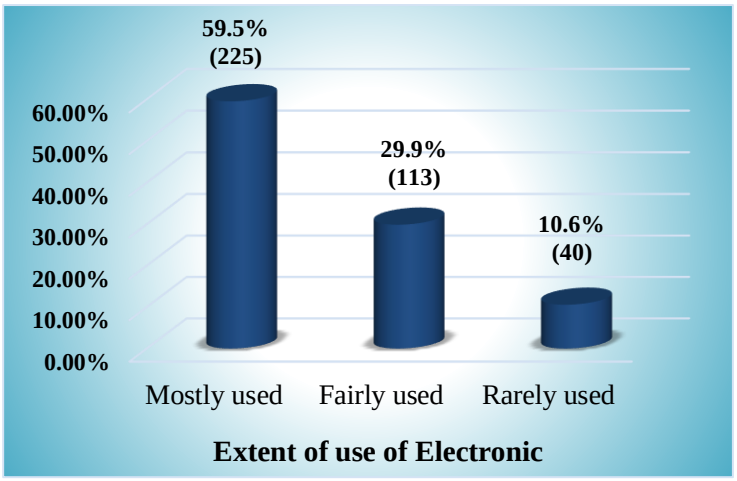

Figure 2: Extent of use of electronic resources -Multiple Responses (N=378)

According to Figure 2, almost 60 percent of respondents used electronic resources mostly; almost 30 percent used them fairly, and 10.6 percent used them rarely. The findings of the study are in line with the findings of Okorie *et al*. (2018), Akpoojotor (2016), Nkoyo and Nsanta (2016), Kadli and Hanchinal (2015), and Tariq and Waseem (2014).

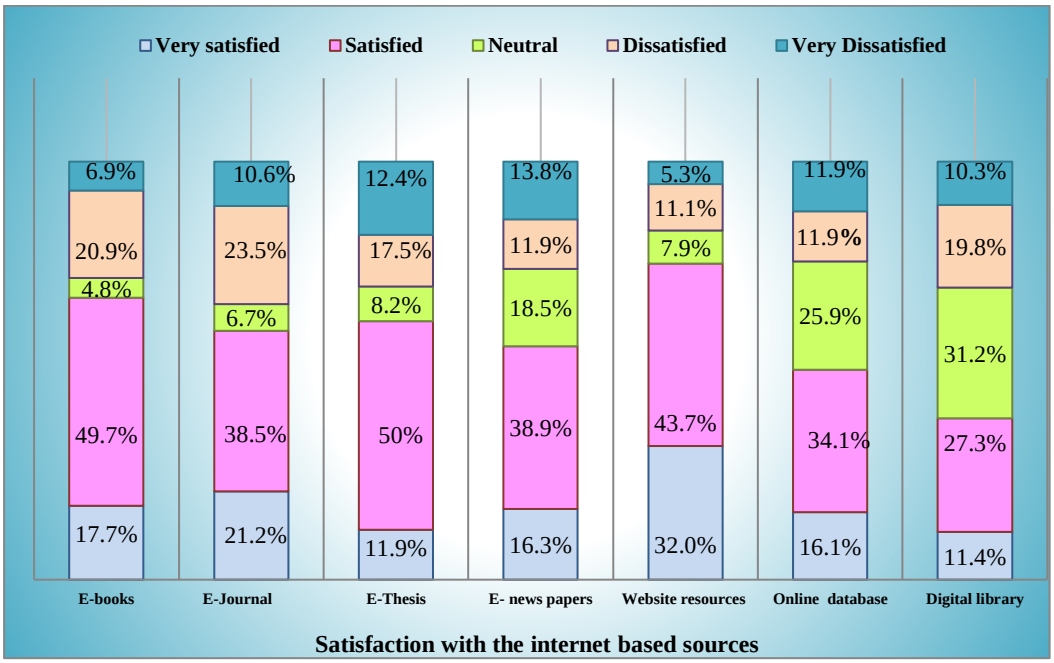

Figure – 3: Satisfaction level with the Internet based sources. (N=378)

Figure 3 depicts the satisfaction level of students using the Internet and Internet resources. It shows that the majority of respondents were satisfied (43.7%) to very satisfied (32 %) with the website resources. Rahaman (2021) reported that most of the students were satisfied with using the internet (53.3%), followed by very satisfied (21.7%), and 12 percent were dissatisfied. Furthermore, this study found that the majority of respondents were satisfied with E-thesis (50%), E-books (49.7%), E-newspapers (38.9%), E-journals (38.5%), and online databases (34.1%). A study conducted by Islam and Sheikh (2019) on determining post- graduate students' satisfaction with using online databases. According to the study, a large number of post- graduate students were satisfied with the online database. While 31.2% of respondents had a neutral level of satisfaction with digital libraries, this could be due to a lack of awareness and knowledge about the use of digital libraries.

Table-3 Challenges faced by students while using Internet based sources

Multiple Responses (N=378)

S .No.	Kinds of Challenge	Extent of challenge		
		High	Medium	Low
		n (%)	n (%)	n (%)
1	Electricity failure	63 (16.7)	74 (19.6)	241 (63.6)
2	Information overload on internet	243 (64.3)	78 (20.6)	57 (15.1)
3	Reliability/Authenticity of e-resources	179 (47.4)	150 (39.7)	49 (12.9)

4	Unaffordable sources	32 (8.4)	91 (24.1)	255 (67.5)
5	Lack of awareness about the university's various e-resources	236 (62.4)	91 (24.1)	51 (13.5)
6	Lack of time for searching	61 (16.1)	93 (24.6)	224 (59.3)
7	Information scattered in too many sources	143 (37.8)	137 (36.2)	98 (25.9)
8	Lack of Technical Guidance of search tool/ document	226 (59.8)	83 (21.9)	69 (18.3)
9	Network problem	218 (57.1)	87 (23.0)	73 (19.3)
10	Restricted and limited access to university internet facility	205 (54.2)	58 (15.3)	115 (30.4)

Table 3 shows that information overload on the Internet (64.3%), lack of awareness of various electronic resources (62.4%), lack of technical guidance for search tools and documents (59.8%), network problems (57.1%), limited and restricted access to university internet facilities (54.2%), and information scattered in too many sources/places (37.8%) were the problems faced by the majority of respondents to a large extent. Whereas unaffordable resources (67.5%), power outages (63.6%) and lack of time to search (59.3%), were problems faced by most of the respondents to a "small extent".

According to a similar study conducted by Rahaman (2021), when accessing the Internet, most students reported slow loading speed (80.6%), websites taking too long to download (75.6%), difficulty in finding relevant information (73.9%), Internet overload (61.7%), and a lack of knowledge about tools and techniques used for searching and retrieving Internet resources (30.6%). According to other similar studies conducted by Maamira (2017), Wijetenga (2016), and Mahwasane and Mudzielwana (2016), the main challenges that affect students' electronic information behaviour are a lack of information search and evaluation skills; a lack of database selection skills; and an inability to select reliable sources. Another similar study conducted by Ahmad and Khazer (2014) on the problems faced by students stated that limited and restricted access to university internet facilities as they are provided through usernames and passwords for a limited time, electricity disruption, problems with networks, and the lack of prepaid electronic resources were the main problems preventing students from searching for information.

Information scattered in many places, lack of library resources, and information that is too extensive were the issues that were affecting graduate students' information-seeking behaviour (Shukla and Lalrinenga 2018).

CONCLUSION

Results show that website resources are the most used type of e-information source on the internet. On the other hand, research also says that majority of the university students use the internet for literature search. The majority of the respondents were in the satisfied to very satisfied

category with the website resources. But the majority of the students were facing the very common issues, which are network problem, information overload on internet, and they were also facing other problems to a high degree, which were lack of awareness about the university's various e-resources and lack of technical guidance of search tools and documents, etc. On the basis of the results of the study, it is recommended to have the provision of awareness and training programmes regarding various search tools and documents, and technical guidance regarding authenticity of information, as well as good network speed and connectivity in a university campus.

It is also recommended that the well-organized home page of the library have a link to the e-resources, database, digital libraries, and consortia that are most important for easy access to e-resources provided by the university. As well, information on the internet should be streamlined.

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WOMEN LEARNERS EXPECTATIONS FROM LITERACY PROGRAMME CONDUCTED IN DINDIGUL DISTRICT, TAMIL NADU

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ABSTRACT

Literacy is basic to women's empowerment. Unless women are literate, they cannot reap the benefits of scores of governmental and nongovernmental programmes for their development. The objective of study was to identify the women learners' interest, expectations, venue and timing for the participation in the literacy programme to improve their literacy learning skill. More than three-fourths of the respondents had shown a high level of interest in learning through the literacy programme .Majority (84.4 per cent) of respondents stated their eagerness to read and write alphabets in Tamil as their aim to joining the literacy programme; 73.3 per cent expressed their expectation of capability building to read the name board of bus and to put signature; 70.5 per cent mentioned their reason to join literacy programme as to become aware of current affairs. More than two third (68.3 per cent) reported that they joined the literacy programme to avoid dependency on others to read or write letters addressed to them and to read the content of notices and communications received. The classes were held either at the residence of the learners (56 per cent) or under the street light (29 per cent) or the Literacy Facilitator's house (14 per cent). Most of the learners chose their own house as the venue for learning as they could avoid worrying about their house hold work and attend to family members while learning. More than 80 per cent of the learners preferred to learn between 6.30 and 8.30 p.m. The study concluded that Women learners interest and expectations to participate in the literacy programme more crucial for success of the programme. The flexibility in the choice of venue and the timings had permitted a good proportion of the adult learners to regularly participate in the literacy programme.

Keywords: Literacy, Interest, Venue, Expectation, Learners.

INTRODUCTION

Literacy is basic to women's empowerment. Unless women are literate, they cannot reap the benefits of scores of governmental and nongovernmental programmes for their development. Many different programmes, approaches and methods have been tried out all over the world to impart literacy to adult women. The literates constitute 74.04 per cent for all persons, 82.14 per cent for males and 65.46 per cent for females (Census of India, 2011). Thus, only three-fourths of the population aged 7 years and above is literate in the country. In other words, four out of every five males and two out of every three females

in the country are literate. The females in the country lag behind their male counterparts in literacy attainment.

The literacy rate reported for the rural areas of India for males was 78.5 per cent and 58.7 per cent for females. In the urban areas, the literacy scenario was better with 89.6 per cent reported for males and 79.9 per cent for females (Census of India, 2011). The low literacy rate for the females and further among the rural population call for immediate action for promoting literacy status of rural women.

REVIEW OF LITERATURE

Societal changes demanding new skills in literacy and numeracy may include economic or forced migration, industrialisation and the passing of subsistence economies and traditional forms of labour, social and economic development, and deepening of democracy (Abideen and Oladiran, 2013).In the study done in Ernakulam, Tharakan (1990), has reported that the learners wanted to acquire literacy skills in order to help their children learn better, to be able to read display boards on buses, to read letters, and to calculate the prices and wages so that others would not be able to cheat them. The author has reported that, almost all women had specific motivations for joining the literacy programme.

Kingah (2014) conducted a study among Mbororo women. Majority of the women attended literacy classes to improve their lives. Fifty per cent of all the women attended the classes to improve on their reading, writing and calculating skills. Some have acquired the reading skills more than the writing skills and others have acquired the calculating skills. These skills have helped them to be able to read road signs and health pamphlets, write letters, minutes of associations and even to teach their peers. The calculating skills have helped them to excel in business.

OBJECTIVES OF THE STUDY

For the success of any literacy programme it is essential to know the interest and needs of the beneficiaries. Hence the present study was conducted with the following objectives.

1. To know the interest of the women learners in learning through literacy programme.
2. To identify the expectations of the women learners from literacy programme.
3. To find out the venue and timing preference by the women learners for the literacy learning.

METHODOLOGY

The study was Descriptive in nature. An Interview schedule was used to collect the data from the women learners those who are participated in the literacy programme organised by the researcher in the Dindigul district. The researcher had taken special care to collect the information regarding the women learner’s interest to participate in the literacy

programme and their expectations to participate in the literacy programme and also the preference of timing and venue by the women learners.

Using an interview schedule, data were collected from 180 women for preparing their profiles. Participatory Learning and Action exercises and Focus Group Discussions were conducted in each of the villages to finalize the plan of action and evaluate the programme. 'Each One Teach Two' was the motto chosen for teaching illiterate women. For teaching 180 learners, a total of 90 Literacy Facilitators with capability to teach illiterate women to read and write Tamil were selected from among the school going children in each of the villages were chosen for the literacy exercise. Ten Literacy Education Supervisors from the same village community were selected to facilitate the teaching, monitoring and evaluation of the programme.

RESULTS AND DISCUSSION

Women learners' interest is most important for success of any governmental and Non-governmental programme implemented for welfare of the people in the country. Interest of the learners in learning through the literacy programme was enquired by the researcher during the interview. The self-rating of their interest in learning is presented in Table 1.

Table 1: Learners' Interest in Learning through the Literacy Programme

Level of Interest	Learners	
	No.	%
High	139	77.2
Low	36	20.0
No idea	5	2.8
Total	**180**	**100.0**

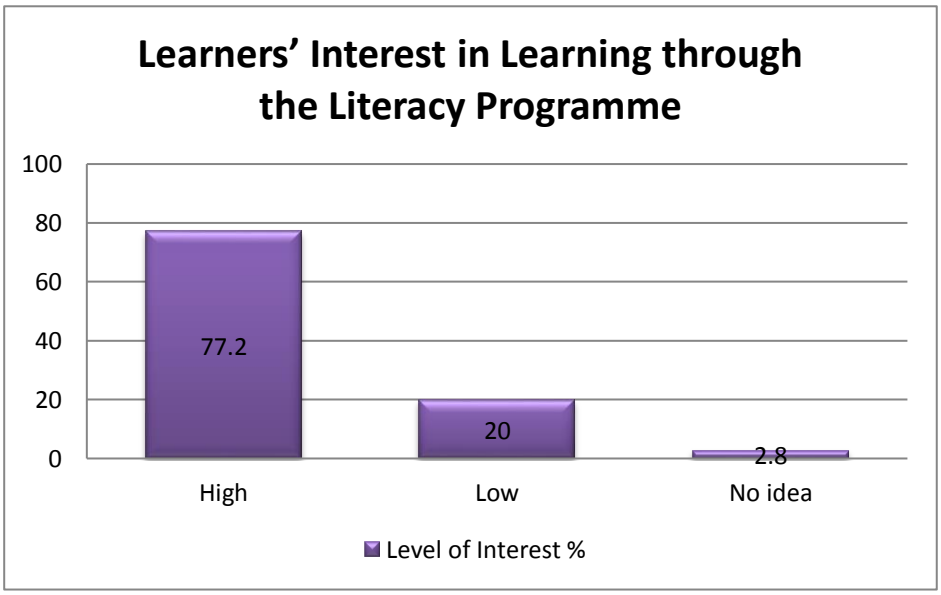

Figure 1

More than three-fourths of the respondents had shown a high level of interest in learning through the literacy programme. 20 per cent of the respondents expressed low interest in learning and the others were unable to express their level of interest in the literacy programme.

Table 2: Expectations of the Learners from the Literacy Programme

Expectations	Learners (N=180) *	
	No.	%
Should be able:		
To read and write alphabets in Tamil	152	84.4
To put signature	132	73.3
To read the name board of bus	132	73.3
To become aware of current affairs	127	70.5
To avoid dependency on others	123	68.3
To change the literacy status	119	66.1
To earn 100 days of employment	107	59.4
To satisfy own needs	76	42.2
To empower self and family	72	40.0
To write in SHG registers	42	23.3
To develop managerial skills	32	17.7

***Multiple Responses**

Table 2 and Figure 2 depict the expectations of the learners from the literacy training programme. It is seen that 84.4 per cent respondents stated their eagerness to read and write alphabets in Tamil as their aim to joining the literacy programme. More than 73 per cent each expressed their expectation of capability building to read the name board of bus and to put signature. A wide majority (70.5 per cent) mentioned their reason to join literacy programme as to become aware of current affairs whereas 68.3 per cent reported that they joined the literacy programme to avoid dependency on others to read or write letters addressed to them and to read the content of notices and communications received. The other reasons reported were: to change their literacy status (66.1 per cent), to get 100 days employment (59.4 per cent),to satisfy their own needs (42.2 per cent), to get empowered oneself and the family (40 per cent), to write in SHG registers (23.3 per cent) and to develop managerial skills (17.7 per cent).

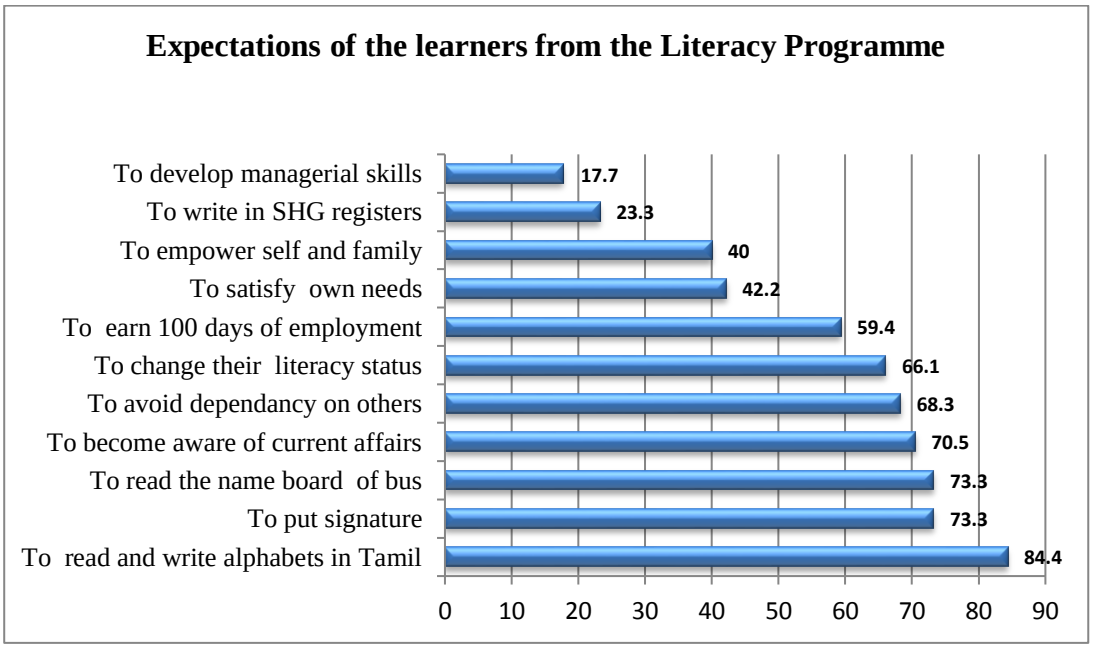

Figure 2

The venue chosen by the learners for learning is depicted in Table 3 and Figure 3. Out of 180 learners, 56 per cent had chosen their own residence for learning; 29 per cent opted to learn under the street light since they didn't have adequate space at home for three persons to sit and learn. Only 14 per cent had chosen the Literacy Facilitator's house as the classroom. Rest of them chose places other than the above three places for learning, including the temple premises and school yard.

Table 3: Venue chosen for Teaching-Learning

Venue	Learners	
	No.	%
Learner's house	100	55.6
Literacy Facilitator's house	26	14.4
Under the street light	52	28.9
Others	2	1.1
Total	**180**	**100.0**

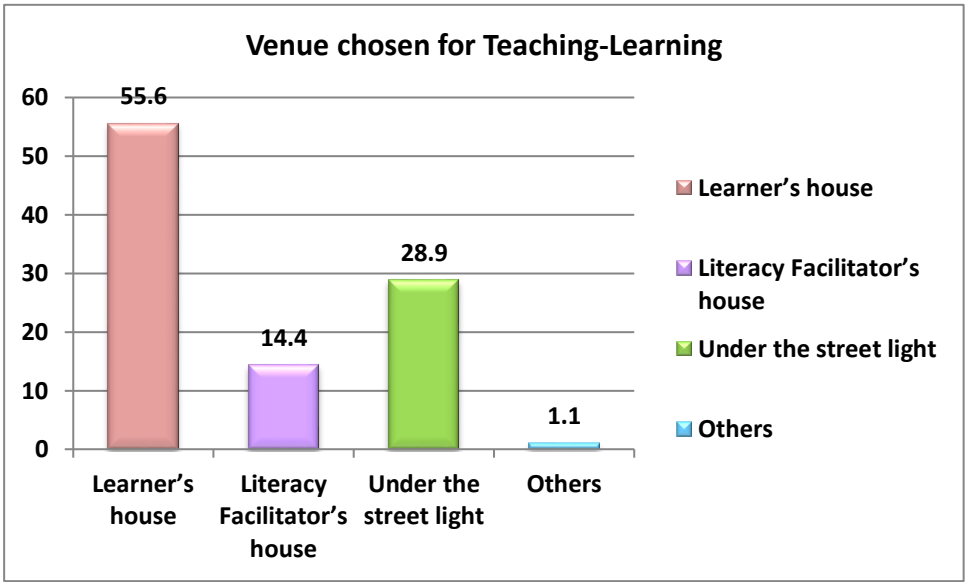

Figure 3

This implies that most of the learners chose their own house as the venue of learning as they could avoid worrying about their house hold work and caring of family members while learning. A significant aspect of the study was that most of the Literacy Facilitators taught their own mothers, grandmothers or close relatives and this would have been the reason for choice of the residence of the learners or the Literacy Facilitator's residence as the class room.

Table 4: Time preferred by the Learners for Teaching-Learning

Time (in 12 hours, format)	Learners	
	No.	%
5.30 -6.30 pm	3	1.7
6.30 -7.30 pm	58	32.2
7.30 -8.30pm	87	48.3
8.30-9.30 pm	32	17.8
Total	**180**	**100.0**

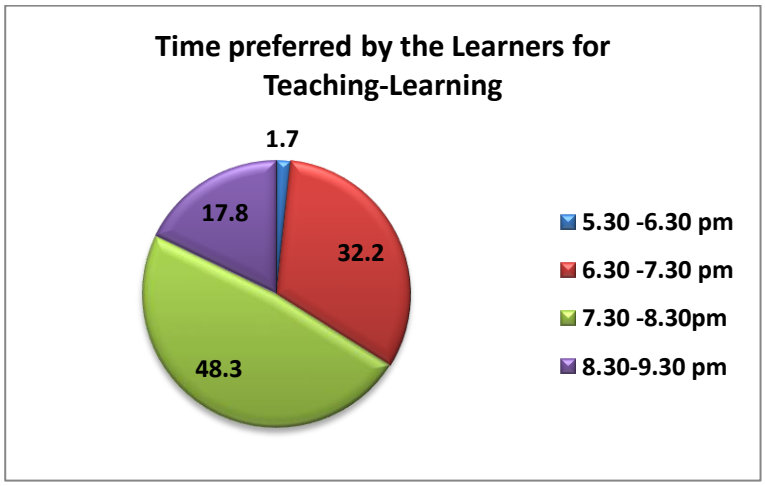

Figure 4

The Time preferred by the learners for learning is depicted in Table 4 and Figure 4. About one half (48 per cent) of the women chose to learn between 7.30 and 8.30 p.m. and 32 per cent chose the timings between 6.30 p.m. and 7.30 p.m. This shows that more than 80 per cent of the learners preferred to learn between 6.30 p.m. and 8.30 p.m. 18 per cent of the learners reported that they would like to learn between 8.30 p.m. and 9.30 p.m. Only a negligible number of respondents had opted to learn between 5.30 and 6.30 p.m.

Generally, in villages people arrive at their residence after the day's work only in the evenings. They finish their cooking and other household work very quickly before day light diminishes. The flexibility in the choice of venue and the timings have permitted a good proportion of the adult learners to regularly participate in the literacy programme.

CONCLUSION AND IMPLICATIONS

The study concluded that ability to read and write alphabets in Tamil was the primary aim of the women learners in joining the literacy programme. Many of them wanted to learn to put signature and to read the name board of bus. Developing managerial skills through literacy programme was a felt need of the Women in Self Help Groups. Thus, most of the women in the middle age have realised the functional benefits of acquisition of literacy skills. It is suggested that some more attention should have been given to the respondents who had shown low or no interest in the literacy programme and efforts taken to motivate them as to create interest in learning keeping in mind the long-term benefits of literacy.

This could be the foremost steps to planning and conducting the Literacy Programmes successful by the planners, policy makers and researchers in the field of Literacy empowerment of Rural Women because lack of interest of the participants lead to failure of the literacy programme. Therefore, the policy makers need to plan the literacy programmes according to the expectations of the women learner's interest. This is the need of the hour for the eradication of illiteracy and literacy empowerment.

SUGGESTIONS FOR FURTHER RESEARCH

All the educational institutions, schools, colleges and higher education centres, within the jurisdiction of a Panchayat union may be directed to adopt the whole area for a period of five years to plan and conduct total literacy campaign in a coordinated way with in- built follow up action programme. Literacy programme, to be cost effective should be target oriented and time-bound. So, small samples are to be chosen by each institution for effective literacy campaign.

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ASSESSMENT OF HAND HYGIENE KNOWLEDGE, ATTITUDE AND PRACTICE AND ITS PREDICTORS AMONG RURAL PRIMARY SCHOOL CHILDREN OF HARYANA, INDIA

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ABSTRACT

The simple act of handwashing with soap has been globally acknowledged and prescribed as cost-effective protection against communicable diseases. However, its adoption remains poor among the most vulnerable. As children are prone to communicable diseases, the present study aims to assess existing hand hygiene knowledge, attitude and practice (KAP) among primary school children and factors impacting the same. A cross-sectional, mixed-method study was conducted in twenty-eight co-educational primary schools from three blocks of Palwal district in Haryana state. A standardized attitude scale was developed and administered along with a pre-designed, pre-tested, structured questionnaire to six hundred and forty-three class-V students. The study found students to have good knowledge (73.7%), average attitude (45.2%) and poor practice (16.5%) of hand hygiene highlighting a significant knowledge-action gap. WASH facilities at home and socio-demographic profile were found to impact students' hand hygiene KAP. Among the WASH factors, source of drinking water at home, water purification technique, access to toilet and use of handwashing agent were found to have a significant positive impact ($p<0.05$). Additionally, mother's education, occupation and involvement in schoolwork were found to significantly impact hand hygiene KAP. This study highlights the need for more comprehensive hygiene promotion strategies at the elementary school level and makes a case for inviting parents and the community into the conversation to bring about a sustainable behaviour change.

Keywords: hygiene, primary school children, behaviour change, handwashing, India

INTRODUCTION

Never before has hand hygiene conversation taken centre stage as it did in 2020 due to the Covid-19 pandemic. WHO guidelines list washing hands frequently with soap and water or cleaning them with an alcohol-based hand-rub as the first critical step for protection from spread of Coronavirus (World Health Organization, 2020). Handwashing with soap (HWWS) has long been acknowledged globally as a simple, low-cost and effective protection against the spread of communicable diseases. Increasing evidence suggests that HWWS at critical moments can significantly reduce the prevalence of pneumonia and diarrhea, two leading causes of child morbidity and mortality globally. However, its adoption remains poor, particularly in low-income countries including India and especially among the most vulnerable. The National Sample Survey (NSS) 76th round report revealed that only 35.8percent households in India washed hands with soap before a meal (Ministry of Statistics & Program Implementation, 2018). It is estimated that inadequate hand hygiene results in nearly 300,000 deaths annually, with the majority of deaths being among children younger than 5 years (Sarkar, 2013). Nearly 2.3 lakh children below five years died of pneumonia and diarrhea in India in 2017 (International Vaccine Access Center, 2020).

The foundations of lifelong hygiene habits are laid in childhood. Approximately 7.48 lakh government schools in India cater to one of the largest groups of school-going children (https://data.gov.in/catalog/number-schools-0). The Government of India and UNICEF have identified school sanitation as a key area of collaboration, recognizing its contribution to children's health (Snel, Ganguly, &Shordt, 2002). Previous studies have linked good personal hygiene with an absence of disease and reduced childhood mortality (Ahmadu et al., 2013; Khatoon, Sachan, Khan, &Srivastava, 2017). Additionally, school children with good hygiene knowledge and practices are less likely to miss school leading to better grades and learning (Vivas et al., 2012; Sidibe & Curtis, 2007). Previous studies from India, however, provide limited details about hygiene understanding and its practice among rural populations. Therefore, the present study was conducted.

OBJECTIVE

The objective of present study was to assess hand hygiene knowledge, attitude and practice among rural primary school children in Haryana, India.

HYPOTHESIS

The study was designed to test the following hypothesis:

Good knowledge of hand hygiene translates into positive attitude and good hand washing practice

RESEARCH METHODS

Study design: School-based, cross-sectional, descriptive research.

Study setting: Twenty-eight villages from three blocks of Palwal district (Hathin, Hodal and Palwal) from Haryana state were selected using systematic random sampling. A list of all rural primary schools from three blocks was obtained from District Elementary Education Officer's (DEEO) office, from which co-educational schools were identified. There was only one government primary school per village. A population-representative approach was followed to randomly select ten percent of schools from each block. Thus, fifteen schools from Palwal, eight schools from Hathin and five schools from Hodal were selected.

Study population: All class V students studying in identified schools and present on the day of study were included. Since pre-testing had revealed class V students to have better comprehension and response-ability than junior classes, the present study was done only among them. A total of six hundred and forty-three children participated in the present study.

Ethical considerations: The study plan was approved by the Institutional Ethics Committee, Lady Irwin College, University of Delhi. Due permission was obtained from DEEO, Palwal to conduct the study. School principals were explained the objective and scope of study. Data collection was done in presence of class teacher after taking verbal assent from students and written consent from their parents. Students were free to decline participation at any point during the study.

Study tool: A structured questionnaire was developed including sections on students' socio-economic and demographic profile, WASH facilities at home along with statements to assess knowledge, attitude and practice of hand hygiene. For measuring students' attitudes, a standardized Thurstone scale was developed.

Knowledge questions: 17 questions including understanding of germs, disease-spread, correct technique and importance of HWWS.
Attitude questions: 15 statements to assess if students had positive or negative attitude towards hand hygiene.
Practice questions: 12 statements to understand current hand hygiene habits at critical moments including before eating and after using toilet.
Reliability and Validity: Test-retest reliability was done by Alpha (Cronbach's) Test of reliability for internal consistency and was found equal to 0.71 when applied to a pilot of five primary schools. Face validity was done with experts as well as content validity with students with similar characteristics but not included in the study sample.
Statistics: Raw data was reported and cleaned in Microsoft Xcel. Data analysis was carried out using SPSS software (Version 21.0). Frequency tables were used to describe knowledge, attitude and practice of hand hygiene among primary school children. Test of significance Chi-square (x2) was done for further analysis wherever possible. The *p*-value was two-tailed and statistical significance was set at <0.05.
Scoring system for Knowledge, Attitude and Practice: Students could score a maximum of 34 points on knowledge, 30 points on attitude and 24 points on practice sections. Good knowledge, attitude and practice were defined as obtaining a score>60% as derived from previous studies.

RESULTS & DISCUSSION

The findings are presented under various sub-sections.

Socio-demographic profile of respondents (Ref. Table1)

Table 1: Socio-Demographic Profile

N=643	n	%	X^2
Gender			df=1
Male	315	49	z=0.285
Female	328	51	p=0.152
Family Type			df=1
Nuclear	309	48	z=1.34
Joint	334	52	p=0.071
Mother's Education			df=1
My mother can teach me (literate)	450	70	z=19.88
My mother cannot teach me (Illiterate)	193	30	p=0.002
Mother assists in schoolwork*			df=1

Yes	333	74	z=28.26
No	117	26	p=0.001
Mother's Occupation			
Homemaker	412	64	df=3
Job	58	9	z=21.03
Self-employed	90	14	p=0.005
Farm labourer	84	13	

* of those literate (n=450)

The mean age of 643 students who participated in the study was 10.3years and gender ratio was 51% (n=328) girls and 49% (n=315) boys; 52% (n=334) of them belonged to joint family while 48% (n=309) came from nuclear family. 70% (n=450) of them had literate mothers, while 30% (n=193) were illiterate. Of those who were literate, about 74% (n=333) of them assisted their children in schoolwork. Most of the mothers of students in the study sample were homemakers (64%, n=412).

Access to WASH facilities at home (Ref. Table2)

Table 2: Access to Wash Facilities at Home

N=643	n	%	X^2
Source of drinking water at home			
Tap/ Hand-Pump inside house	425	66.2	
Roadside Tap/ Roadside Hand-pump	119	18.5	df=4
Tube-well	32	4.9	z=12.69
Well	54	8.4	p=0.001
Pond	13	2	
Drinking water treatment at home	**n**	**%**	df=1
Do nothing	355	55.2	z=6.19
Do something	288	44.8	p=0.021
Access to toilet	**n**	**%**	
Personal (toilet for family)	453	70.5	df=2
Community	125	19.4	z=23.86

Open Defecation	65	10.1	p=0.000
Availability of water at toilet*	**n**	**%**	df=1
Yes	389	85.8	z=2.86
No	64	14.2	p=0.113
Hand cleaning agent at home	**n**	**%**	
Soap	503	78.2	df=4
Only Water	73	11.4	z=66.22
Ash	22	3.4	p=0.002
Mud	13	2	
Nothing	32	5	
* among those who had personal toilet (n=453)			

The most common source of drinking water at home was tap/ handpump inside the house (66.2%, n=425) followed by roadside community tap/ handpump (18.5%, n=119). Other sources included tube-well (4.9%, n=32), well (8.4%, n=54) and pond (2%, n=13).

Majority (55.2%, n=355) of students' households did nothing to purify their drinking water. This finding is similar to studies done by Mohd & Mallik, (2017) in Bangalore and Bhattacharya, Joon & Jaiswal, (2011) in Madhya Pradesh where majority of respondents, 55.6% and72% respectively, were also not found to follow any method of water treatment at home. Among those who did treat their drinking water (44.8%, n=288), the most common method was keeping water covered (24.4%, n=157), boiling water (19.2%, n=123) and use of alum (1.2%, n=8).

When it came to access to toilet, nearly 70.5% (n=453) of them had access to personal toilet at home. About 19.4% (n=125) students reported using community toilet while 10.1% (n=65) were following open defecation. Among those who had a personal toilet, 85.8% (n=389) had water source at the toilet while 14.2% (n=64) said that they had to carry it from their home. This is important because it is a common practice in villages in India to have toilets constructed outside of the main home structure as it is considered impure (Mohanty & Dwivedi, 2019). Most of the students (78.2%, n=503) used soap at home to clean their hands. Others reportedly used water (11.4%, n=73), ash (3.4%, n=22) and mud (2%, n=13).

Knowledge of hand hygiene (Ref. Table3)

Overall, students in the study sample had good knowledge about hand washing as nearly 73.6% (n=414) scored more than 60% in the knowledge section. More than 86 % (n=554) of the respondents knew that HWWS was important after defecation and 70.1% (n=450) said it was important to do so before eating.

TABLE 3

HAND HYGIENE KNOWLEDGE

Characteristics	Yes		No		Maybe	
	n	%	n	%	n	%
Handwashing is important-						
After defecation	554	82.6	62	9.6	27	4.2
After urination	458	71.2	145	22.6	40	6.2
Before eating	450	70.1	147	22.8	46	7.1
Before cooking	293	45.5	212	32.9	138	21.6
After playing	200	31.1	394	61.4	49	7.5
Soap is important -						
To prevent illness	466	72.4	62	9.6	115	18
To remove dirt	494	76.8	85	13.2	64	10
To remove germs	445	69.2	72	11.2	126	19.6
To remove bad smell	442	68.8	75	11.7	125	19.5
For good personal hygiene	383	59.6	88	13.7	172	26.7
Germ awareness						
I have heard of germs	518	80.5	12	1.9	113	17.6
Germs can cause illness	499	77.6	88	13.7	56	8.7
Germs are transferred from one to another by hands	437	68	129	20	77	12

However, only 45.5% (n=293) and 31.1% (n=200) respectively knew the importance of HWWS before cooking and playing. Majority of students also had correct knowledge about why soap was important to wash hands. Top reasons to use soap were dirt removal (76.8%, n=494), illness prevention (72.4%, n=466) and germs removal (69.2%, n=445). This is unlike the study by Buda, Mekengo, Lodebo, Sadore and Mekonnen (2018) in Ethiopia, where students reported HWWS for health promotion (45.2%), prevention of disease transmission (34.7%), and to be beautiful (16.3%).

Students in the present study also had good understanding of germs and their harmful impact. Nearly 77.6% (n=499) students knew that germs cause illness and 68% (n=437) were aware of germs spread from one person to another through hands. These findings are similar to the studies by Hegde, Kar, Suresh and Mathew (2016) in Karnataka where 83.17% of children knew that diseases can spread from one person to another or the study by Hazazi, Chandramohan, Khan and AL-Mohaithef (2018) in Saudi Arabia where 96.1% of the students were aware of the route of germ transfer. Present study reveals that overall, the students were aware of the importance of hand washing.

Attitude towards hand hygiene (Ref. Table4)

TABLE 4
ATTITUDE TOWARDS HAND HYGIENE

Statements	Agree		Disagree	
	n	%	n	%
Missing washing hands sometimes before eating is okay	221	34.4	422	65.6
Missing washing hands sometimes after using toilet is okay	184	28.7	459	71.3
If my hands look clean, I don't have to wash them before eating	370	57.5	273	42.5
Because germs are invisible, they are harmless	371	57.7	272	42.3
Wiping hands on clothes is an easy way to clean hands	317	49.3	326	50.7
Nobody falls ill if they do not wash hands before eating	319	49.6	324	50.4
I don't want to miss school due to illness	422	65.7	221	34.3

Students in the present study did not have a very positive attitude towards hand hygiene as only 45.2% (n=254) scored good (>60%) on the attitude statements. Nearly half the students (49.6%, n=319) did not think that lack of HWWS before eating could lead to illness. About one half (49.3% ; n=317) students also agreed that just wiping hands on their clothes was an easy way to clean hands. Students also seemed to have some misconceptions about the importance of HWWS. More than half (57.5%, n=370) the students said that if their hands looked clean, they did not need to wash them with soap before eating. In a study by Dajaan et al. (2018) among public primary schools in Ghana, 43.06% children reportedly washed their hands when they were visibly dirty. About 57.7% (n=371) also believed that germs were harmless because they were invisible. This need for visible proof of dirt as a motivation for HWWS is a potential attitudinal barrier preventing children from washing hands at critical moments as found in the study by Gupta and Anand (2021). On the positive front, most children felt that it was not okay to miss washing hands before eating (65.6%, n=422) or after using toilet (71.3%, n=459). Also, children not wanting to miss school due to illness (65.7%, n=422) could be a probable persuasion to promote HWWS at critical moments.

Practice of hand hygiene (Refer Table 5)

TABLE 5

HAND HYGIENE PRACTICE

Characteristics	Wash hands with soap		Wash hands with water only		Wipe hands on clothes		Do nothing	
	n	%	n	%	n	%	n	%
After going to toilet, I	292	45.4	300	46.6	12	1.8	39	6.2
After playing I	62	9.6	344	53.9	51	7.9	186	8.6
After defecation I	599	93.2	34	5.2	10	1.6	0	0
After coughing/sneezing I	32	4.9	109	17	253	39.3	249	38.8
Before eating I	371	57.8	228	35.4	18	2.8	26	4

The practice of HWWS was alarmingly poor among the study sample. An abysmal 16.5% (n=93) students were found to have good hand hygiene practice (score>60%) indicating a glaring knowledge-action gap. Most students used soap to wash hands only after defecation (93.2%, n=599), while they used just water after urination (46.6%, n=300). Only 57.8% (n=372) reported HWWS before eating. After playing, students either used just plain water (53.9%, 344) or did not clean their hands at all (28.6%, n=186), both of which are not the right course of action.

The present study rejects the starting hypothesis that hand hygiene knowledge is likely to translate into a better attitude and practice of HWWS. Significant knowledge-action gaps have also been found in previous studies by Dajaan et al. (2018), Gawai, Taware, Chatterjee and Thakur (2016), and Oyibo (2012). This gap between knowledge and practice could be due to the social-desirability effect which states that respondents tend to overreport behaviours they perceive are more socially desirable. Covid-19 pandemic has highlighted HWWS (or sanitizer) after coughing/ sneezing as a crucial preventive action. Students in the study sample reported either wiping hands on clothes (39.3%, n=253) or doing nothing (38.8%, n=249) after coughing/ sneezing. Additionally, 68.1% (n=438) reported that they washed hands only when they looked dirty, a wrong practice given the fact that germs are invisible and may be present on our hands even when they look clean. Mohd and Malik (2017) also found that "hands looking visibly dirty" was a prominent trigger to HWWS.

Hand hygiene KAP predictors:

Among the sociodemographic factors, mothers were found to play a significant role in impacting children's hand hygiene knowledge, attitude and practice in the present study. A chi-

square test of independence was performed to examine the relationship between various sociodemographic factors and students' hand hygiene KAP. Mother's education (X^2 (1, N=643) =19.88. p=0.002), her assistance to her children with schoolwork (X^2 (1, N=450) =28.26, p=0.001), and occupation (X^2 (3, N=643) =21.03, p=0.005) were significantly associated with better hand hygiene KAP.

However, gender, family type and type of house were not found to have any significant association with children's hand hygiene KAP in this study. A study by Sarkar (2013) among primary school children in Kolkata also found statistically significant association between personal hygiene practices of primary school children and literary status of their mother ($p<0.05$). Mothers as primary caretakers of the family are charged with teaching their children proper health and hygiene practices. An illiterate or uneducated mother may be less knowledgeable herself and therefore unable to teach her children proper hygiene practices, subsequently contributing to increased rates of infections among children.

WASH facilities at home are hitherto less explored but significant aspects impacting students' hand hygiene KAP as this study finds. Source of drinking water at home (X^2 (4, N=643)=12.69, p=0.001), practice of treating drinking water (X^2(1, N=643)=6.19, p=0.021), access to toilet at home (X^2 (2, N=643)=23.86, p=0.000) and hand cleaning agent at home (X^2 (4, N=643)=66.22, p=0.002) were found to be significantly associated with hand hygiene KAP. However, availability of water at toilet was not found to be significantly associated probably because even when water was not available at the toilet, students reported carrying it from home.

SUMMARY, CONCLUSION AND IMPLICATIONS

The present study highlights gaps in knowledge, attitude and practice of hand hygiene among primary school children. While the knowledge levels were found to be satisfactory, efforts are required to shift their attitude as well as improve hand washing habits. More specifically, their understanding of critical moments needs to be improved. This study highlights the need for more comprehensive hygiene promotion strategies at the elementary school level as a place for intervention and learning. The findings from the study were further used to design a low-cost intervention to bridge the knowledge-action gap as found in the present study. Children are the change agents taking back concepts learnt in school to their families and siblings (Vally et al., 2019) creating a ripple of change. Primary schools thus provide a conducive platform to undertake hygiene education at scale. Hygiene promotion strategies need to make it easy for children to understand critical moments and remember HWWS.

Access and availability of WASH facilities at home, specifically access to toilet, came out as a strong positive impacting factor for hand hygiene KAP among children along with socio-demographic factors like mother's education and participation in child's learning. In developing countries, access to adequate and proper sanitation facilities remains a challenge due to multiple reasons including poverty, the policy as well as cultural factors. This study also makes case for inviting parents and the community into the hygiene conversation to bring about a sustainable behaviour change.

Covid-19 has highlighted the grave need to practice hand hygiene not just as a good habit but as a means to break the chain of infection. The present study provides an effective baseline to assess the impact of hand washing communication as it was conducted just before the pandemic hit and the country went into lockdown.

LIMITATIONS

The present study was limited to rural schools in one district hence the findings cannot be generalized to the entire state. Study was limited to class V students who were present on the day of study and the results therefore may not be true for all school children. Self-reported data by children could also lead to over-reporting. Multiple studies across urban and rural settings would be required for drawing generalizations.

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KUND SYSTEM OF RAIN WATER HARVESTING: A STUDY IN DISTRICT JHUNJHUNU, RAJASTHAN

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ABSTRACT

Water scarcity is a serious problem throughout the world for both urban and rural communities. As the world population is increasing, the demand increases for quality drinking water. India has a long tradition of water harvesting. Each region of the country has its own water harvesting techniques, reflecting the geographical peculiarities and cultural uniqueness of the communities. In Rajasthan, a highly water deficient state, various methods of water harvesting have been used for centuries. The aim of the present study was to understand the traditional KUND system of rainwater harvesting with respect to implementation, operation, and maintenance. It aimed at understanding the experiences of the KUND owners associated with the same and thereby collecting suggestions for better implementation, operation, and maintenance of the KUND system.

Keywords- KUND system, Traditional rain water harvesting system, Rajasthan, India

INTRODUCTION

Water is crucial for advancing human rights, reducing poverty and inequality, and enabling peace, justice, and sustainability (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2017). Freshwater is the most important resource for mankind, cross-cutting all social, economic, and environmental activities. To achieve water security, we must protect vulnerable water systems, safeguard access to water functions and services and manage water resources in an integrated and equitable manner (UNESCO, 2021).

Water being the core of sustainable development covers seventy percent of our planet, among which only three percent of the world's water is freshwater, and two-third of that is tucked away in frozen glaciers or otherwise unavailable for our use (World Wildlife Fund [WWF], 2020). There are eight out of ten people without access to clean water living in rural areas and about one hundred forty-four million people who are dependent on surface water (World Health Organisation [WHO], 2019).

India is among the world's most water-stressed countries. In 1950, India had three thousand- four thousand cubic meters of water per person. Today, this has fallen to around one thousand cubic meters (The World Bank, 2019). Due to the rapid rise in population and the growing economy of the country, there will be a continuous increase in demand for water, and it will become scarce in the coming decades (India-Water Resources Information System [India-WRIS], 2019).

India is currently ranked one hundred and twenty among one hundred twenty-two countries in the water quality index. India is facing the worst-ever water crisis in history. Nearly forty percent of the population will have absolutely no access to drinking water by 2030 and six percent of India's GDP will be lost by 2050 due to the water crisis (NITI Aayog, 2018).

India, for hundreds of years, has been using a variety of techniques to harvest every possible form of water-rain water, streams, spring, rivers, and flood water. Rainwater harvesting as an old practice is being adopted by many nations as a viable decentralized water source. It provides an independent water supply at the time of water shortage and has been often utilized to supplement the regular water supply. This has been a good source related to potable water, as rainwater is free of salinity and other salts. It saves the excessive flow related to water and preserves it for later reuse. It enables regular supplies related to drinking water during all times (Jain & Jain, 2019).

Rajasthan, 'Land of Kings' is India's largest state by area. At the same time, it is the driest state in the country water-scarce (having per capita water availability below 1000 m3/year) since 1991. Rajasthan state, which is 10.4 percent of the country's area has only 1.16 percent of total water sources (Public Health Engineering Department, Government of Rajasthan [PHED], 2019). The desert state of Rajasthan is in the grip of a water crisis with nineteen out of the thirty-three districts are famine-affected. Jhunjhunu district is located in the extreme north-eastern part of Rajasthan state and covers five thousand nine hundred twenty-nine sq. km. of geographical area (Sharma, Goswamee, Kumar, & Agarwal, 2012).

Water has been harvested in India since antiquity, with our ancestors perfecting the art of water management. KUND is a very old and traditional system of rainwater harvesting in the state of Rajasthan since 1607 and the first known construction was by Raja Sur Sithesingh in village Vadi-ka-Melan in the Mehrangarh Fort in Jodhpur. A KUND is a circular underground well and consists of a saucer-shaped catchment area with gentle slope towards the centre where tank is situated (Fig. -1 (a) & (b)). Lime plaster or cement is used for the construction of the tank. The success of a KUND system depends on the site selection and catchment characteristics (Ruhela, Bhutiani, & Anand, 2004).

Figure- 1 (a) & (b): KUND system of rain water harvesting

The depth and diameter of the KUND depends upon their use as well as the catchment area available. The catchment size of KUNDs varies from about 20 sq. m to 2 ha depending on the runoff needed and the availability of spare land. A 2-ha catchment area, having a 2-3 per cent slope on a heavy textured soil free from vegetation, is generally sufficient for a KUND of 200 cubic metres capacity. KUND with a catchment of 100 sq. km could easily collect 10,000 litres of water (Centre for Science and Environment [CSE], n.d.).

Coupled with the benefits of cleanliness and quality of water, KUND became an ideal device to collect drinking water. Water-borne diseases, which are otherwise quite common in the desert area, are thus reduced. Opening or inlets for water to go into the tank are usually guarded by a wire mesh to prevent the entry of floating debris, birds and reptiles. The top is usually covered with a lid from where water can be drawn out with a bucket (Saxena, 2017). Also, water in the KUND system not only lasts for a long period but also remains fresh and potable. Since KUNDs are the main source of drinking water in these areas, people zealously protect and maintain them.

Need for the study: With the increase in water deficiency all over the world, it becomes significant to find some solutions for the conservation of clean water available to us. Hence, this study is significant in understanding about the KUND systems with respect to its design, construction, capacity, and suggestions regarding the implementation, operation and maintenance of the KUNDs. Also, barriers and effectiveness of the KUND have been studied to understand the experiences of the owners.

OBJECTIVES

- To study the KUND system of rainwater harvesting with reference to selected parameters
- To study the experiences of owners with reference to implementation, operation and maintenance of the KUND system
- To take suggestions from owners with reference to optimal implementation, operation and maintenance of the KUND system

METHODOLOGY

Three villages from Jhunjhunu district of Rajasthan where KUND system of rainwater harvesting was practiced were selected. From the selected villages, about 70-80% of the villagers had KUND system in their houses. Five houses each were selected from three different villages. Inclusion criteria for selection of houses were that they must have KUND systems in their homes which were in operation for at least two years but not more than seven years as they would have been designed according to the new design aspects and better operation and maintenance techniques. Purposive sampling was used to select the owners of 15 selected houses having KUND systems. Questionnaire was used as the tool for data collection which had questions related to the details of the KUND owners and the KUND systems, experiences and suggestions of owners with respect to the implementation, operation and maintenance of the KUND system.

The purpose of the study was explained to the respondents and five owners were selected from each village based on their willingness to take part in the study. Data was subsequently collected from the selected stakeholders through google forms, personal/telephonic interviews and video calls. There were incidences when the researcher had to make several visits to each house to collect data, owning to unavailability of the head of the house. During the interaction, some of the respondents were willing to be interviewed, while others preferred filling the Google form. Telephonic interviews and video calls were also conducted with those respondents wherever it was difficult to visit them because of the COVID-19 pandemic. Photographs of the KUND systems were also clicked with the permission of owners.

FINDINGS AND DISCUSSION

The study was carried out in three villages of district Jhunjhunu namely, Ladusar, Haripura, and Rampura. The data revealed that among the houses selected for the study, about 80% of the KUND owners had more than four family members and they were living in joint families, while 20% of the s respondents had one to three family members. These selected KUND owners were asked about the most important source of water in terms of usage. They felt that the most important source was KUND system which was given a mean rating of 2.8, with a standard deviation of 0.4, on a scale of 1-3, where 1 stood for least important and 3 for most important.

The study revealed that with respect to the source of information regarding the KUND system. About 67% percent of the respondents reported having the KUND system as a traditional practice in their villages and hence they were well versed with its functioning and operation. This was followed by 33% of the respondents who said that word of mouth was the most important source for them.

Details of the KUND systems selected for the study

For the study, fifteen KUND systems (five KUND systems each from the three villages) were selected. These were constructed between the years 2012 to 2018. The mean age of selected KUND systems was around five years, and after construction, some of the KUND systems got operated within a few days or months, while some took time for their operation because of delays in the rainy season.

The study further revealed that, the mean of area of KUND storage tank was 175 square meters and the catchment constructed for the water storage directly from rain was 249 square meters. The reason cited was, larger the catchment area, the larger will be the amount of water harvested. Approximate cost incurred for constructing a KUND system was around fifty-two thousand rupees that could store about 19,000 litres of water. Also, about 53% of the respondents reported that they used rooftop catchment, 20% used surface runoff and the rest used both the techniques for storing water in the KUND system. Table 1 summarizes the details of the KUND systems selected for the study.

Table 1: Details of selected KUND systems

	Age of KUND system (Years)	Area of KUND storage tank (Sq. Meter)	Catchment area (Sq. Meter)	Cost of construction of KUND system (Rs.)	Capacity of KUND system (Litres)
Mean	5.0	175	249	52,533	19,000
Std. Deviation	2.4	2.6	2.6	2.3	2.8

The data revealed that the KUND owners rated the water quality of the KUND system to be excellent with a mean rating of 4.6 (On a scale of 1-5, where 5= excellent and 1= poor). The respondents reported that the water obtained from the KUND systems had good taste and was free from fluorides and foul smell. Further, they said that the stored water of the KUND system

required no filtration and it contained a significant amount of minerals, needed for water to be potable.

It was observed that about 61 to 80% of the total KUND water was used for different purposes annually. It was most frequently used for drinking and other potable uses accounting to about 41 to 100 percent of the total KUND water, followed by drinking source for pets and livestock which was about 60 percent of the total water. About 40 percent of the KUND water was used for toilet purposes, washing clothes, and irrigation of plants.

The data revealed that the KUND system was mostly used during summer season, which was given the highest mean rating of 4.5 with a standard deviation of 1.2. Rating was done on a scale of one to five, where five was given to the most important season and one to the least important season regarding the time of the year when the stored water of the KUND system was used. Greater water requirement during summer season was because of decrease in water level due to poor rainfall, and rising temperatures. In such conditions, water stored in the KUND systems was very important to meet the daily water requirements of families. It was found that 80% of the respondents got their KUND system implemented because of water scarcity and better water quality. This is because rivers, lakes, and ponds etc. were reported to have evaporated, leading to water scarcity. Also, the available was salty and unfit for human consumption, whereas, water stored in the KUND system was potable and contained significant amount of minerals.

The owners of the KUND systems were further asked to report about the factors that were considered before construction of the KUND system. They ranked the factors on a scale of one to three, where three was given to the most important factor and one to the least important. The highest mean rating of 1.5 was given to location as a factor considered before constructing the KUND system with a standard deviation of 1.2. This was considered as an important factor because the location of the KUND system needed to be such that the harvested water from the catchment could be transported easily via conveyance system to the KUND storage tank (recharge zone). A mean rating of 1.5 was given to availability of area with a standard deviation of 1.1. This factor was considered important as it determined the size of the KUND storage tank. The lowest mean rating of 0.5 each was given to rainfall and cost of construction.

As far as the ease of operation of the KUND system was concerned, about 93% of the KUND owners reported that KUND system was easy to operate. It did not require any machines or tools for harvesting the water and no manual efforts were needed except during the first flush of rainwater. Further, the respondents said that water from the KUND system could be easily fetched using buckets, hand-pumps, taps etc. About 7% of the respondents reported that KUND system was difficult to operate at times, it became difficult to draw water from the KUND system using bucket when the level of water went down.

The owners of the KUND systems were asked about the medium through which water was taken out from the KUND system. The study revealed that handpumps as a medium of pulling out water from the KUND system was used by 60% of the respondents. This was so because handpumps did not consume electricity like motor pumps and were easy to use. Approximately 27% of the respondents were fetching water manually using buckets, and containers. This had been a traditional practice for fetching water in the selected regions, and families did not want to invest in hand pumps or motor pumps. Only about 13% of the KUND owners reported using motor

pumps like jet pumps, submersible pumps, etc. because of the high electricity consumption by these methods, and therefore, most of the respondents did not want to increase their expenses by using these methods.

Responses of selected stakeholders regarding barriers faced in the implementation, operation and maintenance of the KUND system

When the KUND owners were asked if they faced any barriers while implementing the KUND system, about 47% reported facing several barriers while implementing the KUND system and the remaining 53% of respondents reported otherwise. One of the most common barriers faced by the respondents was preparation for construction. It was reported to be the most important barrier because initially reaching out to constructors, and collecting information regarding construction of KUND system was difficult. They also reported allocating area for the construction of the KUND system as a barrier. It was observed that KUND owners had varying field sizes. The respondents with lesser area of land had to judiciously allocate the area for KUND construction and hence, they found it as a barrier.

The study further revealed the barriers faced during operation and maintenance of the KUND systems. About 87% of the respondents reported facing no barriers during its operation, as it was very easy to harvest rainwater in the catchment area, and storing the harvested water in the KUND storage area. Only about 13% of the respondents reported facing barriers while operating the KUND system because they found it difficult to fetch out water manually using buckets, and pots etc.

As far as the barriers faced during the maintenance of the KUND systems were concerned, about 87% of the KUND owners reported that they did not face any barriers during the maintenance of the KUND system. This was because other than cleaning the KUND system at regular intervals, nothing more was required to be done for the maintenance. Only about 13% of the respondents faced barriers while maintaining the KUND system. They reported that cleaning the catchment and the components of the KUND systems was difficult because of their large areas. It was reported to be a tiring and time-consuming process.

Experiences of selected stakeholders regarding the implementation, operation and maintenance of the KUND system

Implementation and operation stages each were given the highest mean rating of 2.9 with a standard deviation of 1.2, on a scale of 1 to 3 (where 3= very good, and 1= poor) (Table 3). The reasons cited were its easy, inexpensive, and fast implementation, and various techniques that could be used to fetch water which were easy and convenient. Further, a mean rating of 2.7 was given to the maintenance of the KUND system, rating the experience of KUND owners as good because of little or no money incurred while cleaning and maintenance of the KUND system. However, sometimes cleaning large areas of the KUND systems became tiring. Table 2 summarizes the experiences of KUND owners regarding its implementation, operation, and maintenance.

Table 2: Experiences of KUND owners regarding implementation, operation, and maintenance

	Implementation	Operation	Maintenance
Mean	2.9	2.9	2.7
Std. Deviation	1.2	1.2	0.8
Rating on a scale of 1 to 3, 3= Very good and 1=Poor			

All the selected respondents recommended that people should get the KUND system constructed as it is a sustainable and economical practice to harvest rainwater. They stated that the KUND system only involves initial investment, as no additional cost is required for either its operation or maintenance. Further, KUND systems can store a large amount of water in small areas (a 150-180 sq. m of KUND system can store about 15,000 to 20,000 litres of water) and the water that is harvested in the KUND system has good taste, stays fresh for a very long interval, is free from the foul smell, and has a significant amount of minerals which makes it potable. Also, getting the KUND system constructed is a traditional method of rainwater harvesting, which can help in conserving water and making the water easily available in water-scarce areas.

Suggestions for optimal implementation, operation, and maintenance of the KUND system

Table 3 enlists the suggestions for optimal functioning of the KUND system, as reported by the selected KUND owners.

Table 3: Suggestions for optimal implementation, operation, and maintenance of the KUND system

Stages of KUND system functioning	Suggestions for optimal functioning of the KUND system
Implementation	• KUND system should be implemented in an area where surface runoff and rooftop catchment techniques of water harvesting can be done together (a large amount of rainwater gets harvested in a small-time interval) • For implementing the KUND system, materials used for construction should be of good quality, high durability, and strength • During this stage, for deciding the capacity of the KUND system all the factors (number of family members, area, location, rainfall, and cost) are necessary to consider • First flush system should be installed in the KUND system • Constructors should be well acquainted with the knowledge of constructing the KUND system • KUND system should be plastered with limestone, which keeps water cool even during summers

Operation	• For easy operation of the KUND system, manual handpumps, and taps should be used which neither use electricity nor require efforts to pull out water • After every use, the KUND system should be kept covered. Animals and humans should not be allowed to sit around, eat or spit anything around the KUND system • First flush system should be used to divert the first bit of water that is collected in the catchment area • KUND system when operated via manual fetching (using buckets, pots, etc.) should be used with clean hands, to keep the water clean in the KUND system • Taking out water from the KUND system manually should be done by adults, to prevent accidents
Maintenance	• Regular cleaning of the KUND system should be done to keep the water clean, prevent the deposition of algae near the KUND storage tank • For the maintenance of the KUND system, facades should be created around the KUND which prevents animals and pets to come near the KUND and thereby preventing defecation by them • Repairing of the KUND system should be done if any part gets broken

SUMMARY AND CONCLUSION

Continuous water deficiency over years in different regions of the world, and the country makes it important to conserve water. Rainwater harvesting is one method by which can contribute to water conservation. This is an old practice that is being adopted by many nations as a viable decentralized water source. Each region of the country has its own water harvesting techniques, reflecting the geographical peculiarities and cultural uniqueness of the community. In Rajasthan, a highly water deficient state of India, various methods of water harvesting have been used for centuries, the KUND system being one of them. It is a very old and traditional system of rainwater harvesting.

The study revealed that the KUND system had been the most important source of water for the respondents. Being a traditional practice in their villages, they were well versed in its functioning and operation. The water stored in the KUND system was used for various purposes like drinking sources, washing clothes, irrigating plants, etc. This system was not only easy to implement but also easy to operate and required minimal or no maintenance. The water stored was reported to be of good quality, rich in various minerals making it potable, and was mostly used during summer seasons. Suggestions were given by the KUND owners for optimal functioning of the KUND system like constructing a KUND system with quality material for them to last long, keeping the KUND systems closed, installing the first flush system, fetching out water with clean hands, and regularly cleaning the KUND system to remove dust, leaves, debris, and bird droppings in order to maintain the quality of the water.

KUND systems need to be propagated more for their higher adoption and to increase the installation base of the same. All the KUND owners selected for the study reported that they would recommend KUND systems to others as a sustainable and economical practice to harvest rainwater. The study has thus thrown light on various parameters related to the KUND system and has brought forth the fact that KUND as a traditional method of rainwater harvesting is a good practice to follow. The findings and suggestions that have emerged from the study can be used by the people and also by the other KUND owners as it identifies the loopholes in the existing system. Filling in these voids can create a pathway towards a more efficient working of the KUND system. This, in turn, would encourage more and more people to adopt such sustainable rainwater harvesting techniques. Further, in addition to the study carried out on KUND system of rainwater harvesting technique, other traditional systems could be studied and a comparison could be drawn. Also, KUND system can be further studied from other technical and engineering perspective that has not been included in the above study.

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EXTENT OF PROBLEMS EXPERIENCED BY HOMEMAKERS REGARDING THEIR OWN KITCHEN GARDENS IN VADODARA CITY

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ABSTRACT

The waste is affecting all the natural resources by polluting air, water and land. Waste generation is done at all the level, viz; household, commercial, industrial, etc. The major waste generation at the household level is bio-degradable waste which can be minimised by preparing the homemade compost for using in kitchen garden for growing fresh and chemical-free vegetables and fruits. Homemakers are incorporating kitchen gardens in their homes for growing fresh and nutritious chemical-free food crops. In doing so homemakers may face problems in developing, utilizing and maintaining their kitchen gardens. One needs to identify the problems faced in the development or maintaining the kitchen garden. So the researcher was interested to study the problems faced by the homemakers in their kitchen garden. Research design for the present study, was descriptive. The sample comprised of 200 homemakers from various areas of Vadodara City who had kitchen gardens in their residence. The Questionnaire was selected as the tool. The questionnaire was divided into two sections. Section 1 dealt with the demographic profile of the respondents. Section 2 dealt with the extent of problems experienced by the respondents in maintaining their kitchen garden. The procedure of analysis of the data comprised of categorization, coding, tabulation, and statistical analysis. The extent of the problems faced by the homemaker was found to be at a high extent. An intervention program was conducted for the respondents focusing on the ways to solve the problems related to sunlight, space, soil, seedlings, pests, etc. through PowerPoint presentation. The intervention program also included various designs of kitchen garden and how these designs can be incorporated into the residences. The intervention program aimed to upgrade the knowledge of the homemakers regarding various aspects of the kitchen garden and motivated them to develop their kitchen garden in their residence.

Keywords: Kitchen Gardens, Problems, Homemakers, Intervention Program

INTRODUCTION

India faces a truly formidable challenge in managing the rapid process of urbanization and the growth of its cities (Ballaney, 2008). Due to the rapid rise in migration from rural areas to cities, there is increasing pressure on land as a resource. As the population increases, more land is required for providing basic human needs like food and shelter. Everything is changing at a faster rate than one can predict. Previously, when the population was small, needs were few, and resources were plentiful, garbage was primarily biodegradable and spontaneously recycled. However, as the world's population grew, urbanisation and industrialization grew, the consequent

massive amount of garbage, of all types, grew beyond nature's capabilities, posing a serious dilemma. As a result, rising waste levels are concerning. This necessitates efforts such as reducing waste generation to lessen the negative consequences and challenges associated with solid waste disposal and disposing of waste in a way that allows for resource recovery through recycling (Patel, 1999).

Major waste generation at the household level is bio-degradable waste, which can be minimised by taking proper measures. One such measure is preparing homemade compost prepared from the bio-degradable waste generated in the kitchen or garden. Homemade compost is a great substitute for the chemical fertilisers available in the market. Homemade compost can be a good option for growing healthy and nutritious organic vegetables and fruits in one's kitchen garden. In the kitchen garden, one can grow organic vegetables for family consumption by using homemade compost prepared from kitchen waste at home. People have started developing kitchen gardens in their houses in places such as terraces, balconies, window sill, or containers even if the land space is not available. The kitchen garden provides fresh, healthy, and nutritious vegetables for the family.

The importance of gardens has greatly increased in present times,as, it presents many advantages. It improves human health and adds to the natural environment. It helps in improving quality of life by providing opportunities for refreshment, relaxation, and recreation. Some gardens are developed for aesthetic purposes, while some gardens also produce food crops, sometimes in separate areas, or sometimes intermixed with both. In a home, a garden developed to provide food crops and other consumable flora is known as a kitchen garden. The vegetables and fruits are the basic necessity of daily routine and the hike in the price of the vegetables and fruits affect the purchase of the same. Fixed-income group families have to suffer from decreasing real incomes and purchasing power. The need of an hour is to gain access to increasing the nutritious value of the food at present. Now a day's people have started incorporating kitchen gardens in modern houses for growing fresh and nutritious chemical-free food crops (Rehman, et.al., 2013). Kitchen gardens can be grown in the space available at the backyard of the house or a group of women can come together, identify a common place or land and grow desired vegetables, fruits, cereals, etc. that can benefit the women and community as a whole (Christensen, 2011).

In present times, people are more sensitized regarding the benefits of a kitchen garden, and therefore, several homemakers develop it in their homes. It is designed professionally by landscape experts or self-developed by homemakers. Homemakers plan kitchen gardens for growing fresh and nutritious fruits and vegetables. In doing so homemakers may face problems in developing, utilizing and maintaining their kitchen gardens. Kitchen gardening may seem easy but many problems are encountered by homemakers in this. People who already have developed kitchen gardens also face different problems related to their kitchen garden; viz, related to soil, drainage, amount of sunlight, pests, seedlings, plants, fruits, etc. All these problems also need to be addressed while developing a kitchen garden. One needs to identify the issues faced in the development or maintaining the kitchen garden. Thus, it is necessary to study the problems faced by the homemakers in their kitchen garden.

The researcher came across studies related to the assessment of home and kitchen gardens in relation to nutrition, cost-benefits, social attitude, maintenance of plants, and bio-diversity in home gardens, but a dearth of research was found focusing on problems experienced by

homemakers regarding their kitchen garden. Therefore, the present study was undertaken with the objective to find the extent of problems experienced by the homemakers regarding their kitchen garden. An intervention program focusing on the problems related to kitchen garden and ways to solve them was planned. The intervention program also included various designs of kitchen garden and how these designs can be incorporated into the residences. The intervention program aimed to upgrade the knowledge of the homemakers regarding various aspects of the kitchen garden and motivated them to develop their kitchen garden in their residence.

OBJECTIVE OF THE STUDY:

1. To find the extent of problems experienced by the homemakers regarding their own kitchen garden.
2. To conduct an intervention program to provide solutions to the problems experienced by the homemakers in their existing kitchen garden.

METHODOLOGY

For the present study, the descriptive research design was used. The sample comprised of 200 homemakers from various areas of Vadodara City who had kitchen gardens in their residence. The sample for the study was selected through the purposive sampling method and the respondents were contacted through the snowball technique method. The unit of inquiry was the homemakers of the residences having kitchen gardens in their existing residences. The Questionnaire was selected as the tool. The questionnaire was prepared keeping in mind the objectives of the present study. The questionnaire was divided into two sections. Section 1 dealt with the demographic profile of the respondents. Section 2 dealt with the extent of problems experienced by the respondents in maintaining their kitchen garden. The respondents were asked to respond to a 3 point continuum in terms of "always", "sometimes", "never" and the scores from 3 through 1 were given to the respondents respectively. To obtain the categories of extent of problem faced, the score range was divided on an equal interval basis. The procedure of analysis of the data comprised of categorization, coding, tabulation, and statistical analysis.An intervention program was conducted for the respondents of the study which focused on enhancing the knowledge of the homemakers regarding various aspects of a kitchen garden. The intervention program was delivered in the regional language (Gujarati) for a better understanding of the audience. The major focus of the intervention program was to discuss the ways to solve the problems faced by the respondents in their existing kitchen garden. The developed designs of the kitchen garden for various spaces of the residence were also explained to the respondents. This was done for creating an understanding of the respondents regarding the design aspect of the kitchen garden in various spaces in their residence, namely; land, terrace, balcony, and containers.

FINDINGS AND DISCUSSION

Following results were revealed through the study:

Section 1: Demographic profile of the respondents:

It was observed that the majority (67 per cent) of the respondents were ranging in the income group of rupees 30,001 to 90,000 per month. It was found that majority of the respondents (62%) were having nuclear family type and less than half of the respondents (36.5%) were having

a joint family. Data revealed that the majority of the respondents were having 4 members in their family.

It was observed from the data that the majority of the respondents (33%) were residing in a flat. About 22.5 per cent of respondents were residing in a tenement. It was found that the majority of the respondents (33.21%) were having a potted type of kitchen garden. Nearly 25 per cent of the respondents were having their kitchen garden on the land.

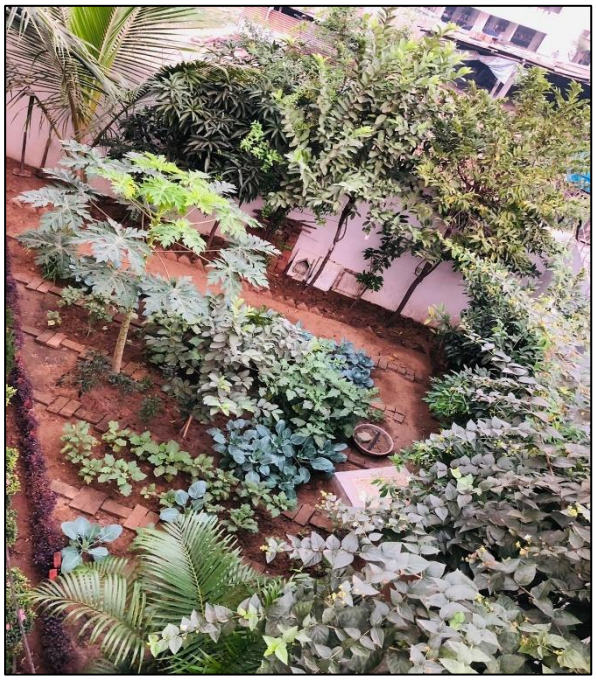


Plate 1 Rectangle Shaped Garden

It was revealed from the data that the majority of the respondents that is 90 per cent of the respondents owned the house, whereas; only 10 per cent of the respondents were having a rented house. It was found that majority of the respondents i.e., 78 per cent of the respondents were having 50-200 sq.ft. area of the garden. Very few respondents had 201 - 350 sq.ft. area of the garden. Data also revealed that more than half of the respondents i.e.; 59.5 per cent had the rectangle shape of their garden, whereas, 23.5 per cent of the respondents were having the square shape of their garden.

Section 2: Extent of Problems experienced by the Homemakers regarding their own Kitchen Garden

The problems were studied for various aspects of the kitchen garden namely; sunlight, water, and drainage, soil, food crops and rotation, pollution, compost, seedlings, plants, leaves, bud ends, and fruits.

- **Sunlight**: It was found that half of the respondents had insufficient sunlight available in their garden to a high extent. The excess of heat causing plants to dry was experienced at a high extent by nearly half (43.5%) of the respondents. More than half of the respondents had harsh sunlight entering their garden to a high extent.
- **Water and Drainage**: Data revealed that more than half of the respondents had problems regarding the water-logging causing breeding of insects, growth of unwanted algae and fungi, and clogging of drainage to a high extent. More than one-third of the respondents had problems related to water-logging causing the death of certain plants due to air blockage, affecting the growth of the food crops by damaging the roots and soil erosion to a high extent. It was also found that nearly 40% of the respondents had a problem related to watering their kitchen garden to a low extent.
- **Soil**: It was found that nearly half of the respondents had a great extent of problem of walls getting dirty due to soil and the need for the removal of weeds consuming their time. It was

also found that nearly 64% of the respondents had a high extent of problems related to an infestation of harmful pests in their garden.

- **Food crops and Rotation**: Data revealed that nearly half of the respondents had problems related to restrictions in the choice of food crops due to soil and climate conditions, difficulty in placement of food crops due to the size of the garden to a great extent. Nearly 40% of the respondents had a problem related to the placement of food crops due to the shape of the garden to great extent. More than half of the respondents had a high extent of problems related to limited flexibility in plant rotation due to soil and excess heat. Nearly half of the respondents had a high extent of problems related to limited flexibility in plant rotation due to climate conditions and space. Nearly half of the respondents experienced high extent of problems related to food crops grown in a container, yield of the food crops, quality of fruits and vegetables grown in a container, maintaining the quality of soil, and protecting food crops from untamed animals.
- **Pollution**: It was found from the data that 45% of the respondents experienced low extent of problem related to odour in the kitchen garden. 40% of the respondents experienced high extent of problems related to maintaining cleanliness and maintaining food crops due to pollution.
- **Compost**: Data revealed that the majority of the respondents experienced great extent of problems related to preparing compost. Nearly 45% of the respondents faced problem related to the suitability of the compost to their plants to a high extent.
- **Seedling**: Respondents faced many problems related to various aspects of seedlings. More than half of the respondents faced problems related to the germination of seeds, rotten seeds, old seeds, wilted seeds, fungal disease, fertilizer burn, cutworms, and root maggots to a high extent. Less than half of the respondents faced problems to a high extent related to soil temperature, dryness of the soil, and birds and insects.
- **Plants**: Data showed that respondents had various problems related to plants. More than half of the respondents experienced problems related to death and wilting of plants due to disease, rotting of roots, water-logging, lack of moisture, slow growth of plants due to insufficient sunlight, cool weather, excess of water, soil nutrient deficiency, compact soil without draining and infected with insects and diseases to a high extent of level. Less than half of the respondents faced problems to a high extent related to weak and spindly plants due to poor drainage, fungal disease, vascular wilts, too much shade, crowded planting, excess nitrogen, low pH level, and wilt disease.
- **Leaves**: The findings of the study revealed that respondents experienced various problems related to leaves to a high extent. The problems included various aspects related to leaves, such as; yellowing of leaves due to nutrient or mineral deficiency, insufficient sunlight, virus disease, spotted leaves and stems and brown spots due to fertilizer or chemical burns; brown scorched and shrivel leaves due to dry soil, salt damage or fertiliser burn, potassium deficiency, cold temperature; leaves curled or distorted due to wilting, moisture imbalance, herbicide injury, weed killer damage; leaves stippled with tiny spots due to spider mites and air pollution (ozone); leaves having holes due to insects or birds and heavy winds.
- **Bud Ends**: The respondents faced problems related to bud ends to a high extent. Nearly half of the respondents experienced problems related to rotted bud ends due to compacted soil; water and nutrient uptake impeded, too – deep cultivation, injured root because of disrupting water uptake. More than half of the respondents faced problems related to rotten bud ends due to dry weather, uneven irrigation, and insufficient calcium in the soil.

- **Fruits**: The problems related to fruit were experienced to a high extent by the respondents. More than half of the respondents faced problems related to no fruits on the plants due to too hot weather, too much nitrogen in the soil, absence of pollination on a plant, not matured plant, and poor soil fertility. Nearly half of the respondents experiencedproblems related to fruits on the plants due to, too cold weather, uneven soil moisture, and improper temperature.

Distribution of the respondents regarding the extent of problems experienced by them in existing kitchen garden

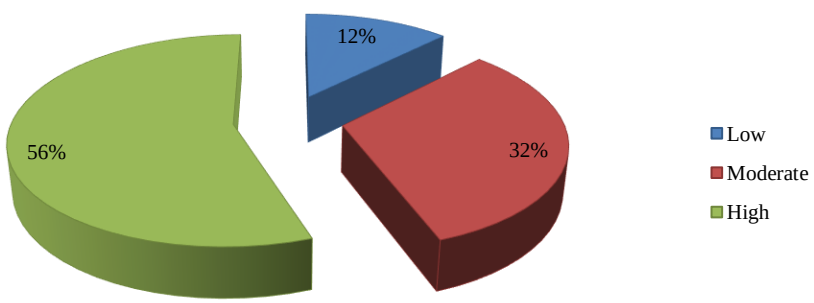
This section dealt with the extent of problems experienced by the respondents in maintaining their kitchen garden. This was a summated rating scale. The respondents were asked to respond to a 3 point continuum in terms of "always", "sometimes", "never" and the scores from 3 through 1 were given respectively to the responses. The possible scores ranged from 123 to 287 of which three categories having almost equal intervals were made. Higher scores indicated high extent of problems experienced by the homemakers.

The sample surveyed showed that majority of the homemakers lied in the high score category experiencing high extent of problems. Very few homemakers were lying in the low score category, which showed that very few were experiencing less problems in their existing kitchen garden.

TABLE 1: Frequency and percentage distribution of the respondents regarding the extent of problems experienced by them in an existing kitchen garden.

Sr. No.	Extent of Problem	Range of Score	Distribution of the Respondents (n=200)	
			f	%
1	Low	123-177	25	12.5
2	Moderate	178-232	64	32
3	High	233-287	**111**	**55.5**

Figure: 1
Extent of problems experienced by the respondents with their existing kitchen garden



AN INTERVENTION PROGRAM:

An intervention program was conducted for the respondents of the study which was focused on enhancing the knowledge of the homemakers regarding various aspects of a kitchen garden. The intervention program was delivered in regional language (Gujarati) for a better understanding of the audience. The major focus of the intervention program was to discuss the ways to solve the problems faced by the respondents in their existing kitchen garden. Problems related to sunlight, space, soil, seedlings, pests, etc. were addressed in the intervention program.

PLATE 2

Plates Showing an Intervention Program Conducted by Researcher

A Power Point presentation on the kitchen garden was shown to the respondents. The content covered the ways to solve the problems. Also developed designs of the kitchen garden for various spaces were shown to the respondents to motivate them to develop a kitchen garden on their terrace and balcony. A demonstration of potting was also shown to the respondents. The respondents were taught the proportion of soil and compost and mixing of soil for planting a sapling or sowing a seed. Demonstration was done on planting a sapling. The intervention program ended with the question-answer session.

CONCLUSION

Due to excessive pollution, the vegetables and fruits available in the market are full of harmful chemical and pesticides which leads to deadly diseases. Thus, the kitchen garden option for fresh vegetables and fruits for the family is adopted by many homemakers nowadays. The fruits and vegetables grown in one's kitchen garden can be chemical-free and nutritious and can be grown with the use of homemade compost. In a kitchen garden, one can grow different variety of vegetables and fruits throughout the year. But many a times, problems are experienced by homemakers related to various aspects of kitchen gardening. The problems related to sunlight, soil, drainage, pests, etc. are to be assessed before developing kitchen garden designs. Thus, the researcher gathered information regarding the problems experienced by the homemakers regarding their existing kitchen garden and through an intervention program; the researcher enhanced the

knowledge of the homemakers regarding solutions to their problems related to the kitchen garden and also the designs of the kitchen garden for various spaces in a residence.

RECOMMENDATIONS FOR FUTURE RESEARCH

1. Similar study can be conducted for different cities across the states of India.
2. Researches can be done in collaboration with government and municipal corporations for creating awareness regarding kitchen garden at large scale.

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REUSE OF REVERSE OSMOSIS RETENTATE ADOPTING HYDROPONIC TECHNIQUE AS AN INITIATION OF HOME-LEVEL BIOPHILIC PRACTICES - A MICRO-LEVEL STUDY

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ABSTRACT

Mother Earth is endowed with plenty of natural resources. Every resource plays a vital role in the sustenance of the ecosystem. As technological kindred interventions increase, the overuse of natural resources arises, which results in increased volume of wastes, quality loss of natural resources and diminishing bond between nature and humans. Recently, at a micro-environment level too, people rely on tech-based life, which brings behaviour changes in the usage pattern of resources, resulting in the diminishing of resources. People use technology like reverse osmosis (RO) units to extract pure, safe water from the environment. But surreptitiously it generates three to four folds of wastewater to the environment. With this as a view, the household survey conducted in Coimbatore city adopting purposive sampling showed that a large volume of waste water was discharged from the Reverse Osmosis water purifier. In particular, one of the water purifiers brands which were used by many families at west zone generates more volumes of wastewater. In the present increasing water demand scenario, wasting or discharging multiple volumes of water without any beneficial use is quite unacceptable. To find solution to this problem at grass root level (home - level) and to efficiently manage ***"retentate"*** water is the present need of the hour. This prompted to conduct a micro-level study on the re-utilization of reverse osmosis retentate, adopting home-level hydroponics (raising plants in water or nutrient solution).

Keywords Biophilic practices, Hydroponics, Resource, Retentate, Reverse Osmosis (RO),

INTRODUCTION

Water - the elixir of life, that makes all living organisms sustains in the Earth. Humans get benefitted from nature, utilizing its natural capital (the stock of physical natural assets), state Voora and Venema (2008). Worldwide, due to technological interventions overuse of resources is in vogue, especially, fresh water which is in demand. The water stress developed countries are spending millions of capitals to restore the lost prime resources – water. This vital resource demand made people rely on domestic water purifiers, among which reverse osmosis is widely in use. The usage of reverse osmosis purifiers for potable water discharges a large quantum of wastewater from the purification units. In this prevalent water crisis scenario, one such wasted resource at the household level (which is accessible and reusable) is allowed in the drain as waste, is inadmissible. According to Ramasamy (2019), disposal of RO retentate stream directly to ground

cause soil and groundwater contamination and also turns the groundwater unsuitable for human consumption in future. This problem needs to be addressed in grass- root level.

Several research scientists, environmentalists and research studies identified viable solutions that bring sustainability adopting circular practices and valuing waste as a resource. Practicing such micro-sustainability actions (small environmental actions) at the microenvironment bring about large environmental impacts at the macro-level. Many research studies are carried out reusing reverse osmosis retentate productively. The research studies conducted reusing retentate showed the possibility of utilizing it for the irrigation of plants (Asharp *et al.*, 2018). Repurposing wastewater for irrigation brings resource utilization and brings a biophilic environment around living premises. It enhances nature connectedness, sustainable lifestyle and pro-environmental behaviour in individuals and communities. With this backdrop, the present study was conducted with the following objectives.

OBJECTIVES

- Find out water supply, distribution, use and reuse pattern of water in selected households
- Quantify the retentate discharged out from the domestic reverse osmosis unit
- Identify the strategies to reuse the micro- level accessible wasted resource (retentate) in a productive way
- Find out the prospects of raising seedling using retentate and set up biophilic practices in micro-level environment
- Identify the possible way of value addition of accessible household wastes

ASSUMPTIONS

- The domestic reverse osmosis units generate large quantity of retentate
- Retentate is not safe for watering plants.
- Retentate can be reused for propagating various vegetative parts of plants

METHODOLOGY

The methodology adopted for the study involved the following phases

A. Survey
B. Water quality testing
C. In-situ trials using retentate

A. Survey

The selected locale for the conduct of the study was Coimbatore which comprises five zones, and the sampling adopted was convenience sampling. The water distribution system in selected area was analyzed adopting situational analysis. The authentic primary data pertaining to the study was collected from the TWAD Board (Tamil Nadu Water Supply and Drainage Board) personnel with prior appointment adopting interview schedule. For the conduct of the survey, 125 domestic reverse osmosis (RO) water purifier users were chosen from the selected five urban zones. The purposive sampling method was adopted. The schedule included relevant inquiries related to the study. The investigator met homemakers and the purpose of the study was explained clearly to them. During face to face interview and observation, relevant information such as details on water availability, purification method adopted, usage patterns and quantum of wastewater generation (measured) was collected. ***Plate.1*** shows the reverse osmosis units used in select households.

B. Water quality testing

It was imperative to find out the quality of water before conducting the experimental study. Thus, the retentate collected from the reverse osmosis water purifier unit was given for the presence or absence of heavy metal analysis in a reputed laboratory.

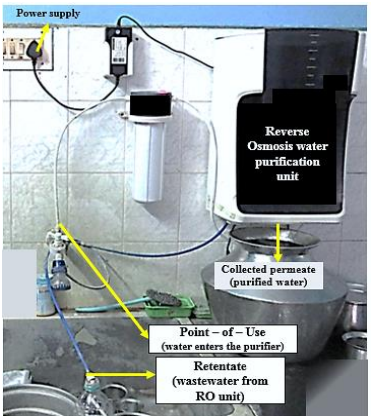

Plate1. Reverse osmosis water purification unit used in select households

C. In-situ trials using retentate

This part of the study included experimental study conducted at home- level which included:

1. Growing hydroponic fodder in trays using seeds
2. Raising seedlings from seeds in pro- tray
3. Growing novel hydroponic microgreens using seeds
4. Propagation of plants using different vegetative parts – In-situ hydroponic trials

1. Experimental study I: Growing hydroponic fodder in trays using seeds

In the peri-urban area of Coimbatore, (being the urban-rural fringe area) it was found that some of the households were rearing livestock. Knowing the prevalent fodder scarcity, it was decided to conduct the study on raising hydroponic fodder crop reusing the accessible wasted resource "retentate" adopting hydroponic technique. In the selected sample house of the west zone (peri-urban area), the model greenhouse was constructed using indigenous materials and 50-80 per cent humidity was maintained. Maize and Jowar seeds were chosen for the study, as many research articles highlighted their growth and yield within a short duration (nine days). The quality seeds were purchased from a reputed institute. The hydroponic fodder experiments were conducted as comparative study as follows:

Hydroponics

It is a technique of growing plants in water or nutrient solution without soil.
Source: Dharm (2013)

- Pilot study - Permeate (purified water) as control and retentate as experimental samples
- Experimental study – Tap water as control and retentate as experimental sample

Procedure

The uniform procedure was followed for both the study. For pilot study, Yellow Maize alone was chosen. In the experimental study, two kilograms each of Yellow maize (sample A) and Jowar (sample B) was chosen for comparative study. Both the seeds, Sample A and B in similar quantities (one kilogram) were cleaned, introduced in respective water samples (control experimental sample - retentate) and soaked overnight. The next day-soaked seeds were spread on sterilized trays in the unit. Periodically the watering was done with respective water samples, every five hours a day. A water sprayer was used. The study was conducted for nine days. On the ninth day, the commendable growth attained in samples used was observed. The good sprout mat formation and harvest were seen. The growth monitored and recorded was presented in results.

2. Experimental study II: Raising seedlings from seeds in pro- trays

Tomato, Amaranthus and Coriander were the chosen seeds for the experiment. These plants were commonly used in Indian cuisines which makes the dish complete. The seeds were purchased from a reputed certified institute. The number of seeds used, per pro-tray plug for Amaranthus, Tomato and Coriander is fifteen, one and two seeds respectively. The seeds were sown in 50 cavities pro-tray filled with coir pith (substrate). Periodically, the watering was done with respective water samples, tap water as control and retentate as experimental samples. The pro - trays were introduced into the shade net-model greenhouse. The temperature (25°- 40°C) and humidity (40 -75%) conditions were observed. The growth milestones were monitored periodically.

3. Experimental study III: Novel hydroponic microgreens raised using seeds

Microgreens, a new wave in hospitality landscapes, is gaining momentum in recent times. These small leafy greens are the infant versions of all vegetable plants harvested within 15 days, also known to be forty times healthier than the mature plant parts, states Nusra (2019). Some

culinary seeds such as Amaranthus, Mustard, Coriander, Fenugreek and Fennel were selected to grow novel microgreens. The rectangular food packaging sterilized containers (approved by fssai) (1000 ml) were drilled at the bottom to drain excess water. The coir pith (60g) as a substrate was filled per container. The seeds were weighed and spread evenly on the container. The microgreens samples were misted periodically, using different water samples (control -tap water and retentate experimental - samples). The samples (triplicate) were allowed to grow. The day-wise growth was monitored and seedlings (root and shoot length) were measured till the cotyledon stage. The recorded growth was presented in the results. The harvest day differs with the plant. It was decided to conduct experiments in other vegetable plant parts hydroponically, as the lab results on retentate was safe and elemental contents in microgreens were found to be appreciable. The organoleptic analysis of microgreens proved that, the experimental samples (retentate) have the same sensory attributes as the commercially available greens.

4. Experimental study IV: The plants propagated using from different vegetative parts hydroponically

With the successful experiments gained in the previous experiments, it was decided to grow horticulture plants using other vegetative parts. Vegetative propagation is the common method used in horticulture, to propagate new plants from the vegetative parts such as stems, roots, leaves, buds and underground parts, state Singh & Kaur (2018). The vegetative propagation methods were adopted using the following plant parts: ***Cuttings*** - Portulaca, Rose, Carnation; ***Bulbs*** - Onion (Shallots), Rain lily; ***Tubers*** - Potato, Dahlia; ***Seeds*** - Gomphrena, Chrysanthemum; and ***Leaf Propagation*** – Jasmine. The coir pith was used as a substrate and hydrated with retentate. The different containers used were - grow bags, throw away food packing containers and small nursery UV poly bags. The certified seeds purchased from reputed Institute and Nursery, were used. Wherever found necessary the pro-trays/grow bags were placed in the shade net greenhouse.

RESULT AND DISCUSSION

A. Survey

This aspect of the findings is explained under the following headings:

1. Details on water distribution in select area
2. Zone-wise mean permeate obtained and retentate realized
3. Brand wise mean permeates available and retentate realized

1. Details on water distribution in select area

Based on the collected data, the total water supplied to individual families in Coimbatore Corporation was set 135 LCPD under normal conditions. This water distribution was based on the norms IS1172- 1993 (water requirement for domestic purposes for India), in which 5 L which is 3.7 per cent, was allocated for drinking purposes alone out of 135LCPD. The 3.5 per family was the lowest average household size set by the NFHS (National Family Health Survey) - 4 (2017) reports, Tamil Nadu (applicable both to urban & rural). Based on this, the water supply cumulatively, for drinking alone was 17.48 L which is comparatively low per 14 days' supply.

This has to be used till they received the next supply. Despite each family receiving 472 L, it was found as per allocated supply it was only 437.06L per supply. Within this, water allocated for drinking alone per family per supply was 17.48L. The family size with 3, 4 and 5 was found to be maximum in all zones of 41, 36 and 14 per cent respectively; which further pinpointed the inadequacy of water supply.

2. Zone-wise mean permeate obtained and retentate realized

The following table presents details on the zone-wise permeate obtained as output per supply.

Table 1. Zone wise mean permeate and retentate realized per supply

Zones studied	Mean retentate generated (Per L of Permeate)	Ratio of Permeate to Retentate (in percent)
Central	3.44	22.53: 77.47
East	3.46	22.40: 77.60
North	3.58	21.84: 78.16
South	3.50	22.22: 77.78
West	3.57	21.90: 78.10

The allocated cumulative water supply for all five zones was 11812.5 L, as per the norms stated earlier. It was clear from the table that ***nearly three-four litres*** (***1:3.5 L***) ***of retentate (wastewater discharged from RO unit) was realized in all five zones*** (irrespective of water purifiers used). None of the zones reap even 25 per cent of the total water supply as ***purified water (permeate).*** Among all five zones, North and West zones recorded the minimum permeate of 21 per cent with a maximum retentate realized of about 78 per cent.

Table 2. Details on brand used Vs retentate realized				
Brand used	Number of families	Input provided (L)	Retentate generated per litre of permeate	Ratio in percent permeate to retentate
A	50	23625	**3.77 ± 0.09**	**20.96: 79.03**
B	24	11340	3.59 ± 0.09	21.79: 78.21
C	19	8977.5	3.61 ± 0.20	21.70: 78.30
D	10	4725	3.31 ± 0.17	23.20: 76.79
E	9	4252.5	2.66 ± 0.33	27.32: 76.28
F	8	3780	3.27 ± 0.10	23.42: 76.58
G	5	2362.5	3.20 ± 0.11	23.81: 76.19

3. Details on brand wise mean permeate available and retentate realized

The details on brands used and retentate realized is explained under the Table

The survey revealed that the select households used seven different water purifiers, out of which Brand A was found to be popular. The maximum representation of ***Brand A*** water purifier was from the ***west zone*** of about 68 per cent. Also, compared to other brands, ***Brand A*** found to discharge more of retentate which prompted to conduct the following phases of the study in west zone, using hydroponics (raising plants in water without soil) as an appropriate technology to recover this resource. The survey data highlighted that many RO users were concerned about water wastage and found to reuse it for gardening and various other purposes.

B. Water quality test: The water quality of retentate was found to have the necessary minerals required for plant growth, with the physical parameters within acceptable limits. The presence of certain heavy metals or toxic metals such as Arsenic, Cadmium, Cyanide, Lead and the like is in the Below Detection Levels. Thus, it was found that the water is safe for raising plants.

C. In- situ Hydroponic trials: The findings of the study are explained below:

1. Experimental Study I:

In both comparative studies on hydroponic fodder experiments, (pilot study and experimental study), the experimental samples (retentate) showed better and faster growth. The pilot study conducted earlier showed satisfactory results in retentate within nine days. But, the growth potential was poor in permeate samples even after nine days ***(Fig.1)***. The experiences gained from the pilot study prompted conducting an experimental study using tap water and retentate. Table.3 presents the growth potential of yellow maize and Jowar seedlings achieved.

Fig 1. Growth of Maize at the day of harvest (control sample)

Table 3. Fodder seedlings growth milestones achieved at the day of harvest (9th day)				
Water samples	**Maize**		**Jowar**	
	Root length (cm)	Shoot length (cm)	Root length (cm)	Shoot length (cm)
Experimental samples	5.8	13.5	6.3	6.3
Control samples	5.4	9.5	3.6	5.3

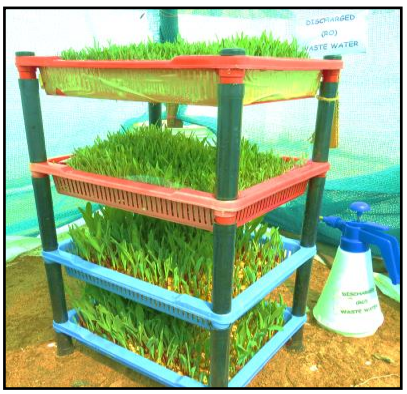

Fig 2. Growth of Maize and Jowar fodder at the day of harvest (Experimental sample)

The seedling growth of the experimental sample - maize showed appreciable shoot growth. In Jowar, shoot growth was satisfactory in both control and experimental samples. The seeds of experimental samples formed a good root and shoot system, resulting in good sprout mat formation in Jowar and maize fodder samples ***(Fig.2)***. The sprout mat had weighed twice as their initial weight (one kilogram) of seeds, on the harvest day. This proved that the retentate has the potential to grow hydroponic fodder without substrate. This could help farmers to overcome fodder shortages and grow fodder throughout the year. Also, it helps in recovering the natural resource -Water.

2. Experimental study II: Raising seedlings from seeds in pro- trays

The selected plant seeds were raised in pro-trays as control and experimental samples. The plant growth achieved is presented under the Table.

Table 4. Monitoring plant growth in pro-trays				
Plant part measured	**Sample pro-trays**	**Day at which selected plant attained true leaf stage in cm (Mean ± S.D)**		
		Tomato	**Amaranthus**	**Coriander**
		9	**9**	**16**
Root	Control	7.65±1.48	2.50±0.07	5.85±1.63
	Experimental	8.80±0.28	3.00±0.00	7.75±0.49
Shoot	Control	3.45±0.07	1.55±0.07	2.3±0.42
	Experimental	3.9±0.14	1.90±0.14	2.95±0.21
Leaf	In both	One	One	One

All the selected plant seeds sown in pro-tray achieved appreciable growth adopting hydroponic pro-tray technique. Germination rate was cent per cent in Tomato and Coriander, whereas in Amaranthus the germination percentage was 80 per cent. The germination day of each plant differs. The growth milestones achieved by the Coriander and Tomato was better (***Figures 3 and 4***) as compared with Amaranthus growth milestone. But later, it showed better growth.

Fig 3. Growth milestones of Tomato seedlings (Experimental sample)

Fig 4. Growth milestones of coriander seedlings (Experimental sample)

Collectively, all the seedlings achieved good growth in the experimental sample as compared to the control samples with a well-established root and shoot system. This proved that it is a viable way to reuse the retentate in a productive way. Also, any woman or household may take up this as an entrepreneurial activity and could start a micro-level nursery to raise seedlings from their own premises without any investment.

3. Experimental study III: Novel hydroponic microgreens raised using seeds

The hydroponic microgreens were grown as stated in the methodology using seeds. The microgreens such as Fenugreek, Fennel, Amaranthus, Coriander and Mustard were grown adopting hydroponics. The select microgreens plant seeds showed appreciable growth with yield. The microgreens such as Mustard, Amaranthus and Fenugreek sprouted out the very next day, whereas coriander and fennel sprouted out on 6th day. Thus, the growth period was extended up to fifteen days, whereas in other microgreens (Amaranthus, Mustard and Fenugreek) the growth period was seven to ten days. Table.5 present the yield obtained in microgreens.

Table 5. Yield of microgreens harvested

Select Microgreens	Microgreens raised (Mean in g)	
	Control samples	Experimental samples
Amaranthus	5.00	**9.33**
Fennel	10.17	**12.25**
Fenugreek	124.33	**136.67**
Coriander	**27.00**	6.00
Mustard	100.33	**111.32**

Fig 5. Weighing the harvested mustard microgreens

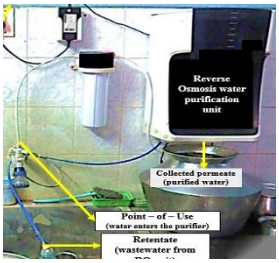

Fig 6. Microgreens at the time of harvest (Fenugreek Microgreens)

The yields realized from the experimental samples were quite commendable except coriander, because of least germination percentage recorded. While the other microgreens showed better growth. The ***Figures (5) and (6)*** represent the yield realized in Mustard and Fenugreek microgreens.

4. Experimental study IV: Propagation of plants using different vegetative parts adopting hydroponic technique

The experiments were conducted using different vegetative parts as explained in the methodology. The details are explained below:

- ***Cuttings:*** The cuttings of portulaca, Rose and Carnation were grown hydroponically. The portulaca (*Portulaca grandiflora*) started producing flowers at a stipulated time with colourful flowers. Rose cuttings which are 45 cm height started developing leaves at their nodes after 27 days. The root and leaf growth were observed, but wilted before budding. In the carnation cuttings, good shoot development was observed.
- ***Bulbs:*** The Rain lily (*Zephyranthes grandiflora*) and Onion (*Allium cepa*) bulbs were raised. The onion started producing well- established root and shoot system after three days. The quality rain lily bulbs started producing buds after 28 days of sowing. The next day blooms appeared with beautiful pink petals with fragrance.
- ***Tubers:*** Instead of throwing the sprouted potatoes (*Solanum tuberosum L*) collected from the kitchen, an attempt was made to grow them hydroponically. Using a waste bucket with drainage holes and coir pith as substrate the potatoes were sown. The tuber started showing shoot growth within 20 days but was not appreciable produce seen. The use of seed potatoes may give a good yield. Dhalia (*Dahlia pinnata*) sown in plastic containers at first sprouted within nine days and these were transplanted in respective grow bags for further development.
- ***Seeds:*** The Gomphrena (*Gomphrena globose*) and Chrysanthemum (*Dendranthema grandiflora*) seeds were sown and raised in individual pro-trays. The seeds started sowing sprouts after the 6th and 4th day respectively. After 38 days, the seedlings with the well-established shoot and root systems were seen.
- ***Leaf propagation:*** The matured leaves of jasmine, guava and hibiscus were collected from the mother plant. The samples were allowed to sprout in a conducive environment. Proper watering (retentate) was done. On the completion of the 28th day, the leaves of jasmine leaves showed appreciable growth of the root system.

Thus, it proved that the retentate can be reused for propagating various vegetative parts of plants. ***Fig.7*** presents the plants propagated from different vegetative parts hydroponically using retentate.

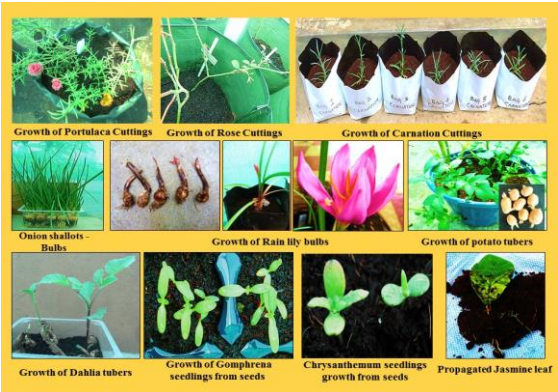

Fig 7. Propagated plants from different vegetative parts hydroponically using retentate

The solid waste (spent coir pith) collected from experiments conducted was introduced into the vermin-compost unit along with daily kitchen organic wastes. Practicing this waste valorization process, resulted in a good quantity of vermin-compost. The harvested vermin-compost was used in the preparation of nutrient solution for hydroponics, later.

LIMITATION OF THE STUDY

- As this study was conducted during COVID pandemic curfew, only limited varieties of plant seeds and gardening materials were available to purchase.

SUGGESTION FOR FUTURE RESEARCH

- A research study on raising herbal and kitchen gardens by reusing retentate discharged on large scale could be carried out.

CONCLUSION

The study was aimed at finding a possible way of reutilizing or reclaiming the reverse osmosis retentate that was discharged as wastewater. The in–situ hydroponic experiment showcased the appreciable results in raising plants using retentate (RO wastewater). This technique has the possibility of creating a biophilic environment with less investment around the micro-environment (home-level) and rebuilding the nexus between humans and nature. On another side, it could create a new entrepreneurial avenue for homemakers or one may take up this as leisure time activity. This micro-sustainable activity can bring changes on a macro-level scale, if practiced with pro-environmental consciousness in reusing the wasted resource in a productive way. Overall, this study proved successful in propagating plants using different vegetative parts, ***reusing retentate***, which enables to ***create a biophilic environment*** at the micro–level.

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PSYCHO-SOCIAL PROBLEMS FACED BY SURAT DIAMOND POLISHERS

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ABSTRACT

India is a leading producer of finished diamonds, as, Surat serves as the main hub for the largest diamond cutting and polishing industry in the world. Ironically, India is a top exporter of polished diamonds, considerably outpacing its rivals Israel and Belgium, despite not possessing significant domestic diamond reserves. The transformation of uncut diamond stones into brilliant diamonds entails a number of methodical stages that call for the workers' attention to detail and ability. Several thousand people are employed by the diamond industry in Surat. Few of these industries are organised and offer better amenities to their employees, while most of the others are unorganised in nature. For the present study a sample size of 500 workers from the small polishing units of Surat were purposively selected using the snow ball technique. 100 employees were chosen from each of the five main polishing tasks for diamonds: "tablework," which involves polishing the topmost single facet; "girdle rounding", "talia," which involves polishing the bottom 24 facets of the pavilion; "athpel," which involves polishing the top 8 facets of the crown; and "mathala," which involves polishing the top 24 facets of the crown. In the present study an attempt has been made to assess the background and demography of the workers in diamond polishing industry and to analyse the psychosocial problems faced by them. A structured interview schedule was prepared and administered for the purpose. Results obtained from the survey indicated that although the cutting and polishing sector is a highly flourishing industry of Surat, but the hazards faced by the workers cannot be ignored. Thus many psychosocial problems faced by the respondents surfaced in the results obtained from the data analysis and coping strategies were suggested to overcome such problems.

KEY WORDS: Diamond Polishing, Psycho-social Problems, Coping Strategies

INTRODUCTION

The famous diamond provider De Beers in its famous marketing campaign of 1948 had stated 'A Diamond is forever' (Peveto A, 2013), This phrase has stayed with everyone for a long time now. Since history men and women have been drawn to the world's most stunning and desirable stone. It is interesting to note that both coal and diamond contain carbon as the chief element. It is the purity and carbon structure that make them totally different from each other. While coal contains a lot of impurities like nitrogen, arsenic, selenium etc., diamonds are a pure

form of carbon having a crystalline structure, which is mainly due to the extreme heat and pressure that this valuable stone is exposed to (Platt J, 2020).

Diamonds begin their journey hundreds of miles below the earth's surface and needs to be processed before it can be used by the end consumers. The process begins with the exploration of rough stones that has crystallized under the earth's surface for millions of years and are forced up through openings during volcanic activities. Explorers try to identify such locations where diamonds may be found. Once such locations are identified, mining is done to extract the stones. From around the globe, 80% of the rough diamond supply comes from Australia, Canada, Congo, Namibia, Russia and South Africa. The mined stones are then sorted on the basis of their size, colour and quality before they can be sent to the cutting unit. The stones are then either cut by the cleaving method or the now more commonly used laser method.Cut stone is then handed over to the polishing unit. In this unit the stone is rubbed against a spinning wheel to convert it into a sparkling gem. The last and the final stage is the export of diamonds to registered diamond bourses who set these beautiful stones into beautifully crafted jewellery pieces. Although India does not have significant mining location of its own, it is the largest importer of rough stones and largest exporter of finished diamonds. 11 out of 12 diamonds globally are cut and polished in India and this industry is specifically concentrated in Surat city of the Gujarat region.

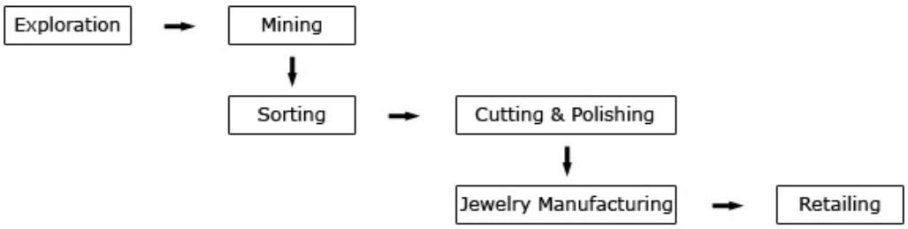

Fig 1: Diamond Process Flowchart

(Source:https://www.ashidiamonds.com/Education/DiamondGuide/Journey_of_Diamond.aspx)

The processing of diamonds involves several steps that are either manual or mechanical. However, the polishing of diamonds involves steps that are mostly manual and which require high levels of skills of the worker. Polishing of diamonds involves curating the different facets of the stone. In a typical brilliant cut diamond, there are 58 facets that are rubbed against a high speed rotating machine. In the first step the table of the diamond is polished and the process is called 'tablework'. The second step involves the rounding of the centre girdle. The third step is bottom work or polishing of 24 facets of the pavilion. In the fourth step the 8 facets of the top are polished and in the last stage 24 facets of the crown are polished. After the final inspection the sparkling piece is ready for distribution or export.

Traditionally, occupational health and safety concerns were limited to those involving physical, chemical and ergonomic hazards at the work place. But gradually, there is a growing awareness towards psychosocial factors that can have a direct impact on the physical as well as the mental health of the employees. Factors that have psychological, economic and social influences on an individual is termed as psycho-social factors[2].Since the diamond polishing work is a repetitive task and requires the workers to sit in the same position for long durations, it results in

not only physiological but also psychological strain. Along with such work demands, the work environment in most of the small units are not very conducive, since, most of these units belong to the unorganised sector that do not generally follow set guidelines.

The review of literature reflected that there is a dearth on the studies conducted on the psychosocial problems faced by the employees of the Surat diamond polishing industry. A lot many studies have been conducted on different industries other than diamond polishing industry to understand the psychosocial problems faced by the employees (Padmini, D., and A. Venmathi., 2012; Choobineh, Alireza, et al., 2011; Raja, Sharifah Shameem Zahari Taha Nazaruddin, and Ariffin Iskandar Norhafizan Ahmad, 2001; Anderson, Charlene, and Carolyn Stark, 1988,). Studies conducted on the diamond industry mostly revolve around the growth of the industry, impact of technology and globalization on this sector and issues like child labour (Arora, Neelam, 2014; Varkkey, Biju, and Randhir Kumar, 2013; Berger, Ron, and Ram Herstein, 2012 ; Rao, Indu, 2011; Rao Indu, and Deepti Bhatnagar, 2009,). Hence the need to conduct the study was strongly felt.

OBJECTIVES

- To assess the psycho-social problems faced by the workers of the diamond polishing industry
- To suggest coping strategies to overcome the problems

DELIMITATIONS

- The study was limited to diamond industry located in Surat city only
- The study was limited to the diamond polishing process only
- The study was limited to small units employing less than 50 employees
- The study was limited to a sample size of 500 respondents

METHODOLOGY

The research design of the present study was descriptive in nature. A sample size of 500 workers employed in the small diamond polishing industry of Surat was selected purposively through snow ball technique. Units employing less than 50 workers were selected for this study. An interview schedule with structured questions was prepared and administered in order to collect relevant information.100 workers working in each of the five activities for diamond polishing unit namely the ‘tablework’, ‘girdle rounding’, ‘talia’ or ‘bottom work’, ‘athpel’ and ‘mathala’ work were interviewed. The interview schedule consisted of two sections. The first section collected data related to the demography and back ground information of the workers. The second section inquired into the psychosocial problems faced by the workers. The second section was further subdivided into four sub sections, namely, ‘Relationships at work’, ‘Job demands’, ‘Work culture’ and ‘Work-life balance’. The obtained data was tabulated and analysed by using MS Excel software. Descriptive statistics was used to express the results.

FINDINGS AND DISCUSSION

The findings of the study are divided into two sections. Section 1 provides background information of the employees of the diamond polishing industry. Section 2 assesses the psychosocial problems faced by the workers and is further divided into four subsections.

Section 1- Background Information of the Respondents

It was observed that majority of the respondents working in the diamond polishing industry belonged to the young age group and were below 35 years of age. Very few of them belonged to the higher age group. This could be because of the reason that the polishing work requires long duration of sitting in the same posture. The work also entails excellent eye- hand coordination with a lot of concentration, focus and skill of paying attention to details. Most of the respondents were males with handful of females. This industry has been male dominated for a long time now, but gradually women are also taking up jobs in the polishing sector.

Regarding the educational qualification, it was observed that none of them were graduates and maximum number of them had received just primary education. There were many who had received no formal education. This proves that the polishing work is a skill job and can be performed without any formal educational degree. Thus, people looking for a means of earning dropout early from school and join this sector. The data also revealed that many of the respondents were migrants from nearby villages and suburban towns, who migrated to Surat in search of job and joined this industry. It was observed that maximum respondents were the sole earning members of the family. Regarding the work related information the data showed that the average working hours for the respondents was 10 hours/day with one break of 45 minutes in between.

Section 2- Psychosocial Problems

The psycho-social problems faced by the respondents were studied under four subsections, which are as follows:

2.1 Relationships at Work

Table 1: Problems related to Relationships at Work (n=500)

Problems	Experienced		Not Experienced	
	Frequency	Percentage	Frequency	Percentage
Poor relationship with employer	166	33.2%	334	66.8%
Poor relationship with co -workers	350	70%	150	30%
Poor communication between staff and management	117	23.4%	383	76.6%
Poor communication between co-workers	334	66.8%	166	33.2%
Harassment	112	22.4%	338	67.6%
Dis-respect	276	55.2%	224	44.8%
Discrimination	190	38%	310	62%
Risk of violence	90	18%	410	82%
Feeling aloof from the organisation	314	62.8%	186	37.2%
Inefficient grievance handling	281	56.2%	219	43.8%

An investigation into the psychosocial problems related to relationships at workplace revealed that 70% of the workers agreed that they did not have good relationship with their co-workers. Two third of them felt that there is poor communication between their co-workers. In comparison, the respondents felt that they had good relations and communication with their employers. About 63% of the respondents also agreed that they do not feel an integral part of the organisation. More than half the respondents also felt disrespected at work and thought that grievances were not handled properly.

2.2. Job Demands

Table 2: Problems related to Job Demands (n=500)

Problems	Experienced		Not Experienced	
	Frequency	Percentage	Frequency	Percentage
Dissatisfaction with working hours	388	67.6%	112	22.4%
Overburdened	351	70.2%	149	29.8%
Monotonous work	362	72.4%	138	27.6%
Less time to complete tasks	145	29%	355	71%
Insufficient rest breaks	372	74.4%	128	25.6%
Self-doubt at work	106	21.2%	394	78.8%
Difficult Targets	121	24.2%	379	75.8%
Tight deadlines	80	16%	420	84%
Insufficient job specific training	221	44.2%	279	55.8%
Underutilization of skills	238	47.6%	262	52.4%

With regards to the demands at the job, 74.4%of the respondents felt that they were not getting enough rest breaks as compared to the number of hours that they were putting into their work. About 72 % also agreed that their work was monotonous and 70.2% of them felt overburdened. More than two third (67.6%) of the respondents agreed that they were not satisfied by the working hours. Interestingly, 78.8% of the respondents were confident with their work.

2.3 Work Culture

Table 3: Problems related to Work Culture

Problems	Experienced		Not Experienced	
	Frequency	Percentage	Frequency	Percentage
High performance pressure	118	23.6%	382	76.4%
Over harsh discipline	232	46.4%	268	53.6%
Too much supervision	280	56%	220	44%
Insufficient salary	408	81.6%	92	18.4%
Lack of good facilities	302	60.4%	198	39.6%
No job security	289	57.8%	211	42.2%
Lack of appreciation	369	73.8%	131	26.2%

Data collected on work culture revealed that 81.6% of the respondents felt that they were not getting paid enough for the job. While, 73.8% of them agreed that they did not feel appreciated for their work, 60.4% felt that they were not provided with good facilities while 57.8% did not feel secure at the job. More than one half (56%) of them also felt that there is too much supervision at the workplace.

2.4. Work Life Balance

Table 4: Problems related to Work Life Balance (n=500)

Problems	Experienced		Not Experienced	
	Frequency	Percentage	Frequency	Percentage
Non flexible work hours	384	76.8%	116	23.2%
Insufficient holidays	288	57.6%	212	42.4%
Difficulty in getting leaves	132	26.4%	368	73.6%
No medical aid	179	35.8%	321	64.2%
Insufficient time for socialization	389	77.8%	111	22.2%
Insufficient time for family	206	41.2%	294	58.8%
Tobacco addiction	291	58.2%	209	41.8%
Alcohol addiction	168	33.6%	332	66.4%
Unmotivated at work	126	25.2%	374	74.8%

More than three fourth (77.8%) of the respondents from the entire sample felt that they did not get enough time to socialize and 76.8% felt that work hours were not flexible. 58.2% of the respondents agreed that they were addicted to tobacco while 57.6% of them felt that they were not getting enough holidays. However, a positive result showed that 74.8% of the respondents were motivated to come to work. The analysis clearly shows that money is not the motivating factor for the respondents but the nature of work could be the reason of their motivation. Diamond polishing work does not require any degree or intellectual input. It is a repetitive job and is easy to do once the skill is acquired.

Coping Strategies

Considering the psychosocial problems faced by the respondents, the following coping strategies were suggested.

- By keeping communication open and transparent among the co-workers trust and good interpersonal skills can be developed
- Eating lunch or sharing a joke with co-workers can help to develop cordial relationships with them
- Looking for or developing unique methods of performing the same task to break the monotony, but not compromising on the quality of output can be beneficial in doing the work well
- Doing simple eye, shoulder and back exercises to relax the tired muscles in between tasks can prove to be very valuable
- Pre-planning social activities on weekends and holidays will bring a refreshing change

- Spending quality time with family and planning activities with them will also relax the mind
- Indulging in relaxing activities like yoga, regular exercises and sports will not only help to calm the body and mind but also increase physical strength

CONCLUSION

On the basis of the findings of the present study it can be concluded that the workforce of the Surat diamond polishing unit is a young in age and male dominated sector. But they do not have much formal education and sustain in this industry on the basis of the skills that they learn first through training and then through experience. The findings also revealed that the psychosocial factors with regards to the respondent's relationship at work, job demands, work culture as well as work life balance if not handled properly can have a detrimental effect on the mental and physical wellbeing of the workers and in turn will adversely impact the productivity.

Thus the findings and results from the study will be helpful for the owners of the polishing units in order to understand and control these factors that will impact them as well. They should work towards creating conducive work environment in which the workers can work in peace. Developing a good connection with the employees as well as organizing training programmes for them in order to learn skills like leadership, interpersonal skills and also emotional intelligence could prove to be advantageous.

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Weblinks

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2. https://oshwiki.eu/wiki/Psychosocial_issues

USE AND EFFECT OF NATURAL MATERIALS FOR INTERIOR SPACE DÉCOR

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ABSTRACT

The study was conducted to investigate the use and effects of natural material for interior space decor. Data from 100 households was collected through the questionnaire. Purposive sampling method was implemented. The results showed that natural materials used for interior space decors brings out the effect of happier and healthier environment by increasing people's connection with the natural world, even indoors, at home. The result of the study shows that natural materials give a perfect blend of natural and organic design to the interior space with a strategy solution to make people feel relaxed, restored and revitalized. These natural materials brings out the earthy feel and green home effect by mimicking or been inspired by spatial configurations in nature. By adding the natural materials to the interior space, it helps in recovering from buildup of stress through visual connection with nature as the images of nature are more brain stimulating and soothing.

Key words: Visual Connection, Relaxed, Natural and Organic, Interior decore

INTRODUCTION

Use of natural materials in a space is generally organized into three categories: nature in the space, nature of the space and natural analogues. Nature in the space refers to the direct presence of nature and includes multi-sensory interactions such as thermal, visual, hepatic or anything else were natural presence was clear and direct. Nature of the space refers to mimicking or been inspired spatial configurations in nature. These principles are used to create connection with nature in non-natural space to feel the form of nature**.**

Kellert et al, (2008) concluded that biophilic design ultimately aims at improving the well-being and it does so by creating interiors that take inspiration from the natural world. The dictionary defines well-being as a state characterized by health, happiness and prosperity. In other words, well-being is that desirable condition where to thrive (prosperity) both physically (health) and mentally (happiness).

Beatly (2011) opines that when humans have evolved to become largely indoor creatures, people still have a deep connection to nature. The sight of waves steadily crashing on the beach, the smell in the morning air when dew clings to leave and grass- all evoke a peaceful, calming sensation

McLaughlin (2017) says that humans rely on environmental cues to make judgments about perceived safety. Biophilic design connects building occupants to the cycles and patterns of nature by subtly incorporating cues reminiscent of the visual and spatial qualities of natural settings, such as through the use of patterns rather than the specific representations of nature. In this way, natural qualities can be readily brought indoors without being heavy handed or kitschy. For example, turning to regional environments can provide design insight related to material, colour and patterns as well as the sensory qualities of spaces that often creates subconscious understanding of supportive and nurturing environmental qualities. Ninety percent of time is spent inside buildings and much of that is in the homes, which should provide a respite from busy and stressful lives. Value of being connected to nature with homes, people are happy to pay more for homes that have a view, are next to the water or a park, but even without the view or waterfront, homes can be designed to connect with nature in simple and subtle ways. Especially pay attention to how humans have interacted with nature over the thousands of years (http://i2p.com.au/biophilic-design-is-a-natural-part-of-life/).

NEED OF THE STUDY

The investigator has taken up the study entitled " **Use and Effect of Natural Materials for Interior Space Decor"** with views to understand humans love towards the natural and organic appeal of elements that make them feel calm, at peace and stress-free environment within the living space. The main objectives of the study were as follows.

OBJECTIVES OF THE STUDY

- Elicit information on the benefits of the natural materials
- Study the attitude and preferences of people in adopting natural materials in households
- Analyze the physical and psychological impacts on people who used natural material as decor in their interior.

METHODOLOGY

The research methodology is a scientific and systematic way to solve research problem.

Sampling frame: The area chosen for the study were Coimbatore and Theni. The residential areas such as Saibaba Colony, Ramnagar, Ramalingam Colony, Singanallur and Racecourse in Coimbatore and other places in Theni such as NRT Nagar, P.C Patti, Forest Road and Sri Ram Nagar were selected. Purposive sampling method was adopted considering the purpose of the study. Total 25 high income families who have used natural materials in their interior space as design and decor from the district of Coimbatore (13 samples) and Theni (12 samples) were selected for the study.

Tool to collect data: The methods used were direct personal interview and observation. An interview schedule was framed to acquire information. Interview schedule included details about the general information of the house, trendy natural materials used in the house, their maintenance and the cost involved in it. The investigator selected 25 houses to collect the required data. The investigator approached each house personally and explained the purpose of the study. Data

collection is a process by which the researcher collects the information from all relevant sources to find answers to the research problem (Sharma,2011). Thus, the data collected by the investigator putting forth the questions to the sample from the interview schedule and recorded the information instantly. Data consolidation refers to consolidating multiple sources into a single destination, from the collection to integration of the data.

RESULTS AND DISCUSSION

The findings of the study on **"Use and Effect of Natural Materials for Interior Space Decor"** are discussed under following headings.

A. General Profile of the Family

1. Background information

Among the surveyed households a most of (40 per cent) of them were in the age group of 41-50 years, 32 per cent were in the age group of 31-40 years and 20 per cent were in the age group of 21-30 years. A minimum eight per cent belonged to the age group above 50 years. With the respect to educational status larger parts of 44 per cent of the homemakers were graduates and 40 per cent of them were diploma holders. Only 16 per cent belonged to the category of higher secondary education. Occupational detail shows that 32 per cent of the respondents were homemakers, 24 per cent were business people, 16 per cent were doctors, eight per cent of each was designers, freelancers and engineers and only four per cent were IT professionals. Out of the selected men and women in the household survey, 100 per cent of the selected family members were married. Seventy-two per cent of the selected families belonged to nuclear family and the remaining 28 per cent were in joint family.

2. Size of the family and monthly income of the households

a. Size of the family

Among the selected households a majority of (48 per cent) of them had six members, 36 per cent of the families had four members and only 16 per cent of the households had three members.

b. Monthly income of the households

Among the selected households 44 per cent of them were having highest monthly income (above Rs.2,00,000). Thirty-two per cent of the families earned between Rs.1,00,001 and Rs.2,00,000. Twelve per cent of the selected households belonged to the income group of Rs. 80,001 - Rs.1,00,000 and eight per cent received monthly income between Rs.60,001 and Rs.80,000. The lowest income of Rs. 40,000 - Rs. 60,000 was earned by four per cent of them.

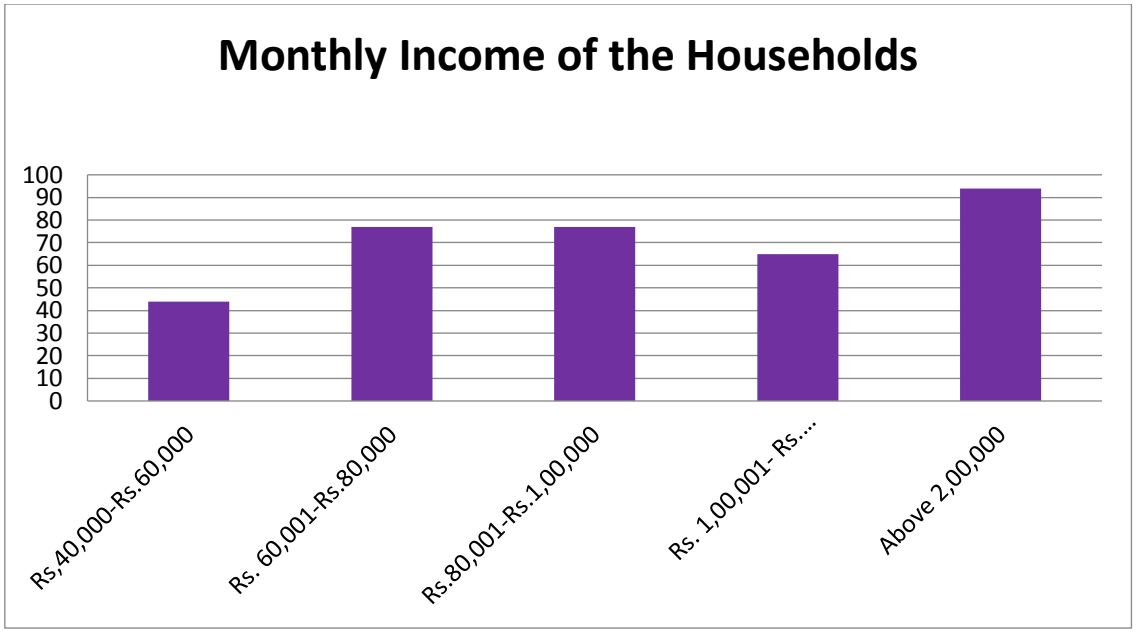


Figure 1. Monthly Income of the Households

B. Information About the Design and Decoration of the Selected Houses

1. Year of construction

A many of (20 per cent) of the houses were built in the year 2019, following them 16 per cent were built in the year 2012 and 12 per cent were constructed in the year 2014 and 2017 respectively. Eight per cent were built in the year 2009, 2013, 2015 and 2018. A four per cent of the surveyed houses were constructed in the year 2010 and 2016.

2. Type, ownership and locality of the selected houses

a. Type of the house

It is clear that 88 per cent of the respondents were living in independent houses while 12 per cent were in apartments.

b. The ownership details

A majority of (80 per cen)t of the respondents had own houses and 20 per cent were living in rental houses.

c. Locality of the selected houses

A maximum of 52 per cent respondents were living in an urban area followed by 36 per cent in township. Only eight per cent were in semi urban and four percent in rural areas.

Table 1: Locality of the Selected House

Locality	Percentage (n= 25)
Urban	52
Township	36
Semi- Urban	8
Rural	4

C. Details of Natural Materials Used in the Selected Houses

1. Type of natural materials used in the selected houses

Table 2: Type of Natural materials Used in the Selected Houses

Natural materials	Percentage* (N= 25)
Indoor plants	76
Wood and bamboos	62
Cactus and succulents	55
Indoor lawns	44
Potted plants	32
Mosses	24
Fountains	20
Rocks and stones	20
Ponds	8

*Multiple responses

A majority of (76 per cent) of the households used indoor plants, 62 per cent used wood and bamboos. Fifty-five per cent displayed cactus and succulents, indoor lawns (44 per cent), potted plants (32 per cent) and mosses (24 per cent). Twenty per cent each used fountains, rock and stones in their houses Ponds were used only in eight per cent of the houses

2. Source of information about natural materials used in interiors

Information about the natural material is important for every household to be aware of the current trends in this aspect. A vast majority of (84 per cent) of the homemakers preferred internet to gain information and 72 per cent used magazines as their major sources. Architects (68 per cent) and suggestion from friends (44 per cent) helped them to enrich knowledge. Only 40 per cent of them had own interest in using natural materials. Households used newspapers (20 per cent),

exhibitions (16 per cent) and advertisements (12 per cent) for enlightening self for the use of natural materials in interiors.

Table 3: Source of Information about Natural Materials Used in Interiors

Source of Information	Percentage (n= 25)
Internet	84
Magazine	72
Architect	68
Suggestion from friend	44
Own interest	40
Newspaper	20
Exhibition	16
Advertisement	12

*Multiple responses

3. Place of purchase of the natural materials

The place of purchase is very important for the households to buy the excellent quality natural materials for the houses. A more than one half (56 per cent) of the households purchased the natural materials from the market and 20 per cent bought them from interior shops. Only 16 per cent purchased from other places like plant nursery and natural material boutiques. Eight per cent of the households bought from online stores.

Table 4: Place of Purchase of Natural Materials Used in Interiors

Place of purchase	Percentage (N= 25)
Market	56
Interior shop	20
Plant nursery	16
Online store	8

4. Type of plants used in the selected houses

It is happy to note that 44 per cent of the households used ornamental plants as the major plant type. Twenty per cent of them used cactus whereas 16 per cent of the homemakers opted herbs and vegetables, 12 per cent were having bonsai and remaining eight per cent used bamboos in their houses.

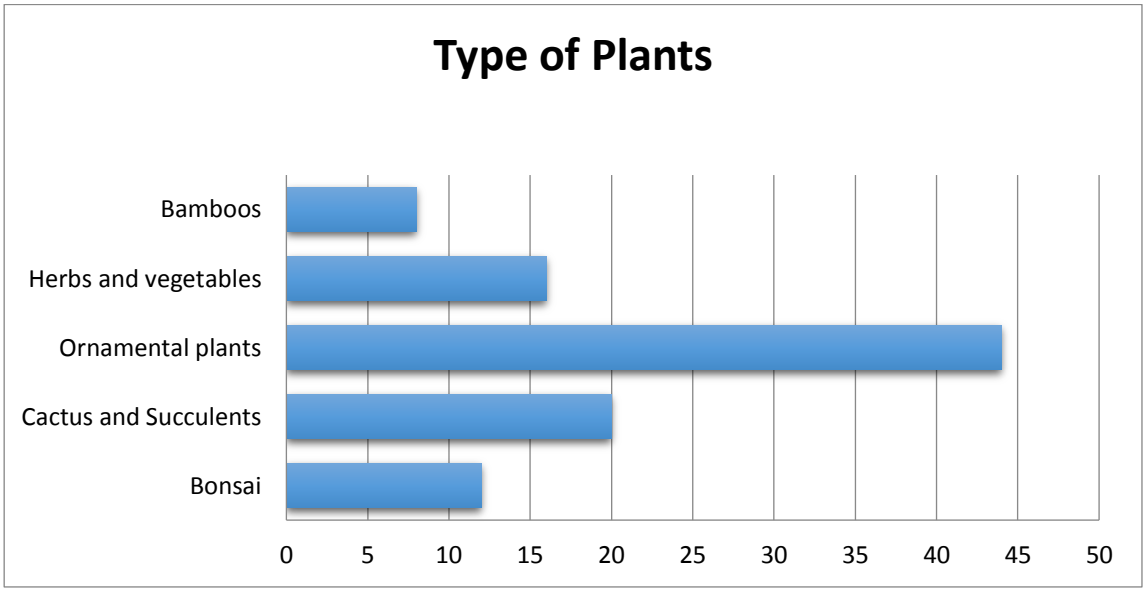


Figure 2. Type of Plants Used in the Selected Houses

5. Designers in-charge for designing and decorating the selected houses

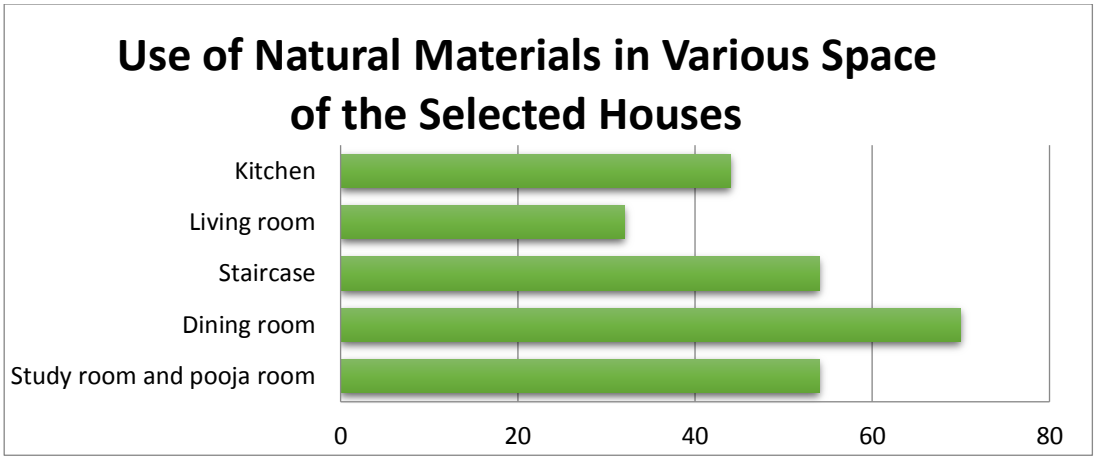
More than one half (54 per cent) of the homemakers hired architects whereas 40 per cent of them used interior designers to design their houses with natural materials. Four per each used civil engineers and family members to design the interiors of the selected houses.

Table 5: Designers In charge for Designing and Decorating the Selected Houses

Designer In charge	Percentage (N= 25)
Architects	54
Interior designers	40
Civil engineers	4
Family members	4

6. Use of natural materials in various spaces of the selected houses

A majority of 72 per cent of the homemakers placed the natural materials in dining room, as, the thought, it improves the health, reduces the stress and provides the well being of the family members. Fifty-two per cent placed natural materials in other places such as staircase, pooja room and study room, as, it gives respite and joy for the households. Kitchen (44 per cent), living room (32 per cent) and bed room (12 per cent) of the houses were decorated with natural materials.



*Multiple responses

Figure 3: Use of Natural Materials in Various Spaces of the Selected Houses

7. Opinion on money spent for natural materials used in interiors

Money spent on indoor plants was considered as "reasonable" by a wide majority of respondents. Lawn and woods/bamboo were considered as expensive by 72 and 60 % of the respondents.

Table 6: Opinion on Money Spent for Natural Materials Used in Interiors

Natural Materials	Opinion	Percentage *(n= 5)
Indoor plant	Reasonable	88
Lawn mat (natural & synthetic)	Expensive	72
Cactus and succulent	Reasonable	64
Wood and bamboo	Expensive	60
Potted plant	Reasonable	40
Mosses	Costly	24
Rock and stone	Economical	20
Fountain	Expensive	8

*Multiple responses

8. Criteria considered for the purchase of natural materials

A maximum of 92 per cent looked at cost during the purchase of the natural materials whereas 78 per cent checked the durability. Seventy per cent of the households considered beauty as the prime criteria and 56 per cent had seen the care and maintenance of the natural materials. Only 44 per cent of the homemakers preferred to go for trendy materials.

9. Money spent on natural materials by the selected households

A majority of 46 per cent of households spent their money between Rs.2,00,001 and Rs.3,00, 000.Twenty-four per cent of the households spent between Rs. 3,00,001 and Rs. 4,00,000. Sixteen per cent spent between Rs. 1,00,001 and Rs.2,00,000. Eight per cent spent above Rs. 4, 00,000 whereas six per cent spent between Rs. 80,000 and Rs.1,00,000.

10. Problems faced by the households using natural materials

A maximum (92 per cent) of the households expressed that they felt it was difficult to maintain the freshness of the natural materials such as grasses, mosses, ornamental plants, bonsai and the terrarium. Eighty-eight per cent each of the households faced problems with pests, insects, trimming and cleaning of the mosses and grasses placed on the wall. Seventy-six per cent of the households expressed watering the mosses on wall and terrarium on ceiling was one of the major problems whereas 74 per cent had noticed the damage of natural materials (terrarium containers, broken plant pots and cracked bamboos) which required immediate replacement.

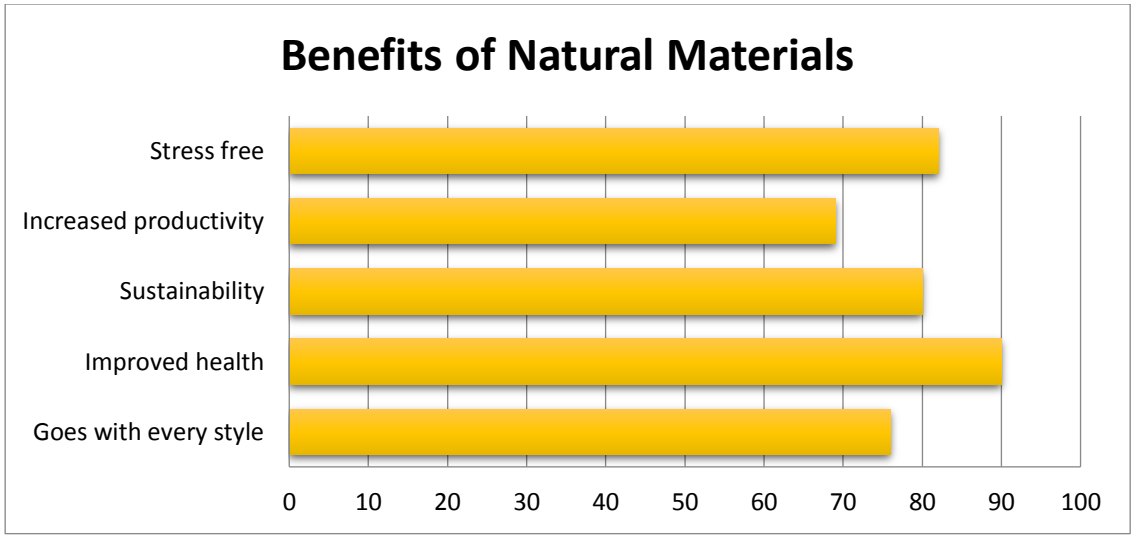
D. Influence of Using Natural Materials for bringing out door space into the Interiors of the house

1. Opinion of households using natural materials for their interiors

Natural materials incorporate nature into built environment to create restorative and connective space, positive impact and bring the outdoor world inside the house. A vast majority (98 per cent) of the households got inspired by the natural materials used in the houses and only four per cent were not inspired.

2. Benefits of natural materials used in the selected houses

The benefits of incorporating direct or indirect elements of nature into the built environment is to reduce stress, blood pressure levels, heart rate, increase productivity, creativity and self reported rate of well-being. A vast majority of 90 per cent of the households agreed with the benefit “improved health” whereas 82 per cent experienced “happy and stress-free environment”. Sustainability (80 per cent), connects with every style (76 per cent) and increase in productivity (69 per cent) helped to obtain the maximum benefits of natural materials by households.



*Multiple responses

Figure 4. Benefits of Natural Materials Used in the Selected Households

Plate 1: Type of Natural Materials - Terrarium and Bonsai


Biomimic of nature - rocks used


Mosses on wall

Plate 2: Type of Natural Materials - Rocks, Stones Mosses and Bamboos

Plate 3: Indoor Lawn and Indoor Pond Used in the Selected Houses

Plate 4: Potted Plants and Hydrophobic Plants Used at the Dining Room in the Selected Houses

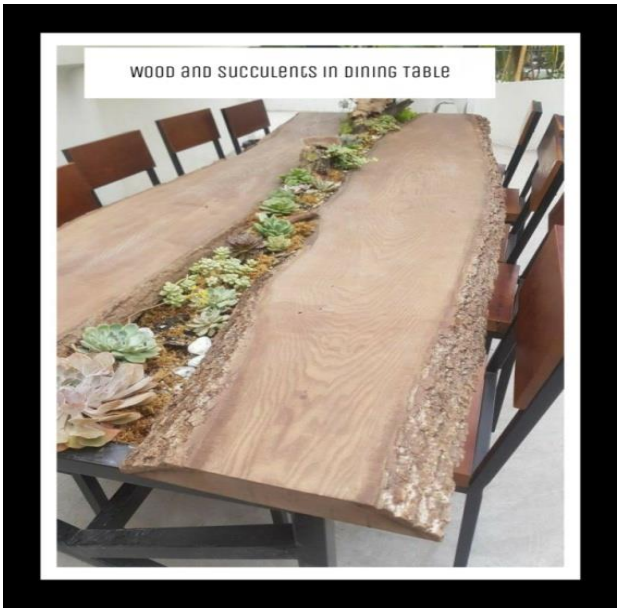


Plate 5: Succulents Used in the Uncarved Dining Table in the Selected Houses

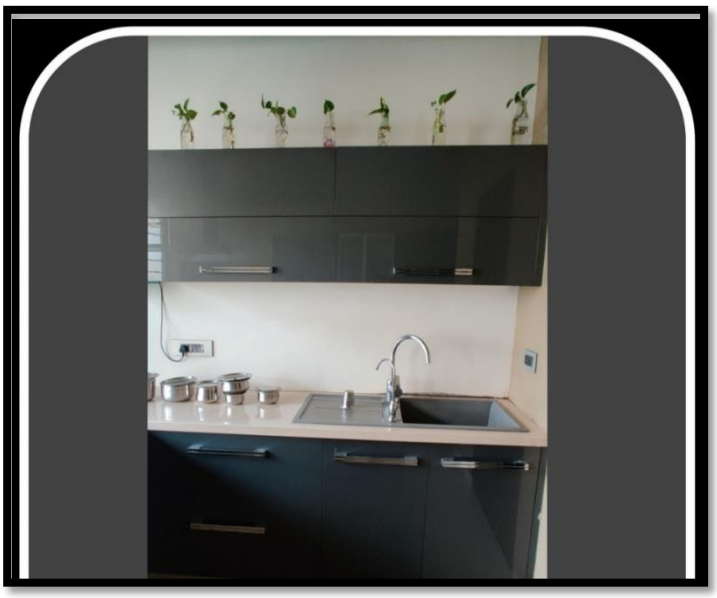


Plate 6: Hydrophonic Plants Used in the Kitchen in the Selected Houses

Plate 7: Indoor Plant Grown Using Natural Sunlight in the Living Room and Pebbles and Mosses Used in the Study Room

SUMMARY AND CONCLUSION

Worldwide, people instinctually seek the features of nature, which their bodies were accustomed to living in for many thousand years, it's now conducted mostly indoors, people can feel disconnected from nature, which leads to depression, high level of stress etc., other health problems mentally and physically. Bringing some of nature's best features inside and allowing them to shine in their own way into the built environment through decor and design helps to restore the balance by helping people feel healthier and more energetic. The study entitled on **"Use and Effect of Natural Materials for Interior Space Decor",** was taken up to show the current trends and benefits of the natural materials in households.

On the basis of the findings of the present study following conclusion could be drawn. The findings revealed that people liked to spend their leisure time at their houses, with natural materials for their interior space as it represented a design philosophy and principles that connected the outdoor and indoor space. It was observed from the data that among the selected households as sample ,majority were happy to use natural materials inside the house, spent good amount of money to purchase natural materials and the materials that mimicked natural materials as they brought the greenery inside the house and reduced stress, fatigue and improved the air quality inside the house. Such studies should be carried out on a larger scale and at different places to draw some generalizations.

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TIME MANAGEMENT SKILLS USED BY UNDERGRADUATE STUDENTS DURING ONLINE STUDIES

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ABSTRACT

Management of the time involves the process of decreasing the time devoted for a particular work, without sacrificing the quality of life. Time management involves balancing various demands upon a person relating to work, social life, family, hobbies, personal interests and commitments with the finiteness of time. During lockdown due to covid-19 pandemic situation, mostly student's teaching –learning process is done online. Students have to manage their study time at their own premises along with their household work, hobbies and other work. But, to make effective use of time, students should have to use different strategies of time management. Therefore, to know the different time management skills used by the undergraduate students during online studies, the present study was conducted. For that purpose, descriptive research design was adopted and the data was collected through purposive sampling technique. A questionnaire was developed as a Google form to collect the data from 365 undergraduate students of The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat. The study showed that, majority of the respondents had followed different time management strategies to make their work planned, better and effective during their online studies. It was also seen that the respondent's academic performance was moderate but there was lack in managing their time, because of which, they were not able to give time for their extra classes apart from their regular online classes in a day.

Keywords: Undergraduate student, Time management, Skills, Online study.

INTRODUCTION

Time is the seemingly irreversible progression of existence and events that occurs from the past, through the present, and into the future. Time is considered as a miracle in the sense that each individual has only 24 hours of daily time. Out of it they have to spin wealth, pleasure, money, content, respect and the evolution of their immortal soul (Benett, 2000).

Therefore, management of time is very much important. Time management implies making the best use of what people have and what people want. It involves the process of decreasing the time devoted for a particular work, without sacrificing the quality of life.

> 'Time management is considered as the process of planning and exercising conscious control of time spent on specific activities, especially to increase effectiveness, efficiency, and productivity which involves balancing various demands upon a person relating to work, social life, family, hobbies, personal interests and commitments with the finiteness of time'.
>
> Britton et al. (1991)

When given an assignment, the majority of students run out of time because they are unable to complete it before deadline, while rest learn to manage it as they are trained to manage it efficiently. In everyday life, effective time management usually leads to contentment and satisfaction. It's the outcome of education and it foretells the extent to which the students, teachers and educational institutions have attained their educational goals. Academic achievement is important because it promotes success later and in current life (Areepattamannil *etal*.2008). The desire to achieve success in college often causes undergraduate students to experience role overload, defined as having too much to do in the time available (Beehr*et al*.,1976). Role overload pressurizes students, which makes them feel stressed to handle daily tasks, which decreases the academic performance. As, people are not born with time management behavior, it is a set of skills that people adapt into their everyday behavior (Twehues, 2013). It can lead to improved success; however, this is a skill that students have to learn and practice. Students must change their habits in order to have good time management skill (Cyril,2015).

The COVID-19 pandemic, a public health crisis of worldwide importance, announced by the World Health Organization (WHO) in January, 2020 as an outbreak, has made distance education through the E-learning system an urgent and irreplaceable requirement (Pham *et.al*.,2021).As a result of the pandemic, more than 1.2 billion children worldwide were forced to leave school which have led to significant transformation such as e-learning, in which teaching takes place remotely and via digital platforms. Although there are many advantages to online learning, some issues can obstruct effective online learning programme. Lack of a timetable, distractions, and multitasking can all contribute to poor time management among online learners. Lack of a specific work space is another factor that might lead to poor time management.

Empirical evidence suggests that effective time management is associated with greater academic achievement (McKenzie*et al*.,2004; Truman*et al*.,1996) as students learn coping strategies that allow them to negotiate competing demands.

There are different skills which students can use to manage their time effectively,

1. **Goal-setting**: In terms of making the most out of the one's time, one must first determine what to do with it. Short- and long-term goals can be beneficial to students.
2. **Prioritization**: Tasks can be prioritized according to their particular timeframe.
3. **Organization**: Once priorities have been identified, it's necessary to create a work plan to manage the work by keeping an up-to-date calendar
4. **Stress management**: Students demand appropriate strategies for dealing with academic pressures while being productive. Getting enough sleep and exercising regularly are two wonderful ways to minimize stress.

The performance of undergraduate students is influenced by a variety of factors. The development of academic skills, such as critical thinking and educational frameworks, is one of the general purposes of higher education. This is accomplished through teaching and access to high-quality materials. Nonacademic elements that influence students' prospects of success in higher education, on the other hand, are equally essential and should be investigated. Time management is one such non-academic talent. (Misra *et al*.,2000). However, many students find it hard to regulate both their studies and their external lives leading to time mismanagement, poor sleep patterns, and increased levels of stress (Hardy,2003).

The review of literature reflected a dearth of researches on Time Management skills used by undergraduate students. Hence, the need for present study was strongly felt. It has been observed that during covid-19 pandemic situation students attended online classes from home and their time management pattern got changed. Therefore, the present study was under taken to know the Time Management skills used by undergraduate students of The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat. The findings of this study would be helpful to all the undergraduate students to manage their time while attending classes online from home along with managing other household task. This study would also be helpful for other students to know different time management skills to perform their daily work effectively.

OBJECTIVES

1. To assess the time management skills used by undergraduate students.
2. To assess the effect of time management on study pattern of undergraduate students.

DELIMITATION OF THE STUDY

1. The present study was limited to a total of 365 undergraduate students of Faculty of Family and Community Sciences, The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat.

METHODOLOGY

Descriptive research studies are designed to obtain information concerning the current status of phenomena. This is directed toward determining the nature of a situation as it exists at the time of the study (Ary et al.,1979). Therefore, for the present study, descriptive research design was adopted.

The data was collected by utilizing purposive sampling technique and a questionnaire was developed in the form of Google form and adopted to gather the data from 365 undergraduate students from The Maharaja Sayajirao University of Baroda, Vadodara, Gujarat. The questionnaire for the study consisted of two sections;

- **Section-I**: It included demographic data of the respondents including their study pattern.
- **Section-II:** It included different time management strategies used by the undergraduate students, which was measured on a two-point continuum i.e., yes or no. This scale was used to assess the use of different time management skills used by the undergraduate

students during their online classes. The developed scale was pre-tested on a few respondents who had similar characteristics as of those of final respondents of the study. No changes were made for the final scale.

FINDINGS AND DISCUSSION

The findings are presented in form of frequency and percentage distribution followed with interpretation and discussion. In order to make systematic presentation, the findings are presented in two sections;

Section- I: Demographic data of the respondents.

Section- II: Frequency and Percentage distribution of the respondents according to the Time Management Strategies used during online classes.

Section- I: Demographic data of the respondents:

This section deals with the demographic information of the respondents, like personal and situational variables of the respondents.

Table-1: Age and Gender of the respondents

	Respondents=365	
Category	**Frequency**	**Percentage**
Age		
13-22	328	89.86
23-32	37	10.14
Gender		
Male	235	64.38
Female	130	35.62

It was found that, more than three-fourth (89.86%) of the respondents belonged to the age group of 13 to 22years and less than one-fourth (10.14%) of the total respondents belongs to the age group of 23 to 32years. About Two-third (64.38%) of respondents were male and only one-third (35.62%) of the respondents were female (Table-1).

Table-2: Study pattern of the respondents

		Respondents=365
Category	**Frequency**	**Percentage**
Obtained scores in last semester (GPA)		
< 6.0	37	10.14
6.0 to 8.0	234	64.11
>8.0	94	25.75
Spent hours for study		
< 2 hours	133	36.44
2 to 4 hours	192	52.60
>4 hour	40	10.96
Time spent for online classes		
< 2 hours	69	18.90
2 to 4 hours	164	44.93
>4 hour	132	36.17

The collected data showed that, less than one-fourth (10.14%) of the respondents got grade point average (GPA) of less than 6.00, More than half (64.11%) of the respondents got GPA between 6.00 to 8.00 and one-fourth (25.75%) of the respondents got more than 8.00 GPA in the last semester. Amongst the respondents more than one-third (36.44%) had spent less than two-hours, slightly more than half (52.60%) of the respondents had spent time between two to four hours for study and less than one-fourth (10.96%) of the respondents had spent more than four hours a day for their study. It was found that, less than one-fourth (18.90%) of the respondents has spent less than two-hours, less than half (44.93%) of the respondents has spent time between two to four hours a day and more than one-fourth (36.17%) of the respondents has spent more than four hours a day for their online college classes (Table-2).

Table-3: Extra classes in a day

			Respondents=365
Sr. no.	**Extra classes in a day**	**Frequency**	**Percentage**
1	Has extra class	113	30.96
2	No extra class	252	69.04
	Total	**N=365**	**100**

It was found that, one-third (30.96%) of respondents had extra classes but two-third (69.04%) of the respondents has no any extra classes apart from their regular online classes in a day, as they didn't get enough time for their extra classes in a day (Table-3).

- **Distribution of the respondents according to their challenge in terms of having time for hobbies or other work:**

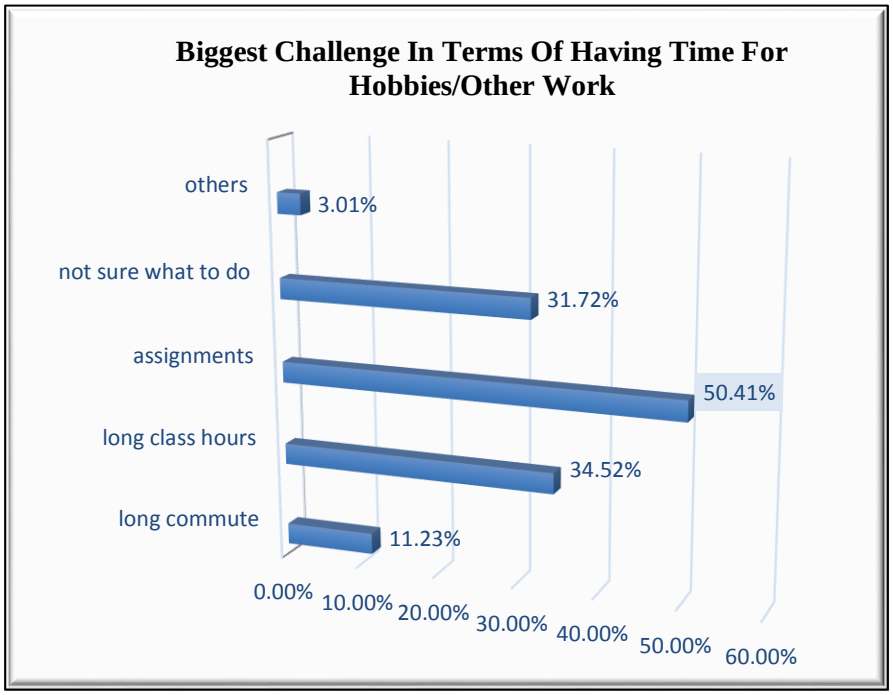

Fig-1: Biggest challenge in terms of having time for hobbies or other work

It was found that, Half of the respondents (50.41 %) said that assignments were their largest obstacle, while more than one third (34.52 %) said that extended class hours were their worst challenge. Again, more than a quarter of the respondents (31.72 %) were unsure what to do, and less than a quarter (11.23 %) saw long conversation with friends and relatives as their main issue, claiming they were not getting time for their hobbies and other tasks in a day (Fig-1).

- **Distribution of the respondents according to their preference to spend time with family/friends/activities:**

For the data it was found that, more than half (59.45%) of the respondents have wish to spent time with family, a little less than half (46.58%) of the respondents preferred to spent time with friends and more than one-fourth (33.70%) of the respondents prefer to spent their time on travelling in a day, if given an opportunity. But only a few (13.70%) of the respondents had wish to spend time on their online classes in a day (Fig-2).

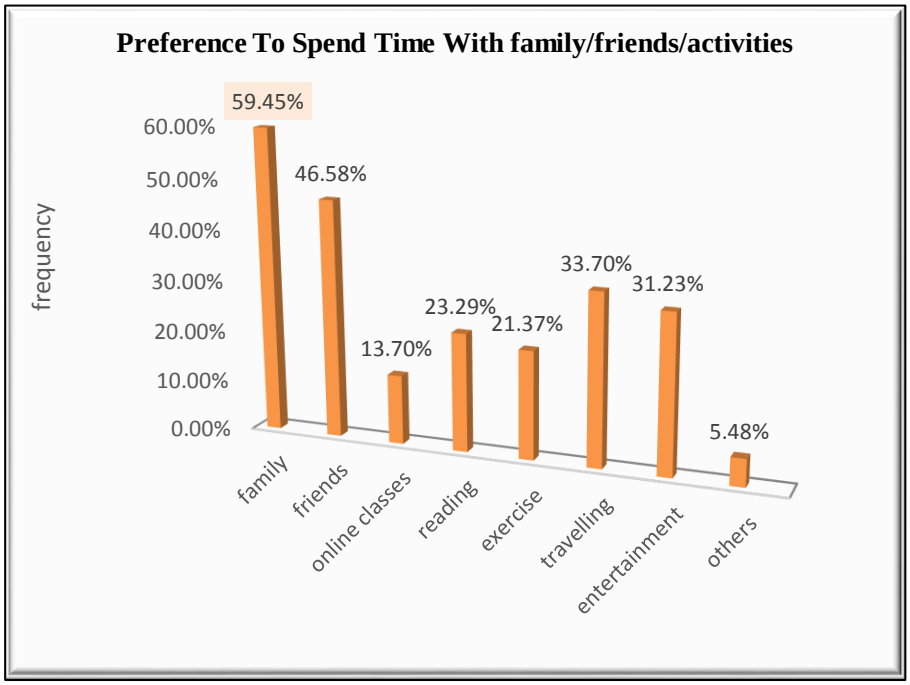

Fig-2: Preference of the respondents to spent time with family/friends/activities

Section- II: Time Management Strategies used during Online classes:

During the online classes, students used different strategies to manage their limited daily time effectively so that they can achieve their daily need on time without much difficulties. Various such strategies are listed here-

Table-4: Goal-setting strategies used by students during online classes

Respondents=365

Sr. No.	Statements	Yes		No		Wt. Mean Score (2-1)
		f	%	f	%	
1	Distribution of time on course materials helps get the highest academic levels	295	80.83	70	19.17	1.81
2	set up reminders for assignments, tests and quizzes on own's smartphone	226	61.92	139	38.08	**1.62**
3	Schedule of made for study time helped to manage time outside of the class too	271	74.25	94	25.75	1.74
4	Evaluate oneself after every completion of task	294	80.55	71	19.45	1.80
5	try to perform own's duties without delay	339	92.88	26	7.12	**1.93**
					TOTAL	**1.78**

According to Table-4, the majority of respondents (92.88%) focused on completing their tasks without delay with the weighted mean score 1.93, while more than half of the respondents (61.92%) admitted that they don't always set reminders for their work and assignments (weighted mean score 1.62).

Table-5: Prioritization strategies used by students during online classes

Respondents=365

Sr. No.	Statements	Yes		No		Wt. Mean Score (2-1)
		f	%	f	%	
1	I prioritize my list in order of importance, not urgency	249	68.22	116	31.78	**1.68**
2	I try to do the most important tasks during my most energetic periods of the day	300	82.20	65	17.80	**1.82**
3	I discontinued any activities which I saw wasteful or unprofitable	270	73.98	95	26.02	1.74
4	I take minimum intervals between two consecutive classes to fresh my mind	280	76.72	85	23.28	1.77
5	I keep myself up-to-date on my reading	265	72.61	100	27.39	1.73
					TOTAL	**1.75**

According to Table-5, the majority of respondents (82.20%) try to prioritize their work and complete the most important activities during the most energetic part of the day to be more productive and creative (weighted mean score of 1.82). Whereas, with a weighted mean score of 1.68, 68.22% of respondents said that they prioritized their work list for the day in order of priority rather than urgency of job.

Table-6: Organization strategies used by students during online classes

Respondents=365

Sr. No.	Statements	Yes		No		Wt. Mean Score (2-1)
		f	%	f	%	
1	I organize work according to my ability Hierarchy	303	83.02	62	16.98	1.83
2	I try to organize the study hours of the day to achieve academic goals	298	81.65	67	18.35	1.82
3	I plan my time in accordance with duties/activities to be performed in a day by making to-do list	258	70.69	107	29.31	1.71
4	I plan time to relax and be with friends and family in my weekly schedule	307	84.11	58	15.89	1.84
5	I try to offer more time to study at the expense of my leisure time	232	63.56	133	36.44	1.64
6	I transfer online notes to my own notebook	249	68.22	116	31.78	1.68
7	I try to record dates of assignments and other important course event information	314	86.03	51	13.97	**1.86**
8	I try to reserve a specific time for study and class	229	61.92	136	38.02	1.63

	preparation before class starts					
9	I use electronic flash cards/alarm to help me in study	174	47.68	191	52.32	**1.48**
					TOTAL	**1.72**

According to Table-6, the majority of respondents (86.03%) try to organize their work by storing dates of assignments and other important course event information, 84.11% of the respondents try to plan time in advance to relax and be with friends and family, and 83.02% of the respondents organize work according to their ability Hierarchy. Whereas, less than half of the respondents (47.68 %) have only utilized task planner like electronic flash cards on mobile phones or alarm to arrange their study-related work.

Table-7: Stress management strategies used by students during online classes

Respondents=365

Sr. No.	**Statements**	**Yes**		**No**		**Wt. Mean Score (2-1)**
		f	**%**	**f**	**%**	
1	I try to clear my doubt as soon as the class is over	255	69.87	110	30.13	1.70
2	Reduction of assignment help eases the availability of adequate time to review the course material	316	86.58	49	13.42	**1.87**
3	I try to identify my strengths and weaknesses of the course material	295	80.83	70	19.17	1.81
4	I try to devote the Class time to gather maximum knowledge about the topic	312	85.48	53	14.52	1.85
5	I try to customize a sufficient time during the weekend to study	212	58.09	153	41.91	**1.58**
6	I check my internet connection and other technical issue before the class started, so that no any difficulties arise at the last minute	293	80.28	72	19.72	1.80
					TOTAL	**1.77**

According to Table-7, majority of respondents (86.58%) believe that reducing assignment will make it easier to find enough time to review course information, and 85.48% of the respondents try to spend class time to learning as much as possible about the issue so as to clear about the topic at the earliest possible. However, slightly more than half of the respondents (58.09%) only try to schedule extra study time during the weekend to alleviate task stress during the week.

Table-8: Distribution of time management skills used by the respondents according to the obtained weighted mean scores

	Time management strategies	*Weighted mean score*
1	Goal-setting strategies	**1.78**
2	Prioritization strategies	1.75
3	Work organization strategies	1.72
4	Stress management strategies	1.77

From the gathered data, it was seen that, the majority of respondents have been using goal setting strategies with a weighted mean score of 1.78, followed by stress management strategies with a weighted mean score of 1.77, prioritization strategies with a weighted mean score of 1.75, and the work organization strategies with a weighted mean score of 1.72.(Table-8).

CONCLUSION

One of the most valuable skills one can have as an online student is effective time management. Time management is important for online students, who are often working full-time, taking care of family, or juggling other commitments. To be more productive, student must plan their work ahead, avoid multitasking, must block out the distractions, try to create balance between coursework and other obligations (Miller,2020).

The present study showed that, throughout the covid-19 epidemic, the majority of respondents applied various time management strategies to ensure that their work was planned, better, and more effective during their online classes. To be more productive and creative, the majority of respondents focussed on completing their tasks as soon as possible and strived to prioritise their work and accomplish the most important activities during the most energetic period of the day. The respondents try to plan their work by writing down due dates for assignments and other essential course events, and they also believe that reducing the assignments will make it simpler for them to find time to examine course material.

Even though the majority of the respondents followed different time management strategies in their daily life during online classes, it was seen that the respondent's academic score obtained in the last semester was moderate, i.e. between 6.8 and 8.0 on a 10-point scale. Apart from that, it was also seen that, majority of the respondents don't get extra hours to spent on extra classes in addition to their regular online classes. It may be because of lack of time management skills of the respondents or to have too much unmanageable work load on them. Again, it was found that, in a day of 24 hours, the respondents felt that they devoted maximum time on their college assignments which is time consuming, and also on their long online class hours, which the respondents felt as their biggest challenges in terms of having free time for their hobbies and other works in a day.

SUGGESTIONS FOR FUTURE RESEARCH

1. A similar study can be carried out on impact of time management on the students' academic accomplishments.
2. A descriptive study can be carried out on importance of time management for students of various age group.
3. An analogous study can be conducted on time management pattern of homemakers and working men and women.

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IMPACT OF NUTRITION KNOWLEDGE ON EATING BEHAVIOR AMONG COLLEGE GOING GIRLS (18-23 YEARS)

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ABSTRACT

Maintaining healthy eating behavior in college is demanding due to various factors depending on their knowledge, peer pressure, living away from home, financial conditions and many more. Hence, its paramount to analyze the eating behavior of youngsters. The aim of this present cross-sectional comparative study was to analyze the eating behavior of college going girls (18-23 years) in Delhi. Information regarding nutrition knowledge, and eating behaviour using a Three-Factor Eating Questionnaire (TFEQ) were gathered. 200 college going girls (100 each from nutrition and non-nutrition studying group) participated in the study. Study ramified that nutrition studying students exhibits more nutrition knowledge which was positively associated with increase in restraint eating (propensity to restrict the food intake in order to control body weight) and negatively associated with disinhibition eating behaviour (overconsumption of food in response to various stimuli) in non-nutrition studying students. On the other hand, restraint eating was significantly and inversely correlated to TBF% and BMI ($p=0.03$) and disinhibition tends to positively associated with TBF% and BMI, especially habitual disinhibition ($p=0.001$). Inter-correlation among TFEQ factors revealed rigid restraint and susceptibility to hunger both have significant and positive correlation with dis-inhibition ($p<0.05$). The present study showed that girls studying nutrition had better eating behavior practices than non-nutrition group. Hence, basic nutrition knowledge among non-nutrition students can improve their eating behavior which will help them to follow only flexible restraint eating instead of rigid eating practices. The study gives a key message that Nutrition knowledge can improve eating behaviour of both nutrition and non-nutrition studying students.

Key Words: Nutrition knowledge, three factor eating questionnaire, eating behaviour

INTRODUCTION

"Eating behaviour is a complex interplay of physiological, psychological, social and genetic factors that influence meal timing, the quantity of food intake, and food preferences and food selection" (Grimm &Steinle 2011). Food choices of today's youth have been changed from nutrition dense to calorie dense which predisposes them to overweight and obesity that can trigger onset of many non-communicable diseases (Baker &Friel 2014; Bhongir, Nemani& Reddy 2011; Pengpid&Peltzer 2014).

Healthy eating remains arduous among adolescents or youth, be it reducing fast food intake or consumption of fruits and vegetables (Bakshi & Singh ,2012). Eating behaviour of a college student can be very different from a school student whose food choices are dependent on the choices of their parents.

However, college students have their own preferences for taste and their eating behaviour usually changes due to various factors like peer influences, stress, lifestyle disorders, staying away from home, accessibility to fast food outlets, lack of knowledge about healthy eating and many more (Gandhi, Varia, Dhabhi & Choudhary 2015; Gan, Nasir, Zalilah & Hazizi, 2011; Kumar, Palaha & Kaur 2013; Schlundt, Hargreaves & Buchowski 2003;Yau& Potenza 2013).

Due to globalization Indians have been exposed to lifestyle changes causing various nutrition alterations like deficiencies or excesses (Mallick, Ray & Mukhopadhyay 2014). According to a study, overweight/obesity (26.8%/10.7%) and central obesity (16.4%) is highly prevalent among Indian college students (Pengpid & Peltzer, 2014). One of the reasons of obesity among age group 18-23 years is obesity-supporting eating behaviour that includes high salt intake by 78.5% and high consumption of junk food for more than thrice a week by 65.9% of the youth which could increase the risk of hypertension by 1.6% (Ismail, Venugopalan, Sarada & Binub 2016). High fat and low fibre dietary intake have been proposed as viable etiological factors in certain cancers such as breast, colon, prostate and other cancers besides heart disease, obesity and non-insulin dependent diabetes (Hargreaves & Buchowski 2003).

Previous studies revealed high prevalence of disordered eating behavior among students studying nutrition (Gonidakis, Sigala, Varsou& Papadimitriou 2009). In contrast, many clinical researches observed better eating behavior among students studying nutrition as a subject (Mealha, Ferreira, Guerra & Ravasco 2013). Also, higher levels of flexible control (more flexible control on eating from restraining) and rigid control (Rigidly controlling diet) on eating was observed among nutrition studying students (Poinhos et al. 2015). Habitual disinhibition (overeating in daily life circumstances) has been strongly correlated with weight gain (Hainer et al. 2006; Hays & Roberts 2008; Lesdema et al. 2012).

Need of the study: There are very few Indian studies indicating the difference of eating behavior between students studying nutrition and non-nutrition subjects. Therefore, the objectives of the current study were designed as following:

OBJECTIVES

1. To assess the nutrition knowledge of college girls studying nutrition and non-nutrition

subjects.

2. To assess the eating behaviour using Three-Factor eating questionnaire in girls studying in nutrition and non-nutrition colleges.

3. To determine the nutrition status of girls studying in nutrition and non-nutrition colleges.

MATERIALS AND METHODS

The present research was aimed at assessing the eating behavior, basic nutrition knowledge and nutrition status among college girls (18-23 years) studying nutrition subjects (from colleges offering subjects in nutrition) with those studying non-nutrition subjects (from colleges who do not offer nutrition subjects in any of their courses).

Research Design

In the present cross-sectional study, after taking informed consent, 200 college girls, aged between 18-23 years, were randomly selected (100 from nutrition streams and 100 from non-nutrition streams) from colleges, Delhi, India. The colleges were selected purposively after taking permissions from the head of department. Ethical Clearance was obtained from Institutional Ethical Committee. Students following diet charts under any expert, having any diseased condition were excluded from the study. Sample size was calculated using formula pq $(Z/E)^2$ where, p was prevalence rate of nutrition knowledge based on previous studies which was 56.71% (Barzegari A, Ebrahimi M, Azizi M &Ranjbar 2011).

Data Collection: Duration of data collection was from October 2017 to January 2018. Information regarding General profile, anthropometric measures, Body Mass Index (BMI), Total Body Fat % (TBF%), eating behavior and nutrition knowledge was collected from the study participants.

Ethical Consideration: The permission to conduct the study was obtained from ethical committee of Lady Irwin College.

General information: Information regarding the age, family composition, dietary habits, diseased conditions, income group and contact with dietitians or nutritionists from the participants was gathered.

Anthropometric and total body fat percent (TBF%) measurements: Participants were assessed for their height using microtoise and weight and TBF% was assessed by using Tanita (UM-050) (Tanita 2006). Body Mass Index (BMI) was calculated and compared against WHO (2004) cut offs (WHO 2004). TBF% was compared against standardized cut offs according to a study (Gallagher et al 2000).

Nutrition knowledge: A questionnaire was developed to assess the nutrition knowledge of the participants which comprised of basic nutrition questions. The questionnaire content was validated by an expert panel of five members. The questionnaire was administered to both the groups and 1 mark was given to every correct answer and 0 mark was given for every wrong answer.

Eating Behaviour: The eating behavior of the participants was analyzed using Three Factor Eating Questionnaire (TFEQ) (Figure 1.1). This is a validated tool and has been used by previous studies to analyze the eating behavior especially among school and college going students. (Hainer et al. 2006; Hays & Roberts 2008; Lesdema et al. 2012). It has also been validated in various ethnicities (Chearskul, Pummoung, Vongsaiyat, Janyachailert & Phattharayuttawat ,2010; Chong et al. 2016; Loffler et al. 2015). It was adapted according to Indian setting and was scored according to standardized questionnaire. TFEQ is a 51-item standardized questionnaire used to assess the in-depth eating behavior covering three main categories i.e cognitive restraint of eating, dis-inhibition and susceptibility of hunger (Stunkard &Messick 1985). These three categories are divided into further subcategories as described below.

Cognitive Restraint eating (TFEQ-R) is the propensity to restrict the food intake in order to control the weight gain. Two subcategories include *Flexible control (TFEQ-R_1)* and *Rigid control (TFEQ-R_2)* which refers to a more flexible control on diet from restraining whenever necessary and "All or

nothing approach to eating, dieting, and weight control" respectively (Kruger R, De Bray JG, Beck KL, Conlon CA &Stonehouse 2016; Lesdema et al. 2012).

Disinhibition (TFEQ-D) refers to overconsumption of food in response to various stimuli like emotions, alcohol intake etc. This factor emerges from the disruption of restrained eating behaviour and is divided into three subcategories. *Habitual Disinhibition (TFEQ-D_1)***;** which refers to constant and recurrent overeating of food items in daily life circumstances. *Emotional Disinhibition (TFEQ-D_2)***;** refers to overconsumption during stress or anxious conditions. *Situational Disinhibition (TFEQ-D_3)***;** refers to disinhibition during specific conditions like social gatherings/parties (Denman 2015; Hainer et al. 2006; Hays & Roberts 2008; Kruger R, De Bray JG, Beck KL, Conlon CA &Stonehouse 2016; Lesdema et al. 2012;).

Susceptibility to hunger (TFEQ-H) refers to food intake in response to feelings and perceptions of hunger which is further divided into two categories. *The internal locus of hunger (TFEQ-H_1)* explains the behaviour of the respondent when overeating due to internal cues. *The external locus for hunger (TFEQ-H_2)*is the hunger when triggered by external cues as seeing favorite dish or eating with someone who overeats.

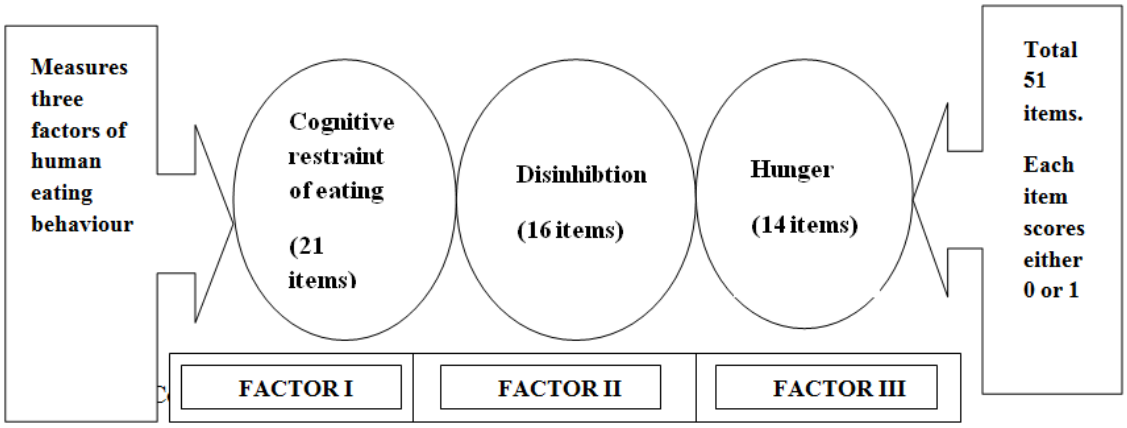

Figure 1.1: Composition of Three-Factor Eating Questionnaire

Statistical Analysis

Spreadsheets were created after data collection which was coded on Microsoft excel and was analyzed SPSS version 23.0.0.0. T-Independent was used to compare the eating behavior and BMI and TBF% among nutrition and non-nutrition streams. Relationship of eating behaviour dimensions with TBF% and BMI was done by Pearson's correlation coefficient.

RESULTS

The present study was conducted to analyse the eating behaviour of 200 students, (100 studying nutrition streams and 100 studying non-nutrition streams) from two colleges of University of Delhi.

General Profile: Average age of nutrition and non-nutrition students was 21 ± 1.29 years and 19 ± 1.39 years respectively. Most of the students (96%) from both the categories belonged to middle income group.

Anthropometric assessments: Majority of nutrition students (74%) were having normal BMI (18.5-24.9 Kg/m^2) as compared to non-nutrition students (53%). Similarly, 62% nutrition students and 55% non-nutrition students had normal TBF%.

Nutrition Knowledge: Students studying nutrition had significantly higher knowledge related to nutrition than students from non-nutrition streams ($p<0.05$).

EATING BEHAVIOUR AND ITS RELATIONSHIP WITH VARIOUS FACTORS

Eating Behaviour Pattern

Table 1 shows non-nutrition students exhibited more disinhibition scores which indicated overconsumption of food in response to various stimuli. However, a significant difference was exhibited only in situational disinhibition ($p=0.001$) between both the groups which refers to overconsumption of food during parties among non- nutrition stream students. Also, significant difference was recorded in restraint eating (propensity to restrict food intake), flexible and rigid restraint eating being high in nutrition students. Further, susceptibility to hunger (food intake according to perception of hunger) ($p=0.0006$) and both of its categories ($p<0.05$) was found to be significantly higher in non-nutrition students.

Table 1. Eating behaviour of nutrition and non-nutrition students

Eating behaviour	Non-nutrition Mean ± SD	Nutrition Mean ± SD	t (p value)
Disinhibition	6.06 ± 2.63	5.70 ± 2.89	0.92 (0.08)
Habitual Disinhibition	3.06 ± 2.11	2.50 ± 1.93	1.95 (1.25)
Emotional Disinhibition	1.50 ± 1.96	2.08 ± 2.23	1.95 (0.09)
Situational Disinhibition	4.46 ± 2.57	3.64 ± 2.24	**2.40 (0.001) ***
Restraint	6.99 ± 4.57	9.98 ± 4.55	**4.64 (0.0003) ***
Flexible Restraint	2.72 ± 1.96	3.52 ± 1.65	**3.12 (0.000001) ***
Rigid Restrain	1.83 ± 1.56	3.08 ± 1.65	**5.50 (0.003)***
Susceptibility to Hunger	6.81 ± 2.41	4.96 ± 2.37	**5.47 (0.0006)***
Internal Locus for Hunger	7.24 ± 4.49	4.89 ± 4.34	**3.76 (0.006) ***
External Locus for Hunger	8.71 ± 4.35	6.18 ± 3.99	**4.28 (0.002) ***

*Significant at p<0.05

Relationship of TFEQ with BMI

Pearson's correlation coefficient revealed that nutrition studying subjects had a negative correlation of situational disinhibition and flexible restraint eating with underweight [r= -0.97 (p= 0.001) and r= -0.99 (p= 0.03)]. In non-nutrition group, only habitual disinhibition was significantly and positively correlated to overweight at r= 0.40 (p= 0.001) (Table 2).

Table 2. Relationship of TFEQ with BMI categories of nutrition and non-nutrition

Eating Behaviour	BMI (Kg/m²) (WHO 2004)					
	Underweight		Normal		Overweight	
	Non-nutrition	Nutrition	Non-nutrition	Nutrition	Non-nutrition	Nutrition
	(n=20)	(n=4)	(n=53)	(n=74)	(n=23)	(n=21)
TFEQ-D1	0.14 (p= 0.54)	0.71 (p= 0.29)	0.40 (p= 0.35)	0.04 (p= 0.35)	**0.40 (p=0.001)***	-0.27 (p= 0.24)
TFEQ-D3	0.43 (p= 0.06)	**-0.97 (p=0.01)***	0.03 (p= 0.85)	0.12 (p= 0.69)	-0.01 (p= 0.96)	-0.03 (p= 0.90)

*Significant at p<0.05

Relationship of TFEQ with TBF%

Disinhibition and its two dimensions i.e. habitual and emotional disinhibition were significantly and positively correlated to normal weight in nutrition studying students and with overweight (p<0.05) in students not studying nutrition. On the other hand, situational disinhibition (r= -0.43, p= 0.00004), restrained eating (r= -0.28, p=0.03) and flexible restraint eating (r= -0.50, p= 0.001) was significantly and inversely correlated to TBF% for nutrition students. Also, internal locus of hunger (r= -0.28, p= 0.03) was significantly and inversely correlated to TBF% for normal weight nutrition students. All other factors of eating behaviour were not associated with TBF% for both nutrition and non-nutrition students (Table 3).

Table 3. Relationship between TFEQ and TBF% of nutrition and non-nutrition

TBF %	25-34.9		35-39.9	
Eating Behaviour	**Non-nutrition (n=55)**	**Nutrition (n=62)**	**Non-nutrition (n=19)**	**Nutrition (n=26)**
Disinhibition	-0.03 (p= 0.85)	**0.27 (P= 0.03)***	**0.50 (P= 0.03)***	0.10(p=0.62)
a) HabitualDisinhibition	-0.03 (p= 0.81)	**0.31 (P= 0.01)***	**0.57 (p=0.01)***	-0.15 (p= 0.47)
b) Emotional Disinhibition	0.16 (p= 0.26)	**0.39 (P= 0.0001)***	**0.47 (P= 0.04)***	-0.50 (p= 0.47)
c) Situational Disinhibition	-0.16 (p= 0.25)	**-0.43 (P= 0.00004)***	-0.25 (p= 0.30)	0.16 (p= 0.43)
Restraint	0.17 (p= 0.22)	**-0.28 (P= 0.03)***	**0.50 (p= 0.03)***	-0.29 (p= 0.15)
a) Flexible Restraint	0.25 (p= 0.07)	**-0.50 (P= 0.001)***	0.47 (p= 0.04)	**-0.33 (p= 0.10)***
b) Rigid Restrain	0.08 (p= 0.58)	**0.39 (p= 0.002)***	**0.47 (p= 0.04)***	-0.21 (p= 0.30)
Susceptibility to Hunger	0.15 (p= 0.29)	**-0.28 (P= 0.03)***	-0.19 (p= 0.44)	0.14 (p= 0.49)
Internal Locus for Hunger	0.17 (p= 0.23)	**-0.28 (P= 0.03)***	-0.19 (p= 0.44)	0.14 (p= 0.49)

*Significant at $p<0.05$

DISCUSSION

The aim of the study was to investigate the eating behavior among nutrition and non-nutrition studying students. Nutritional status among both the groups showed no significant difference. However, the average percent of students who fall under normal categories of BMI and TBF% in nutrition group came out to be maximum as compared to non-nutrition subjects. It has also been observed that some students who had normal BMI levels were having high TBF%. This disparity in BMI and TBF% was also observed in other studies (Deurenberg-Yap M, Schmidt G,Van Staveren WA, Deurenberg 2000; Romero-Corral 2008). Also, Asians have lower BMI but higher levels of TBF% than Caucasians (Romero-Corral 2008).

It is said that knowledge is never wasted which proved to be true to some extent in this study as well. Nutrition students tend to have more restraint eating behavior (restricting food intake in order to lose weight or to maintain weight). Similar results were also documented by previous studies where nutrition students exhibited higher restraint levels than other streams (Poinhos et al. 2015; Wang et al. 1994). On the other hand, non-nutrition students exhibited more disinhibition scores (overeating due to various stimuli) and more susceptibility to hunger scores which implies any external or internal stimuli can make them overeat which can lead to increased BMI and TBF% levels. Another study also suggested that students who had nutrition knowledge tend to select more nutrient rich diet (Korinth, Schiess & Westenhoefer 2010). Adequate nutrition knowledge can decrease disinhibition eating behavior in non-nutrition studying students and increase flexible restraint eating behavior in nutrition studying students which suggested that nutrition knowledge can have a positive impact on eating behaviour of nutrition students as well as non-nutrition studying students.

Studies have shown the adverse impact of improper eating bahviour on TBF% (Kruger R, De Bray JG, Beck KL, Conlon CA & Stonehouse 2016; Lesdema et al. 2012). Present study suggests that disinhibition can lead to gain in weight more specifically habitual disinhibition. Also previous data showed that disinhibition and its two dimensions viz. habitual and emotional disinhibition can lead to increase in percent body fat in both normal and overweight individuals. However, habitual disinhibition can be even worse when compared to emotional and situational disinhibition.

On the other hand, restraint eating behavior especially flexible restraint eating behavior has been shown to decrease TBF% which implies modulating food intake according to need, rather than strictly prohibiting it. Furthermore, rigid restraint can actually lead to higher disinhibition and higher food consumption. This can be related to a fact that rigidly restraining oneself from eating or skipping meals tends to increase hunger sensations in the preceding meals (Berti, Riso, Brusamolino&Porrini 2015; Hong, Shepanski&Gaylis 2016; Leidy 2013).

CONCLUSION AND FUTURE IMPLICATIONS

According to the present study, students without nutrition knowledge exhibit significantly higher disinhibition and susceptibility to hunger levels and students with nutrition knowledge revealed higher restraint eating behaviour which includes both rigid and flexible restraint eating. Hence, the present study calls for more detailed longitudinal study among college girls in future to assess various conducive and deterrent factors affecting eating behaviour among college going girls.

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UPSHOT OF HUMAN BODY MENSURATION ON MAMMOGRAPHIC DENSITY OF THE SUBJECTS

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ABSTRACT

Breast cancer is the utmost recurrent cancer among women. Mammographic density is nowadays considered to be one of the major independent predictor of breast cancer. Women with dense breast tissue not only have the risk of getting breast cancer but also there are high chances among them where the cancer is concealed by the dense breast tissue. The study was taken to find out the anthropometric risk factors for breast cancer among women in their reproductive age groups in connection with the mammographic density. Newly diagnosed subjects with breast cancer and subjects without breast cancer were selected for the study. Mammographic densities of subjects were taken from Hospital Information System through picture archiving and communication system. Human body mensuration like anthropometric measurements and indices of the subjects were taken using universally acceptable techniques and formulae. Waist circumference exhibited a statistically significant difference between the means for subjects with different mammographic densities among the subjects with breast cancer. A significant influence between waist-hip ratio and the mammographic density among the subjects without breast cancer was observed. No other anthropometric measures exhibited any significant difference between the means of waist circumference for subjects with different mammographic densities in both the groups the study concluded that waist circumference and waist hip ratio could influence mammographic density.

Key words: cancer, predictor, mammographic density, anthropometry, waist/hip ratio

INTRODUCTION

Breast cancer is the utmost recurrent cancer among women, annually affecting 2.1 million women, and also causes the highest frequency of cancer-related deaths among women. In 2018, it is assessed that 627,000 women passed away from breast cancer – that is nearly 15% of whole cancer deaths among women. While breast cancer frequency is high among women in more urbanized regions, frequency is growing in approximately every region worldwide (World Health Organization, 2008). About 70% of the world's cancer cases is predicted to be in developing countries, with India in the fifth position. Breast cancer is the top cancer in women both in the developed and the developing world (World Health Organization, 2008). The prevalence of breast cancer is growing in the developing world as life expectancy increased, urbanization increased and increasing adoption of western standard of living (THE TIMES OF INDIA, 9th July, 2018).

Mammographic density is nowadays considered to be one of the major independent predictor of breast cancer and contributory factor in decreasing the mammographic sensitivity. If mammographic density is included as a criterion in screening programme for choosing women who want extra examination, it would be more effective rather than it could increase the detection rates for cancer (Kavanagh *et al.,* 2008). The Figure 1 shows an increase in breast density from left to right.

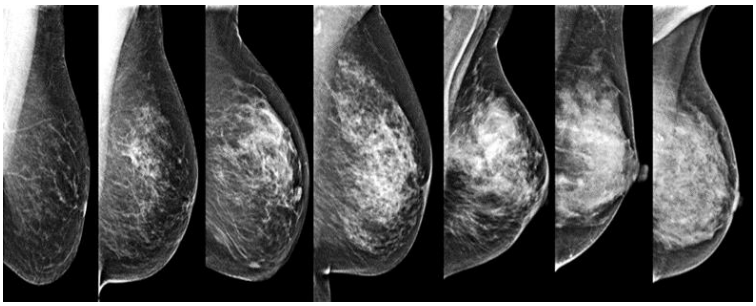

Fig. 1: Increase in breast density from left to right

Lower body mass index and younger age were allied with increased percent density in both postmenopausal and premenopausal women. Among postmenopausal low waist/hip ratio (WHR) and high level of alcohol consumption were linked with high percent density. Factors like smoking and education were inversely related with percent density among premenopausal women but not in postmenopausal women (Vachon *et al.,* 2000). A study (Titus-Ernstoff *et al.,* 2006) inspected aspects in relation to breast density in 144,018 New Hampshire women with at least one mammogram documented in a state-wide mammography registry. First analyses displayed a strong inverse association of body mass index (BMI) and age on breast density.

Need of the study: However, data related with the relation of mammographic density and the human body mensuration in the premenopausal state was limited. The present study was taken to find out the anthropometric risk factors for breast cancer in the reproductive age groups in connection with the mammographic density. The present study had following objectives.

OBJECTIVES

1. To find out anthropometric measurements based on the mammographic density of the subjects.
2. To analyse the effect of anthropometric indices on mammographic density of subjects

METHODOLOGY

Selection of area and sampling

The study was conducted in Kerala, one of the Southern states of India, in association with Amala Institute of Medical Sciences (AIMS), Thrissur, Kerala, India, on newly diagnosed females with breast cancer of any stage and those who were willing to provide informed consented to be sample. The study subjects were selected by using purposive sampling technique. Seventy-five newly diagnosed premenopausal subjects with breast cancer were selected for the study. In order to select the control subjects for the study, health and breast cancer screening camps were conducted in different locations of Kerala and about thirty premenopausal subjects were selected as control. Data collection chart approved by the Institutional Review Board (IRB) of Amala Institute of

Medical Sciences, Thrissur, Kerala, India was used to collect the data related to mammographic density through picture archiving and communication system (PACS).

Research design: The design of the study was prospective case control design.

Selection of tool: Anthropometry is the most often used method to assess the nutritional status of individuals or population groups. Measurements of nutritional anthropometry are mainly centred on growth in children and body weight changes in adults (FAO, 2007). In the present study following measurements were taken.

Weight of the subjects was taken by using a platform balance whereas height was assessed to the nearest 0.1 cm by means of a stadiometre**.** For final measurement the mean of three successive measurements were taken (Bamji, 2009).

Waist circumference was measured at a level midway between the lowest rib and the crista iliac superior (National Heart, Lung and Blood Institute, 2000., National Health and Nutrition Examination Survey 111, 1988., World Health Organisation, 2008). The measurement was taken at the end of a normal expiration while the subject stood erect with feet together and arms hanging down freely at the sides. It was suggested (Ross *et al.,* 2008) that the waist circumference should be at the point of the minimal waist.

Hip circumference was measured at the maximum point below the waist, without compressing the skin (World Health Organisation, 2008). Waist to Hip ratio indicates the abdominal fat deposits (Seidell., 2010). Central adiposity indicated by waist hip ratio are linked with hormonal and metabolic changes and may be a better predictor of breast cancer risk than overall adiposity (Huang *et al.*,1999).

Mid Upper Arm Circumference (MUAC) is considered more feasible to identify poor musculature and wasting features as it is simpler and easily accessible in any age and gender. With the arm hanging straight down, wrap a MUAC tape around the arm at the midpoint mark without exerting too much pressure on the soft tissues of the arm. Measure to the nearest 1 mm (Bamji *et al*., 2009). According to Tsai *et al*., (2010) MUAC is a useful indicator of malnutrition that can be used in ill patients (normal MUAC >23 cm in males, >22 cm in females).

Statistical analysis

Descriptive statistics for the continuous variables were reported as mean ± standard deviation and categorical variables were summarized as frequencies and percentages. The continuous variables were compared by Student's independent t-test or one-way ANOVA as applicable.

Ethical considerations

The Institutional Review Board and Ethical committee of Amala Institute of Medical Sciences, Thrissur approved the study. As per Helsinki Declaration at most precaution was taken to protect the privacy of research subjects and the confidentiality of their personal information.

RESULTS AND DISCUSSION

Categorization of mammographic density

Mammographic density has been publicized to be a strong independent prognosticator of breast cancer and a contributory factor in decreasing the sensitivity of mammography. It is observed that women with a high breast density related to women with a low breast density have 4-6 times higher risk of increasing the disease (Vachon *et al.*, 2007). Younger or premenopausal

women are generally known to have a greater quantity of dense breast tissue, as breast density drops with age (Kolb *et al.*, 2002).

Figure 2 reveals that majority of the sample belonged to Type III mammographic density. Among the subjects with Breast cancer, 26.67% had Type I mammographic density followed by 25.33% Type II and Type IV mammographic density. But among the subjects without Breast cancer, 36.67% belonged to Type III mammographic density, followed by 30% in Type I mammographic density and 23.33% Type IV mammographic density.

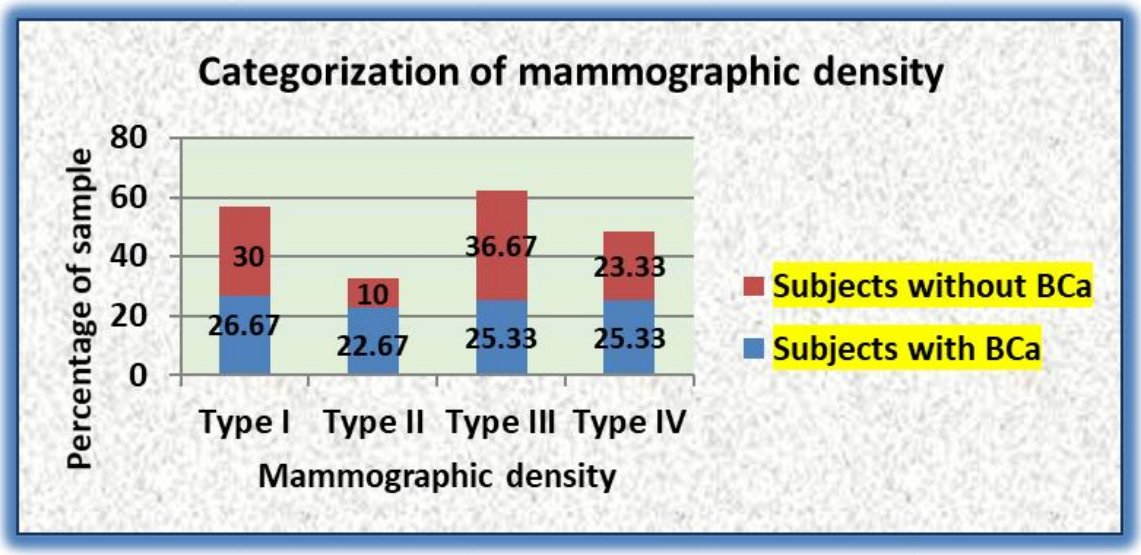

Fig. 2: Categorization of mammographic density

Many researches explained the risk factors that had influenced changes in breast tissue and variations in mammographic density. Factors like younger age, late age at first birth, nulliparity, body weight and lower body mass index potentially affect breast cancer risk through their effect on percent breast density (Vachon *et al.*, 2000). The breast cancer risk features including reproductive factors, age, menopausal hormonal therapy, body size and dietary factors were related with variations in mammographic density (Masala *et al*., (2006); Li *et al*., (2005).

Human body mensuration or anthropometry of the subjects

Mammographic density had different links with body size, weight and the BMI (body-mass index) which were strongly and positively related with the area of non-dense tissue and with the total area of the breast, but less intensely and negatively correlated with the area of dense tissue (Boyd *et al.*, 1998). Studies also showed breast cancer was strongly associated with body size (Amadou *et al.*, 2013, Harvie *et al.*, 2003). An association was noted between body size which included height, weight, body-mass index (BMI), waist and hip circumferences, and waist−hip ratio and incidence of breast cancer (Nemesure *et al*., 2009). In the present study, anthropometric measurements such as height, weight, Mid Upper Arm Circumference (MUAC), waist and hip were taken to assess their influence on mammographic density.

Anthropometry of the subjects with Breast cancer based on mammographic density

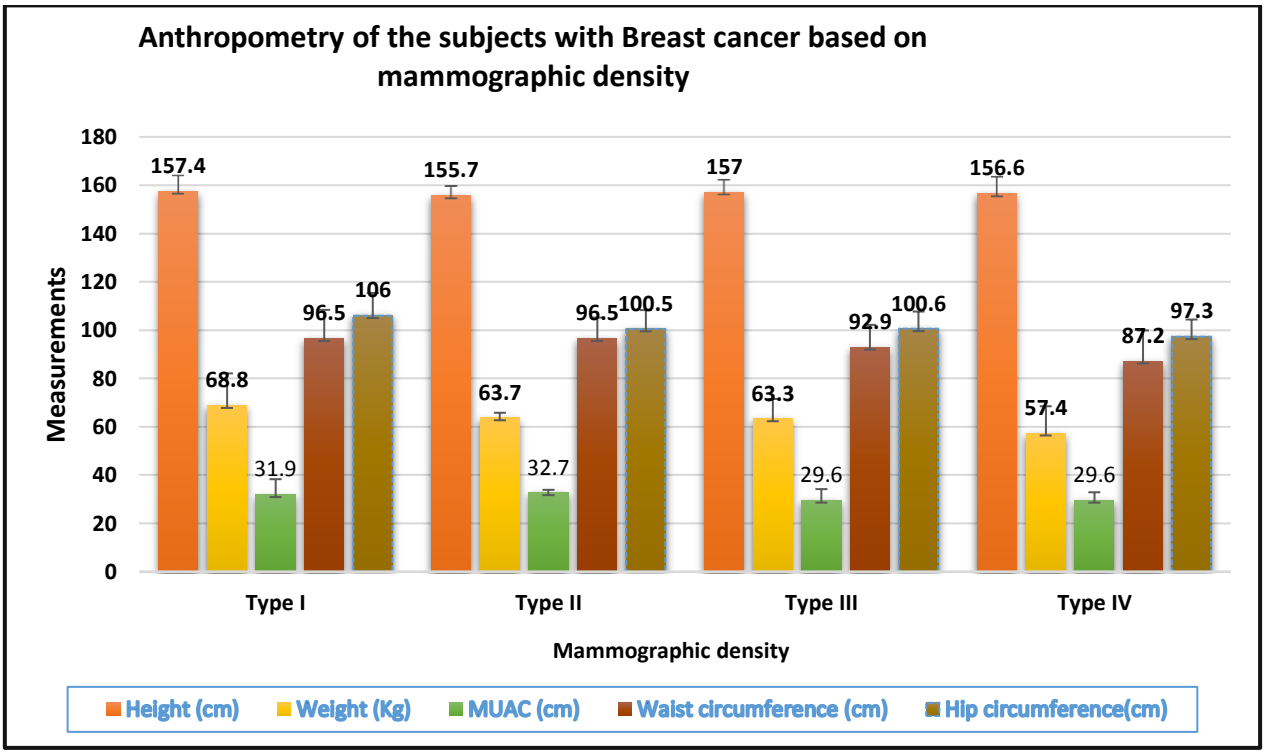

Fig.3: Anthropometry of the subjects with Breast cancer based on mammographic density

Fig.3 describes that waist circumference exhibited a statistically significant differences between the means for subjects with different mammographic densities among the subjects with Breast cancer (F=3.807, p=0.014). No other anthropometric measures exhibited any significant differences between the means for subjects with different mammographic densities among the cases.

Anthropometry of the subjects without Breast cancer based on mammographic density

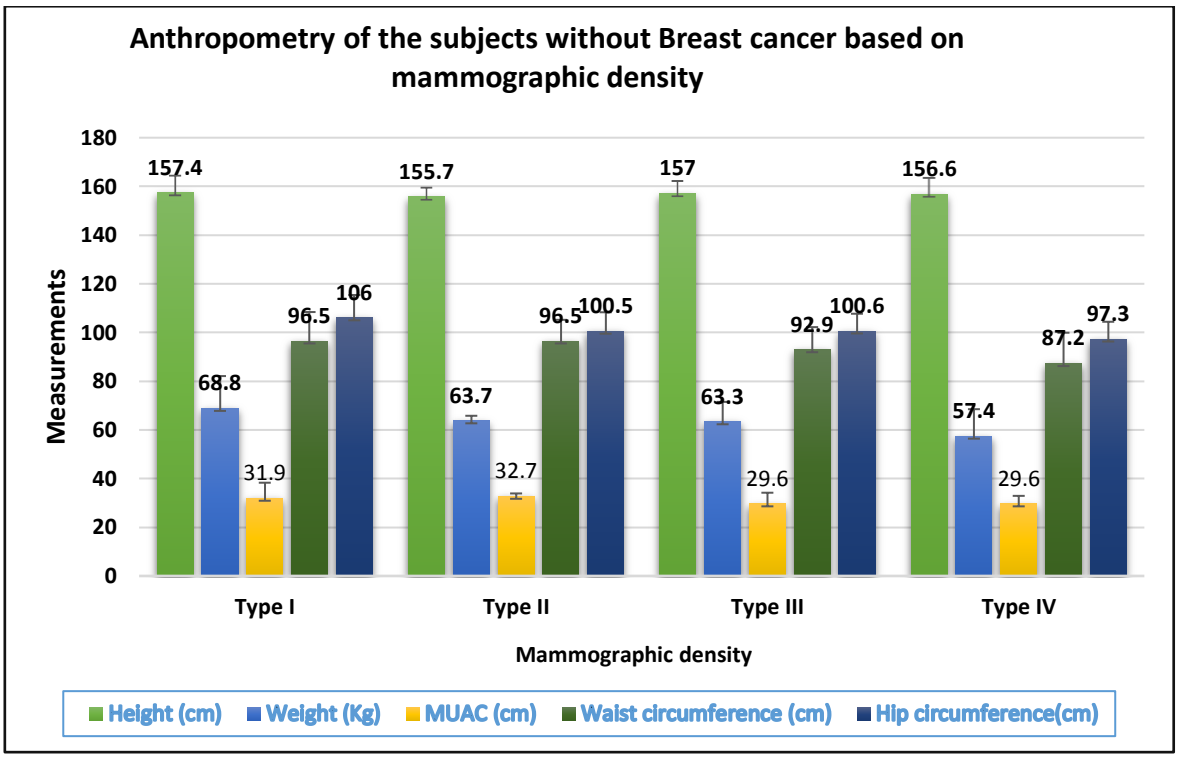

Fig.4: Anthropometry of the subjects without Breast cancer based on mammographic density

Fig.4- describes that among the subjects without breast cancer none of the anthropometric measures showed any significant differences between the means for subjects with different mammographic densities.

A longitudinal interaction between anthropometry and breast density in a prospective cohort showed that the relationship between breast cancer risk and anthropometry did not progress through a direct association between anthropometry and the dense breast area (Reeves *et al.*, 2009). Height was not associated with any mammographic measure (Sung *et al.*, 2010).

Waist circumference was independently and positively related with both premenopausal and postmenopausal breast cancer risk (White*et al.*, 2015). It was also reported that total and non-dense areas had strong positive genetic associations with the existing waist circumference (Sung *et al.*, 2010). Waist circumference was found to be associated with elevated levels of insulin-like growth factors or androgen levels among premenopausal women (Bezemer *et al.*, 2005) and thereby central adiposity might be particularly significant to premenopausal breast cancer risk (Fagherazzi *et al.*, 2005). Waist circumference was highly associated to total body fat more than visceral adiposity (Harris *et al.*, 2000).

Anthropometric indices of the subjects

Influence of anthropometric indices on mammographic density was analysed. Low waist hip ratio was associated with high percent density among both postmenopausal and premenopausal women was reported (Vachon *et al.*, 2000). Among premenopausal women, waist circumferences

and waist-hip ratio were negatively associated to breast cancer risk. A high risk of premenopausal breast cancer with an android body shape (waist-hip ratio>0.87) influence possibly to become obese women (Tehard & Clavel-Chapelon, 2006). Even though obese women are at somewhat higher risk for developing breast cancer, women with android obesity are a part of obese women, have a significantly increased risk for breast (Schapira *et al*., 1990).

Anthropometric indices of the subjects with Breast cancer

Table 1- Anthropometric indices of the subjects with Breast cancer

Anthropometric Indices	Classification	Mammographic density						
		Subjects with BCa* (n_1=75)						
		Type I (n=20)	Type II (n=17)	Type I11 (n=19)	Type IV (n=19)	Total	χ^2	***p* value**
BMI ***	Underweight	2(10)	0	1(5.3)	0	3(4)	6.175	0.722
	Normal	10(50)	5(29.4)	7(36.8)	7(36.8)	29(38.7)		
	Overweight	5(25)	7(41.2	6(31.6)	7(36.8)	25(33.3)		
	Obesity	3(15)	5(29.4)	5(26.3)	5(26.3)	18(24)		
	Total	20(100)	17(100)	19(100)	19(100)	75(100)		
Waist/Hip ****	Lower risk (<0.80)	0	0	0	0	0	0.570	0.903
	Moderate risk (0.81-0.85)	2(10)	1(5.9)	2(10.5)	1(5.3)	6(8)		
	High risk (>0.85)	18(90)	16(94.1)	17(89.5)	18(94.7)	69(92)		
	Total	20(100)	17(100)	19(100)	19(100)	75(100)		

Numbers in parentheses indicate percentage* * 5% level significance*
****National Heart, Lung andBlood Institute,1998* *****World Health Organisation, 2008*

It was observed that a total of 38.7% subjects with Breast cancer were found to be normal, followed by 33.3% overweight. Statistical analysis indicated no significant influence was detected between body mass index and mammographic density (χ^2=6.175 *p*=0.722). Ninety-two percentage of subjects with Breast cancer belonged to high risk category in waist -hip ratio and 8% in moderate risk group.

Anthropometric indices of the subjects without Breast cancer

Table 2- Anthropometric indices of the subjects with Breast cancer

Anthropometric Indices	Classification	Mammographic density						
		Subjects without BCa*(n_2=30)						
		Type I (n=9)	Type II (n=3)	Type III (n=11)	Type IV (n=7)	Total	χ^2	***p* value**
BMI ***	Underweight	0	0	$1_{(9.1)}$	$1_{(14.3)}$	$2_{(6.7)}$	14.14	0.117
	Normal	$1_{(11.1)}$	$1_{(33.3)}$	$2_{(18.2)}$	$5_{(71.4)}$	$9_{(30)}$		
	Overweight	$7_{(77.8)}$	$2_{(66.7)}$	$8_{(72.7)}$	0	$17_{(56.7)}$		
	Obesity	$1_{(11.1)}$	0	0	$1_{(14.3)}$	$2_{(6.7)}$		
	Total	$9_{(100)}$	$3_{(100)}$	$11_{(100)}$	$7_{(100)}$	$30_{(100)}$		
Waist/ Hip ****	Lower risk (<0.80)	$1_{(11.1)}$	0	0	$2_{(28.6)}$	$3_{(10)}$	31.24	0.000**
	Moderate risk (0.81-0.85)	$8_{(88.9)}$	0	0	0	$8_{(26.7)}$		
	High risk (>0.85)	0	$3_{(100)}$	$11_{(100)}$	$5_{(71.4)}$	$19_{(63.3)}$		
	Total	$9_{(100)}$	$3_{(100)}$	$11_{(100)}$	$7_{(100)}$	$30_{(100)}$		

Among subjects without breast cancer a total of 56.7% were overweight followed by 30% normal. Statistical analysis indicated no significant influence was detected between body mass index and mammographic density (χ^2=14.143, *p*=0.117). About 63.3% subjects without Breast cancer belonged to high risk category followed by 26.7% in moderate risk and only 10% belonged to lower risk category. Statistical analysis pointed out a significant influence ($p<0.05$) between waist-hip ratio and the mammographic density among the subjects without Breast cancer (χ^2=31.24, *p*= 0.000).

In women, Body Mass Index was linked with increased risk of lifestyle diseases; and waist–hip ratio appeared to be a stronger independent risk factor than body mass index (Lapidus *et al.,* 1984).Waist circumference and waist–hip ratio was powerful predictive in young and middle-aged adults than older people and those with low body mass index(Seidell., 2010).Studies have proved that regular physical activity of any kind (leisure-time or work-related) reduced waist-hip ratio among middle aged women (Mathew *et al*., 2012).

Central adiposity variables, such as waist circumference or waist-to-hip ratio (WHR), were linked with hormonal and metabolic variations and might be a better predictor of breast cancer risk than general adiposity (Huang, *et al.*,1999). George *et al*., (2014) diagnosed as waist hip ratio was strongly associated with breast cancer. The WHR had developed as a significant biomarker of the association between central adiposity and many obesity-linked diseases (Adebamowo *et al.,* 2003).

Abdominal obesity was associated to breast cancer through irregular insulin signaling leading to elevated endogenous androgen and estrogen levels (Stoll, 2002). Body fat distribution was usually measured by a waist-to-hip circumference ratio. WHR is allied with high risk of breast cancer and thereby avoidance of abdominal obesity could reduce risk of the disease (Connolly *et al.,* 2002).

CONCLUSION

Waist circumference exhibited significant difference between the means of waist circumference for subjects with different mammographic densities among the subjects with breast cancer. Statistical analysis pointed out a significant influence between waist-hip ratio and the mammographic density among the subjects without breast cancer. The study concluded that waist circumference and waist hip ratio could influence mammographic density. Hence, females with high W/H ratio or with abdominal obesity are at risk of having an increase in mammographic density which could be a risk factor for breast cancer. Anthropometric indices which are a prior factor in the assessment of nutritional status should be given much importance as malnutrition can also lead to cancer.

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COMPARATIVE ANALYSIS OF SERVICE QUALITY OF FOOD SERVED AT PUBLIC, PRIVATE AND FAST FOOD RESTAURANTS

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ABSTRACT

Quality is a measure of the degree of excellence or degree of acceptability by the consumer. In other words, it is the summary of features and characteristics of a product or service that bear on its abilityto satisfy stated or implied needs. Every product should have attributes to satisfy the customers' wants / needs of the consumer. It also covers the safety aspect and value for money. The importance of providing quality services in restaurants has been a point of attention among researchers and service managers. Identifying the indicators of service quality in restaurants and their relationship with customer loyalty helps to understanding the factors which affectcustomers' satisfaction. Hence, the present study examines the relationships of service quality, customer satisfaction, and frequency of patronage in India. Permission was sought from the restaurants and only 32 restaurants showed willingness to participate. Primary data was collected using self-administered interview schedules based on the literature related tovarious aspects of service quality. About 60.6 per cent of the respondents were found to be satisfied with the quality of service offered by the studied restaurants. The results of the t-test were marked by the significant p-values of 0.004 and 0.033 respectively at 95 per cent level of confidence for these two parameters between private and public restaurants. However, insignificant p-values of 0.988 and 0.942 respectively at a confidence level of 95 per cent marked that speed and efficiency of service as well as standard of service-ware were almost similar in both private and fast food restaurants. The respondents rated speed andefficiency of public restaurants quite slower in comparison to the fast food ones.

Keywords: service quality, restaurants, customer satisfaction, food quality, fast food

INTRODUCTION

Quality is a measure of the degree of excellence or degree of acceptability by the consumer. Inother words, it is the summary of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs. Every product should have attributes to satisfy the customers'wants / needs of the consumer. It also covers the safety aspect and value for money. Attracting customers with dedicated service and high quality food along with satisfying them and making them into loyal customers is critical for the success of the business in a highly competitive restaurant industry (Gilbert et al., 2004). The importance of providing quality services in restaurants has been a point of attention among researchers and service managers. Conventionally, quality service is

quintessential to satisfy customers and boost income as well as increasing market share (Ryu et al., 2008). Indeed, previous studies found that customer satisfaction and patronage can be enhanced by providing high service and food quality in restaurant (Ha and Jang, 2010; Wall and Berry, 2007). Customers have their own perceptions for evaluating service of restaurant based upon the performance during their meal experience (Ha and Jang, 2010). Identifying the indicators of service quality in restaurants and their relationship with customer loyalty helps to understanding the factors which affect customers' satisfaction.

Barber et al. (2011) investigated how only tangible elements influence service quality while Ha and Jang (2010) discovered how was service quality affected by few intangible dimensions including assurance, reliability, and responsiveness. Thus, scrutiny is required in certain areas so as to recognize the combined effects of tangible and intangible factors on service quality.

Need of the study: Since 20th century, there has been elaborate discussion on service quality which has proved relevant to help current organizations in creating differentiation and gaining competitive advantage in an era of borderless world and globalization. India's impressive economic growth rate increased more than six-fold during the last two decades. The steady income growth of the people in India has provided an opportunity for increased spending in restaurants. However, there are scant studies on restaurant image, food quality, and perceived value in Indian settings. Hence, the present study was planned to examine the relationships of service quality, customer satisfaction, and frequency of patronage in India with the following objectives.

OBJECTIVES

- To assess customer satisfaction with waiting time for taking the order, serving time after placing
  the order, speed and efficiency of service, standard of service-ware and overall service quality
- To compare the service quality of food served at private, public and fast food restaurants

REVIEW OF LITERATURE

Numerous researchers have widely studied and debated over the concept of service (Parasuraman, Zeithaml and Berry, 1985, 1988, 1991; Lee and Hing, 1995; Stevens et al., 1995; Kharasch, 1999; Choi and Chu, 2001; Jordaan and Prinsloo, 2001; Zeithaml and Bitner, 2003; Spears and Gregoire, 2004). In actual sense, there is a certain degree of service present in virtually every exchange situation that's why there is extensive focus on this concept. Majority of the definitions of service attempt to distinguish services from goods but one must remember that goods (food) and services are inseparable in the food service industry. To illustrate, a hamburger (food) cannot be presented to a patron without the component of service – the preparation, cooking and delivery of the hamburger to the guest (Rande, 1995). This has led Powers and Barrows (2003) to suggest that service plays a pivotal role of fundamental element in the

restaurant sector as dining in restaurants is predominantly a social event.

In another vein of thought, Rande (1995) highlighted that service is one of the important aspects in the entire food service industry. To elaborate on the importance of service, Kharasch (1999) explained that great service can make up for a bad meal and can take a great meal and make it an experience so incredible that customers can't wait to come back. Service is also important because of its critical role in determining the customer's perception of the value of meal (Rande, 1995). The higher the level of service provided with the food, the more the customer is generally willing to pay.

Wide examination of the service quality literature unveiled that a number of authors (Lee and Hing, 1995; Kurtz and Clow, 1998; Payne – Palacio and Theis, 2001; Zikmund and d'Amico, 2002; duPlessis and Rousseau, 2003; Zeithaml and Bitner, 2003) have explicated service along its characteristics: intangibility, inseparability, heterogeneity and perishability. In the restaurant sector, inseparability of services means that the customer is present while the service is being produced and views the production process. This affects (positively or negatively) the customer's evaluation of the service (Zeithaml and Bitner, 2003). This dimension also means that customers interact with each other frequently during the service production process and thus affect each others' experiences and satisfaction. To restaurateurs, perishability of services means that they cannot keep an inventory of their services for later use during peak demand. Conversely, an unhappy customer has limited access to recourse following poor service delivery. For instance, a client who is dissatisfied with a service cannot return it (duPlessis and Rousseau, 2003).

Parasuraman et al. (1985, 1988, 1991) identified five dimensions of service quality that are of utmost importance in maximizing customer satisfaction, namely reliability, responsiveness, assurance, empathy and tangibles. These dimensions have been used to measure service quality in this study. In its broadest sense, reliability means that an organization delivers on its promises – promises about delivery, service provision, problem solution, and pricing (Lee and Johnson, 1997; Jordaan and Prinsloo, 2001; Zeithaml and Bitner, 2003). In restaurants, reliability may be characterized by reservations of tables, adherence to customer requests regarding the preparation of menu items, and accurate billing among others.

Attentiveness and promptness in dealing with customer requests, questions, complaints and problems is emphasized by this dimension only (Lee and Johnson, 1997; Zeithaml and Bitner, 2003). The customers evaluate the responsiveness of an organization by the length of time they have to wait for assistance, receiving answers to questions, or attention to the problems raised by them.

Employees in restaurants may show empathy to customers by greeting them by name, by knowing their dietary requirements / preferences, and by being understanding / sympathetic towards their problems. Tangibles are also used by restaurants to communicate their image and signal quality to customers (Zeithaml and Bitner, 2003).
Other researchers (Fick and Ritchie, 1991; Lee and Hing, 1995) stated that the three most important dimensions of service quality to patrons are assurance, reliability and tangibles, respectively. Jordaan and Prinsloo (2001) pointed out that although some dimensions may be more important to some customers than others, the final satisfaction is derived from an overall perception or evaluation of the restaurant's performance on all

dimensions of service quality. They pointed out that when many customers give restaurants low scores for one dimension, such as empathy, the restaurant's management should take steps to improve that particular dimension of their service offering.

METHODOLOGY

Research Design: The present study was carried out in the following three phases:

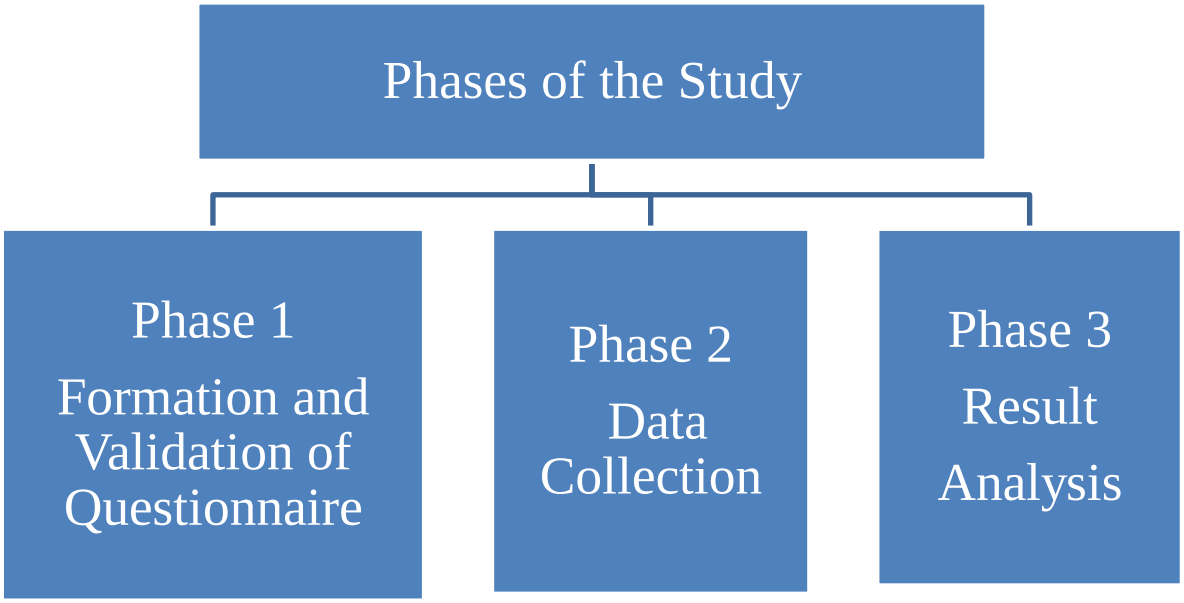

Fig.1 Phases of the Study

The present study was carried out in the following three phases:

Phase I (Formation and Validation of Questionnaires): The questionnaires required for eliciting the required information were developed based on the objectives of the study. The customers' questionnaire was divided into three sections: Section A comprised of questions related to the demographic profile of the respondents; section B consisted of assessing sensory quality of food; section C dealt with the reasons for eating out, satisfaction with overall meal experience, hygiene, ambience etc.

The restaurant staff's questionnaire also comprised of three sections: section A elicited the general information regarding the profile of the restaurant; section B encompassed the information related to food management and section C dealt with waste management practices being followed in the restaurants.

Phase II (Data Collection): Permission was sought from the restaurants and only 32 restaurants showed willingness to participate. Out of these 32 restaurants, 19 fell under the category of private restaurants, 5 were from the public sector and remaining 8

belonged to the fast food category. Data was collected from January 2013 to November 2015. Primary data was collected using self- administered interview schedules based on the literature related to various aspects of service quality. The questionnaires were pre-tested on 20 customers who frequently eat out at private, public and fast food restaurants.

Phase III (Result Analysis): Coding and tabulation of the data was done and statistical tests were conducted. The statistical tools used for presenting the results include percentages, mean, standard deviation, t-test and ANOVA. The percentages of the results are presented in table format; and wherever necessary, percentages are plotted on bar graphs. The mean scores are presented in radar diagrams. However, the results obtained from t-test and ANOVA are presented mainly in the form of tables.

The respondents were asked to mark their responses on a five-point Likert scale which ranged from very dissatisfied - (1), dissatisfied - (2), neither satisfied nor dissatisfied - (3), satisfied - (4), to very satisfied - (5). Similarly, a five-point Likert scale ranging from strongly disagree - (1), disagree - (2), unsure - (3), agree - (4), to strongly agree - (5) was used to draw information on service quality. The secondary data was collected through various publications, books, magazines, newspapers, reports and menus of the restaurants.

RESULTS

Five dimensions were used to measure satisfaction with the quality of service, namely waiting

time for taking the order, serving time after placing the order, speed and efficiency of service and standard of service-ware. These dimensions were measured on a Likert scale ranging from (1) highly dissatisfied, (2) dissatisfied, (3) neither satisfied nor dissatisfied, (4) satisfied (5) highly satisfied. The results obtained are presented in Table 1 and discussed thereafter.

Table 1: Responses of subjects towards Service Quality of Food served in Private, Public and Fast Food Restaurants

Parameter	Scale Rating	Private Restaurants (N=189)		Public Restaurants (N=50)		Fast Food Restaurants (N=78)		Total (N=317)	
		n	%	N	%	n	%	N	%
Waiting Time	1	00	0.0	00	0.0	00	0.0	00	0.0
	2	04	2.1	06	12.0	01	1.3	11	3.5
	3	34	18.0	18	36.0	08	10.3	60	18.9
	4	65	34.4	26	52.0	16	20.5	107	33.8
	5	86	45.5	00	0.0	53	67.9	139	43.8
Serving Time	1	00	0.0	00	0.0	00	0.0	00	0.0
	2	08	4.2	03	6.0	02	2.6	13	4.1
	3	30	15.9	06	12.0	07	9.0	43	13.6
	4	64	33.9	27	54.0	22	28.2	113	35.6
	5	87	46.0	14	28.0	47	60.3	148	46.7
Speed and Efficiency of Service	1	09	4.8	00	0.0	02	2.6	11	3.5
	2	18	9.5	01	2.0	05	6.4	24	7.6
	3	40	21.2	42	84.0	21	26.9	103	32.5
	4	95	50.3	07	14.0	44	56.4	146	46.1
	5	27	14.3	00	0.0	06	7.7	33	10.4
Standard of Service-ware	1	00	0.0	00	0.0	00	0.0	00	0.0
	2	23	12.2	14	28.0	08	10.3	45	14.2
	3	37	19.6	10	20.0	13	16.7	60	18.9
	4	79	41.8	26	52.0	40	51.3	145	45.7
	5	50	26.5	00	0.0	17	21.8	67	21.1
Overall Service Quality	1	00	0.0	00	0.0	00	0.0	00	0.0
	2	19	10.1	29	58.0	06	7.7	54	17.0
	3	48	25.4	10	20.0	13	16.7	71	22.4
	4	115	60.8	11	22.0	55	70.5	181	57.1
	5	07	3.7	00	0.0	04	5.1	11	3.5

Results for satisfaction of the respondents with the quality of the service rendered by the studied restaurants are presented in Table 1. In aggregate terms, only 60.6 per cent of the respondents

were satisfied with the quality of service offered by the studied restaurants. It is clear from Table that the majority of respondents were satisfied with the staff of the studied restaurants in terms of waiting time for taking orders (77.6 per cent) and serving for orders to customers (82.3 per cent). Notably, some respondents were dissatisfied with performance of the staff of the three restaurants as regarding speed and efficiency of service (11.1 per cent) and standard of service-ware (14.2 per cent), especially at public restaurants. These tendencies are well reflected in Figures 2, 3 and 4. The researcher here suggests that the staff of the studied restaurants ought to be more efficient in service. In addition, the standard of the service-ware used should also be improved. Figures 2, 3 and 4 give the graphical presentation for results of various aspects of service quality.

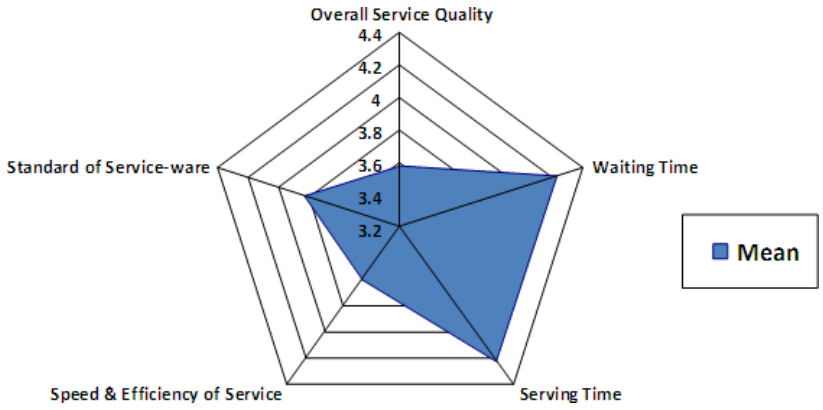

Fig. 2: Mean Scores for Overall Service Quality in Private Restaurants

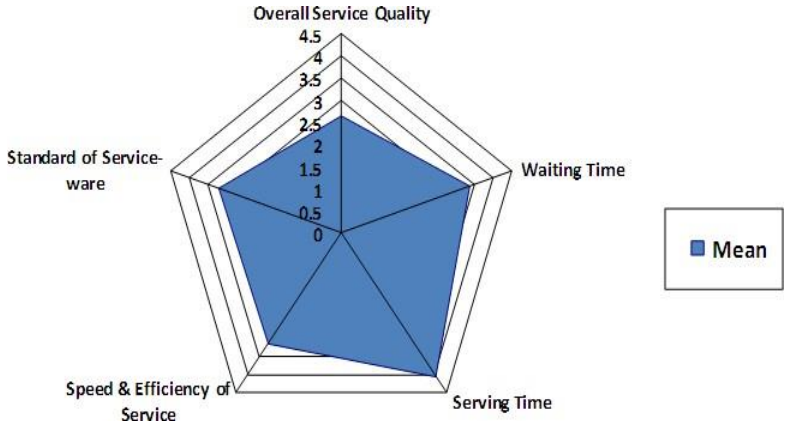

Fig. 3: Mean Scores for Overall Service Quality in Public Restaurants

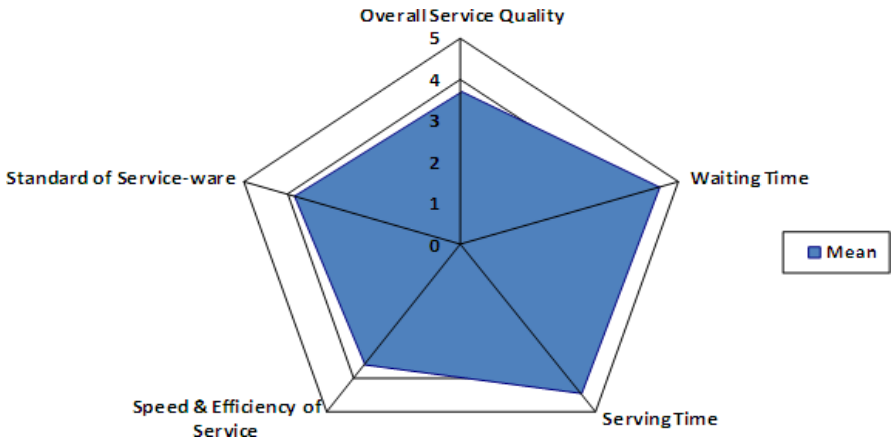

Fig. 4: Mean Scores for Overall Service Quality in Fast Food Restaurants

The figures 2 to 4 indicate that the service was fast specifically at fast food restaurants. In addition, some respondents would indicate that service was not fast probably because they themselves did not have enough time to spend in the restaurants.

Table 2: Comparison of Service Quality of Private and Public Restaurants

Parameter	Private Restaurants n = 189	Public Restaurants n = 50	p-value
Waiting Time for placing the order	**4.23 ± 0.82**	**4.54 ± 0.75**	**.004 ***
Serving Time	**4.21 ± 0.87**	**4.45 ± 0.78**	**.033 ***
Speed and Efficiency of Service	**3.59 ± 1.01**	**3.59 ± 0.84**	**.988**
Standard of Service-ware	**3.82 ± 0.97**	**3.83 ± 0.90**	**.942**
Overall Service Quality	**3.57 ± 0.73**	**3.71 ± 0.70**	**.149**

*** Significant at $p \leq 0.05$**

It was observed that the private restaurants are lacking behind with regard to waiting time for placing the order as well as serving time with mean values of 4.23 ± 0.82 and 4.21 ± 0.87 as against 4.54 ± 0.75 and 4.45 ± 0.78 respectively in public restaurants. Hence, the results of the t-test were

marked by the significant p-values of 0.004 and 0.033 respectively at 95 per cent level of confidence for these two parameters between private and public restaurants (Table 2).

This showed that the guests had to wait more in case of private restaurants due to engagement of waiters with guests and led to the probability of higher guest turnover in the private outlets. However, not much difference was found in speed and efficiency of service as well as standard of service-ware as was evident from the insignificant p-values of 0.988 and 0.942 respectively at 95 per cent confidence level.

Table 3: Comparison of Service Quality of Private and Fast Food Restaurants

Parameter	Private Restaurants n = 189	Fast Food Restaurants n = 78	p-value
Waiting Time for placing the order	**4.23 ± 0.82**	**4.55 ± 0.73**	**.004 ***
Serving Time	**4.21 ± 0.87**	**4.46 ± 0.77**	**.033 ***
Speed and Efficiency of Service	**3.59 ± 1.01**	**3.60 ± 0.83**	**.988**
Standard of Service-ware	**3.82 ± 0.97**	**3.85 ± 0.88**	**.942**
Overall Service Quality	**3.57 ± 0.73**	**3.73 ± 0.68**	**.149**

*** Significant at $p \leq 0.05$**

Table 3 exhibits that the mean values of fast food restaurants for waiting time for placing the order and serving time are 4.55 ± 0.73 and 4.46 ± 0.77 in comparison to 4.23 ± 0.82 and 4.21 ± 0.87 respectively for private counterparts. It was evident that the time taken by the service staff of private restaurants for taking and serving the order is comparatively lower than that of the fast food ones. This difference could be attributed to the limited menu offerings of the fast food restaurants and due to the hard known fact that maximum food items are half prepared in the reputed fast food chains thereby reducing the time to make them ready to be served. However, insignificant p-values of 0.988 and 0.942 respectively at a confidence level of 95 per cent marked that the speed and efficiency of service as well as standard of service-ware are almost similar in both private and fast food restaurants.

Table 4: Comparison of Service Quality of Public and Fast Food Restaurants

Parameter	Public Restaurants n = 50	Fast Food Restaurants n = 78	p-value
Waiting Time for placing the order	**3.40 ± 0.70**	**4.55 ± 0.73**	**.830**
Serving Time	**4.04 ± 0.81**	**4.46 ± 0.77**	**.210**
Speed and Efficiency of Service	**3.12 ± 0.39**	**3.60 ± 0.83**	**.000****
Standard of Service-ware	**3.24 ± 0.87**	**3.85 ± 0.88**	**.158**
Overall Service Quality	**2.64 ± 0.83**	**3.73 ± 0.68**	**.002***

*** Significant at p ≤ 0.05** **** Significant at p ≤ 0.001**

The results of table 4 clearly illustrate that public and fast food restaurants differ significantly in service quality due to a large significant difference with a p -value of 0.000 at 99 per cent level of confidence in speed and efficiency of service. Overall service quality as well as speed and efficiency of service have mean values of 2.64 ± 0.83 and 3.12 ± 0.39 as against 3.73 ± 0.68 and 3.60 ± 0.83 respectively in public and fast food restaurants. The respondents rated speed and efficiency of public restaurants quite slower in comparison to the fast food ones. This response of the guests may be due to mechanization of equipments. Hence, these chains have become more popular among guests with shortage of time in today's fast lifestyle.

CONCLUSION

- Only 60.6 per cent of the respondents were satisfied with the quality of service offered by the studied restaurants.
- Notably, some respondents were dissatisfied with performance of the staff of the three restaurants as regarding speed and efficiency of service (11.1 per cent) and standard of service- ware (14.2 per cent), especially at public restaurants.
- It was evident that the time taken by the service staff of private restaurants for taking and serving the order is comparatively lower than that of the fast food ones.
- However, insignificant p-values marked that speed and efficiency of service as well as standard of service-ware were almost similar in both private and fast food restaurants.
- The respondents rated speed and efficiency of public restaurants quite slower in comparison to the fast food ones.

Implications

- The results and findings of this study can be applied to improve service quality in the restaurants.
- Steps should be taken to build up customer patronage by upgrading the lacking areas.
- Public sector must also realize the importance of determinants of customer satisfaction.

Suggestions for Future Research

- Only a limited locale has been studied under this study hence a large locale can be taken up for future studies.
- This study has covered only private, public and fast food restaurants therefore other types of restaurant can also be studied.

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HEALTH CARE SEEKING BEHAVIOUR OF YOUNG MOTHERS AND ITS ASSOCIATED VARIABLES: A STUDY IN RURAL WEST BENGAL

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ABSTRACT

Health care seeking behaviour of young mothers is of paramount importance due to its unswerving association with maternal and child mortalities and morbidities. Moreover, it is not always the availability of health care services which determines the usage of these services by women. In conventional cultures, as in India or other such developing countries, there are other factors which play a vital role in the use of health care infrastructure for themselves and their children. Direct actions or policies for betterment of mother's health care services utilization, are thus, stalled by her limited capabilities to seek formal health care and have access to the benefits of the supportive health care programs. The purpose of the present paper is to observe the health care seeking behaviour through, meaningful utilization of maternal health care services and institutions in presence of individual and community level factors. These facilitating factors were categorized primarily as personal factors emanating from the particular households and availability of community based infrastructural facilities. The health care utilization of rural mothers was observed against the setup of rural West Bengal. For the above purpose SPSS 17 software was used for analysis of the data. The analysis reveals that demographic factors like, education, age; societal factors like religion, caste; factors like autonomy which are culturally defined and established; economic factors like household expenditure, distance from institutionalized health care center, and associated factors like reach of ASHA workers do have a significant role on the maternal care health seeking behavior of these rural women.

Key Words: Health care seeking behaviour, Rural women**.**

INTRODUCTION

The notion of maternal health is such that it embodies the dimensions of healthcare, pre-conception and pre-natal care, delivery care and post-delivery care of the mother and the child. According to WHO (2014), interventions and improvement in health care accessibility of young would-be mothers or mothers can significantly reduce maternal and child mortalities and morbidities. It is intriguing to note that of the total maternal deaths, a whopping 99 percentage are confined to underdeveloped regions and rural areas. Being a multidimensional concept, it includes not only the accessibility of formal-health-care facilities but also reflects upon the utilization of these services. The maternal morbidity and mortality can be considered as a direct consequence of quality of maternal health which in itself is a good indicator of development of a region.

REVIEW OF LITERATURE

Many thought-provoking studies were carried out that looked into the various facets of maternal health and access and utilization of such services. Vora et al., (2009) in their study

investigated the leanings in maternal mortality and morbidity indicators nationally. Their study critically analyzed the implementation of national maternal health programmes by government of India. While, Saroha et al., (2008) looked into the influence of caste in maternal health, Arokiasamy et al., (2013) in their study discoursed upon the availability of institutional facilities for maternal-health-care in India with respect to its availability and demand. The study by Singh et al., (2014), Kesterton et al. (2010) and Singh et al., (2012) focused on the utilization of institutionalized health care among very young adolescent mothers in rural India. Studies by Banerjee et al., (2009) looked into the teenage pregnancy aspect while some other studies like Bonu et al., (2009) focused on the occurrence and associates of' expenditure on delivery care and pre- and post-delivery care, in context of India. Mistry et al., (2009) discussed the role of a mother's autonomy in pregnancy care in the background of rural India. Navaneetham and Dharmalingam, (2002) analyzed the consumption and demand aspect of maternal health care services in southern parts of India. Bloom et al., (2001) discussed in details, the various extent of women's independence and calculated its effect on maternal health care service utilization in northern parts of India.

Under this backdrop, the present study looks in to the manifold issues affecting maternal and child health care seeking behaviour of young mothers in rural West Bengal.

OBJECTIVES

- To examine the various factors influencing the maternal health seeking behavior.
- To measure the autonomy regarding own health as well as the health of the children and freedom of movement that is without being escorted by other persons of the family in case of visit to a health care facility
- To verify and compare the relative strength of the physical factors like health care facilities, infrastructure of a region etc. and socio-cultural factors like autonomy in decision making, autonomy in movement, religion, caste etc. in influencing maternal health seeking behavior.

HYPOTHESES

H01: There is no impact of the physical factors like health care facilities, infrastructure of a region etc. on health-care-seeking behaviour of the women in the particular area.

H02: There is no impact of the socio-cultural factors like autonomy in decision making, autonomy in movement, religion, caste etc. in influencing maternal health-care-seeking behaviour.

METHODOLOGY

The Sample:

The intent of the present study was to look into the pattern of behaviour among young rural mothers towards seeking maternal-health-care. So, the population of was all the married young rural women who were mothers or had delivered a child at least during or preceding the study

period (October-November 2018) belonging to the age 15 to 35 years in West Bengal. The sample was drawn at two distinct stages. From the 16 villages chosen randomly from the districts of Bankura and Birbhum, 400 households were chosen from the pool of households with the requisite criteria.

Research design:

Diagnostic research design was adopted for the present study to bring out the issues which are influencing the health care seeking behaviour of these rural women. Data was gathered from the respondents regarding the demographic/social/ economic variables, through schedules and questionnaires. It is to be acknowledged here that the essential data were collected with the i invaluable help of student volunteers. A simple questionnaire consisting of 18 questions with categorical answers was developed and validated through a pilot study. Since the present study was undertaken to analyze the implication of various factors influencing maternal health, and general health questionnaire with three distinct components were taken to look into the prenatal, delivery and post-delivery care. Further for the proxy of the economic status of the household average house hold expenditure was calculated and for analytical clarity it was divided by the number of members of the household. This per head expenditure was a rough approximation of the economic status of the sample.

Procedure:

The districts of Bankura and Birbhum were selected as a matter of convenience. From there, 8 villages respectively, were selected randomly from the rural blocks of each district. Of these,25 households, interviews were conducted of young mothers who have already given birth to a child. Preceding the survey, the motive of the study was clearly explained in the local language. Those who were not willing to participate were left out of the study. Under the exclusion principle the would-be mothers were left out of the survey. It should be mentioned here that after visiting the field the lower age limit was decided upon, as, was evident from the survey where many women in the age group 15 to 18 were married and had delivered a baby. The maternal history of the past three years was noted, and only the data on the latest child birth was collected. For assessing the autonomy of the women, all the women in her household were consulted.

Categorization of the variables:

Dependent variables: In this study the maternal health seeking (with its three categories) was the dependent variable. This was measured by access to formal institutions during pregnancy, delivery and after child birth.

Independent variables: Mother's age though a continuous variable was here taken as a categorical variable with two categories (15–20-year) very young mothers and (20-35-year) young mothers. Apart from it another age variable was defined as age at marriage. The woman's education level was categorized as illiterate, primary level and above it. Religion as Hindus or Muslims and caste as general or backwards as taken as two categories. Average per head monthly expenditure of the households was noted and accordingly categorized into two categories below rupees two thousand five hundred and above it. Women's previous familiarity with expiry of an infant, and miscarriages, vis-a-vis and her number of survived children were noted. The women's autonomy was measured through a self-constructed-scale. So, women with autonomy were assigned the score 1 while those with less of it (less than the median scores) were assigned the score 0.

FINDINGS AND DISCUSSION

From the study the various factors influencing the maternal health seeking behavior are found to be age at marriage, economic condition, autonomy to take decision, levels of education and availability of institutionalized facilities. Further it was also seen that the autonomy regarding own health as well as the health of the children and freedom of movement is again dependent on the educational attainment and age of the mothers. Regarding the relative strength of the physical factors like health care facilities, infrastructure of a region etc. and socio-cultural factors like autonomy in decision making, autonomy in movement, religion, caste etc. in influencing maternal health seeking behavior, it was observed that the later plays a relatively more important role.

Descriptive statistics:

The demographic features of the sample reveal that 23.65 years is its mean age, with S. D ±6.76years. Also, the women had an average number of 2.9 children. The average per head monthly household expenditure of Rupees 2,788 on durables was informed by the sampled participants with a S. D of Rs 1260.The details regarding the family or personal variables are given in Table I.

Table-I Family Variables (n=400)

	Categories	Percentage
Age of the woman	15-20	43.07
	20-35	56.93
Age at Marriage of the woman	<18	69.9
	18 or above	30.1
Educational level	Illiterate	61
	Primary Level	22
	HS or above	17
No. of children she has	1-2	41.05
	3-4	40.72
	5 and above	18.23
Experience of infant mortality or miscarriages	No	77
	Yes	23
Monthly per head Household expenditure	I (>2500)	31.76
	II (<2500)	68.24
Religion	Hindu	72
	Muslim	28
Caste	Upper	32.9
	Backward	76.1

The Table I shows that a significant number of very young mothers were seen in the sample belonging to the 15-to-20-year age group. It can be further seen that significant number of these women were married off before attaining the age of eighteen. It further reveals that about 61 percent were illiterate and approximately 22 percent had primary levels of school education. Miscarriages or infant mortality was found to have been true for about 23 percent of sampled women. Most of the households per head expense (68 percent) was less than Rupees 2500, which is quite modest. However, this was an approximate figure reached at by the respondent's feedback. Classified according to religion it can be seen that72 percent were Hindus and 28 percent were Muslims. Stratifying the data according to caste it was observed that 67 percent belonged to backward castes.

The Table II, summarizes the facilitating variables like the women's (mother's) autonomy in decision making regarding own and child health. This was quantified by the responses of the women on whether in case of a necessity they are to consult at least one of the family members like her husband or mother-in-law etc. for getting a permission to seek formal health care either for herself or for the child in concern.

Table-II Enabling Variables (n=400)

Variables	Response	Percentage
Autonomy in decision making regarding own health or child health.	Yes	37.8
	No	62.2
Autonomy in movement	Yes	23.7
	No	76.3
Distance from formal health care center	Near (<5 km)	47.5
	Far (> 5 km)	52.5
Road connectivity	Yes	89.2
	No	10.8
Presence of ASHA workers	Yes	67.4
	No	32.6

Table II shows that about 62 percent of women opined that they had to seek someone's permission especially in-laws or the husband to visit a health center, while the rest said that they were free to do as they pleased. Further, even if the respondent was free to seek health care most of the sample 76percent cited that they were to be accompanied by preferably a male member of the family and if not then at least with some elderly women. 52 percent of the sample were more than 5 km away from any health care center. 100 percent of the villages were electrified and infrastructure like road connectivity was good at about 90 percent. Also, most of the villages covered had active ASHA network coverage.

The Table III shows the usage of institutionalized maternal care services regarding the broad heading of Prenatal- visits, Delivery care and Postnatal-visits including the immunization of the child.

Table-III Use of Formal Health Care Services (n=400)

Variables	Response	Percentage
Prenatal	Yes	49.8
	No	50.2
Delivery	Yes	79.3
	No	19.7
Postnatal	Yes	85.2
	No	14.8

Thus, it is apparent that about half of the women in the sample did not go for the required eight prenatal visits to the health center. Contrastingly, with 85 percent of the sample complying with the post-natal visits which was inclusive of the immunization of the new born, the situation was comparatively much better. Amajorityofwomen79percent delivered at formal institutionalized health care centers andonlyabout20 percent delivered at home.

Inferential Statistics:

Bivariate regression analysis brought out the exact impact of the variables described above on the dependent variable that is the health-care-seeking behaviour of these rural mothers. Now, with the help of the logistic regression the impact of the independent variable categories was observed on the dependent variables through increased or decreased relative chances or probabilities(Stephenson andTsui,2003).It has to be noted here that the independent variables were all for the purpose of the present model converted into categorical variables, and the relative odds were looked into.

Table IV Odds Ratios for Maternal Health Care Seeking.

Variables	Categories	Antenatalvisit	Delivery	Postnatalvisit
Age of mothers	20-35	1.98	1.95**	1.00
		(0.95-1.01)	(0.90-0.99)	(0.96-1.04)
	15-20	01.00	01.00	01.00
Age at marriage of the mothers	>18	1.97***	2.11**	2.67***
		(1.37–3.13)	(1.15-3.66)	(1.34–3.54)
	<18	01.00	01.00	01.00
Education of mothers	Illiterate	1.00	1.00	1.00
	Primary Level	2.17***	2.05**	2.17***
		(1.37–3.13)	(1.15-3.66)	(1.34–3.54)
	HS or above	2.69***	2.95***	2.18***
		(1.68–4.31)	(1.65-5.29)	(1.28–3.69)
No. of children they have	1-2	01.00	01.00	01.00
	3-4	0.74	1.67	1.29
		(0.50–1.10)	(0.99-2.80)	(0.82-2.03)
	5 and above	0.72	0.86	0.49***

		(0.48–1.07)	(0.45-1.62)	(0.29–0.84)
Experience of infant mortality or miscarriage of the mothers	No	01.00	01.00	01.00
	Yes	1.10	1.41	1.68**
		(0.77–1.56)	(0.82-2.41)	(1.08-2.62)
Monthly per head Household expenditure	I	01.00	01.00	01.00
	II	1.16***	1.14***	1.09**
		(1.10–1.23)	(1.05–1.23)	(1.02-1.16)
Religion	Hindu	0.92	2.43*	1.10
		(0.56–1.52)	(0.98–6.04)	(0.59-2.04)
	Muslim	01.00	01.00	01.00
Caste	Upper	1.69**	1.89**	1.49
		(1.13-2.53)	(1.09-3.28)	(0.94-2.36)
	Backward	01.00	01.00	01.00
Autonomy	Yes	1.80***	1.61**	1.44**
		(1.35–2.41)	(1.06-2.44)	(1.01-2.05)
	No	01.00	01.00	01.00
Autonomy(movement)	Yes	1.87***	1.65**	1.47**
		(1.39–2.43)	(1.08-2.89)	(1.17-2.33)
	No	01.00	01.00	01.00
Distance	Near	1.47	1.43	1.87
		(0.75-2.88)	(0.50-4.08)	(0.78–4.47)
	Far	01.00	01.00	01.00
Road	Yes	1.47	1.43	1.87
		(0.75-2.88)	(0.50-4.08)	(0.78–4.47)
	No	01.00	01.00	01.00
ASHA	Yes	1.93**	1.01	1.22**
		(1.14-3.29)	(0.45-2.28)	(0.68-2.19)
	No	01.00	01.00	01.00

(Sample size 400)

Table IV shows that chances for mothers going in for institutionalized delivery care increased by about 95 percent if she belonged to the age group classified as 20 to 35 years than her counterpart 15 to 20 years. It is also seen that the likelihoods of receiving any of the three variants of maternal care significantly increased for women with relatively higher levels of autonomy. Relatively, higher age at marriage of the women than her counterpart who got married at a significantly early age (less than the legal age of marriage)had a greater probability of receiving antenatal care by about 97 percent and about 2.11 times higher likelihood of delivering in an institutionalized formal health care unit and 2.67 times higher likelihood of receiving postnatal care.

The results show that that rise in the prospective mother's freedom to move about freely on her own, significantly increased her chances of receiving antenatal care, delivering in an institutionalized health facility by 65 percent and post-natal care by 47 percent. In comparison to the literate young rural women, those who were uneducated worse, and the former fared well since women withprimaryschooleducationhad2.07 times more chances of receiving antenatal care,2.05

times more possibility of delivering the child in a formal institutionalized health facility, and2.17 times more chances of seeking post-natal care. The effects were more robust for mothers who had, at least basic primary level or more of education. It is observed in the results that higher income augmented probabilities of a woman receiving antenatal care by about 16 percent, delivering in a formal facility by14 percentandreceivingpostnatalcareby9 percent.

Moreover, variables like caste too had an influence on the health-care seeking behaviour of the rural mothers. Caste location of individual played significantly in this sphere, as women belonging to upper strata of caste categories, in comparison to their counterparts in the lower caste wrung, had69 percent greater possibility of receiving prenatal care, and her chances of giving birth in a healthcare facility significantly increased by 89 percent in contrast to women who belonged to backward castes. Similarly, Hindu women were seen to have2.43 times higher chances of child-delivery in a formal facility unlike Muslim women.

Seeking post-natal care among women with five or more children was reduced by 49 percent than women those who had fewer number of children. The previous experience of a loss of an infant or miscarriage resulted in women of such kind coming in the fold of postnatalcareby68 percent.

The presence of an ASHA worker in the village increased the probability of women receiving antenatal care by 93 percent. This reflects upon the success of the immunization drive by the government. The village development indicators like road connections did not associate significantly with any of the outcomes.

Autonomy, awareness, sensitivity and empowerment of rural young women towards potential utilization of healthcare facility was significantly and positively associated to all outcomes of maternal healthcare, in comparison to women with relative smaller liberation, while keeping the demographic determinants and community parameters controlled.

SUMMARY, CONCLUSION AND IMPLICATIONS

From the above analysis it can be seen that maternal-health-care seeking behaviour is influenced mainly by the women's autonomy and the availability of formal healthcare facilities related infrastructure. It can be seen that the women's freedom to take decision, to move out freely at her own will, her years of education and age at marriage and child birth and average amount of monthly expenditure on her are crucial factors in determining the pattern of her health care seeking behavior. This finding is supported by the studies of Bloom (2001) where autonomy regarding to a women's free movement is seen to have significant positive impact upon their maternal healthcare seeking behavior. Education levels of mothers displayed a robust relation with all dimensions of maternal health care. The positive impact of education had been confirmed in other studies like Celik and Hotchkiss, (2000); deSouza (2000) as well.

Thus, one may conclude that both autonomy of the women and years of education positively influence the maternal health care seeking behavior. The other infrastructural variables like road connectivity and distance from the health care center do not have any noteworthy effects on the institutionalized care seeking behaviour in the present sample. On the basis of the results obtained one can say that, at least for the given setup, to make any significant changes in the existing health care utilization or improving the health care utilization among rural mothers, one has to focus on variables like empowerment, education, autonomy and freedom. The nature of

these variables reveal that they can be influenced only by concentrating on the individuals of the households and studying the gender dynamics as it exists embedded in the socio-cultural pattern of a given society. This necessitates a micro focus on households and calls for changes from within the system. Thus, to meet this end the approaches to home science extension working with families could bring out positive results.

The study reveals that the maternal health is a concept which is multilayered and has multiple dimensions, as is affected by the age at marriage, autonomy in movement and decision-taking, education of the women. The study points out at within a given infrastructure better utilization of the formal services could be done if the afore mentioned variables are better taken care off. This is a vital finding as it has direct consequences on the health of the mother but also has an indirect impact on the health of the child whose primary care giver is the mother. Thus, within the limited resources of a household and the community if proper intervention can be made to educate the young women and conditions are made more conducive for them to exercise their autonomy, then the immediate effects could be seen on the mother as well as the child. This is very important consequence if one contextualizes the problem in very long run.

SUGGESTIONS FOR FUTURE RESEARCH

The present study may be further extended to include the psychological variables like self-esteem or social participation through standardized scales to bring out the multidimensionality of the problem. Moreover, attitudinal variables of the family members towards the young mother may be studied. Further, qualitative studies or case studies may also be conducted.

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FORMULATION OF VALUE-ADDED PRODUCTS FOR MENOPAUSAL WOMEN

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ABSTRACT

Soybeans contain isoflavones that mimic the action of the hormone oestrogen and have been associated with beneficial health effects during menopause. People are looking for complementary and alternative health care, as well as treatments that are considered more "natural," to supplement biomedical health care. Soybean is also rich in protein and calcium. So, present study was designed to develop daily consumed Indian food products i.e. chapati and seasoned paratha. Whole wheat flour was replaced with soy flour at 10, 15, 20 and 25 per cent levels of incorporation to obtain four different formulations. Products were evaluated for sensory properties and nutritional quality. It was found that all the products were organoleptically acceptable. Overall acceptability scores revealed that chapati and seasoned paratha both incorporated with 25 per cent soy flour were more acceptable as compared to other formulations. Most acceptable chapati and seasoned paratha contained 31.66 mg and 27.03 mg isoflavone, 21.60 g and 19.55 g protein whereas 65 mg and 56 mg calcium respectively. Thus, soy flour-based value-added household products may be beneficial for menopausal women due to its good quantity of isoflavone, protein and calcium.

Keywords: Wheat flour, soybean, isoflavone, sensory attributes, nutritional quality

INTRODUCTION

"Menopause is the permanent cessation of a woman's menstrual period due to loss of ovarian follicular function or of surgical removal of ovaries". According to the Indian Menopausal Society, there will be 103 million menopausal women in India by 2025.Lower age of menopause in India (47.5 years) combined with increasing life expectancy (71 years) forces the Indian women to spend approximately one-third of her life in menopause (Uni, 2010).

Complaints are common throughout the menopausal transition. Hot flashes, sleeping troubles, tiredness, and muscle and joint stiffness are the most common. The severity of these symptoms varies greatly between individuals, and they can be absolutely negligible in some women but socially problematic in others by causing physical and emotional distress. The occurrence of cardiovascular events and the reduction of bone mineral density (BMD), which causes osteoporosis, are two other noteworthy changes that occur after menopause. During menopause, these changes might have a substantial impact on one's quality of life. Hormone replacement therapy (HRT) has long been the primary treatment for women experiencing

menopausal symptoms. However, due of the health dangers of HRT, such as breast cancer, endometrial cancer, and heart disease, it is not recommended.

So, many women cannot or choose not to use hormone therapy (Posadzki*et al*. 2013). Many women turn to phytoestrogens as an alternative to HRT as they are seeking complementary and alternative health care practices and treatments. In addition, isoflavones do not appear to increase the risk of breast cancer or heart disease (D'Adamo*et al*. 2014)

Soybeans are widely consumed around the world, particularly in Asia. Because of their nutritious value, soybeans are widely consumed as food. Soybeans are high in isoflavones and provide an excellent source of protein and calcium. The three major isoflavones found in soybeans are "genistein, daidzein and glycitein" (Barnes, 2010). Isoflavones have been linked to a variety of health advantages. Isoflavones are known to have estrogen-like actions, alleviating menopausal symptoms. Studies reported that isoflavones consumed at levels found in soy foods can help maintain blood vessel health (Messina, 2009). This led to the widespread use of non-hormonal therapies based on soy isoflavones for the management of menopausal symptoms though scientific evidence for their efficacy is mixed (North American Society, 2011). Aside from this, soy flour is becoming more popular in many countries as a rich source of vegetable protein. Soy flour contains about 44 per cent protein, on dry weight basis and therefore it is considered as an excellent source of protein (Husain and Bhatnagar,2018).

OBJECTIVE

The aim of this study was to develop daily consumed Indian household products by incorporating nutritional and functional properties of soy flour.

METHODOLOGY

Research design:-Complete randomized design was used.

Raw materials: - Soybean (*Glycine max*), whole wheat flour, refined oil and other materials used in the recipes were purchased in a single lot from the local market of Udaipur. Vegetables like onion, green chilli and coriander leaves were purchased as and when required.

Preparation of soy flour: -The dry heat process was used to make soy flour (International Soybean Programme, 2009). Sand, sticks, and foreign substances were removed from the soybeans. The seed was then weighed, rinsed, and immersed for 8 hours in multiple times its volume of water. They were spread in a single layer on a baking sheet after draining the water and baked for 15 minutes at 175°C. After turning them, soybean was cooked for another 10 minutes. The dried beans were cooled before being processed, sieved, packed, and stored in polyethylene bags until they were needed.

Product formulation: -Wheat based daily consumed household products like chapati and seasoned paratha were prepared. Chapati is an unleavened flat bread and is popular in majority of the households in India". Basically, chapati is prepared using whole wheat flour. It is baked at high temperature for a short time period to cause rapid steam formation which causes the chapati to puff up. Supplementing wheat flour with flours made from various legumes increases protein and mineral content and therefore increases the nutritional content of chapatis (Chakrabarti*et al.* 2013).

Seasoned wheat paratha is an Indian recipe and is used as the breakfast dish. It is basically an unleavened dough of wheat flour added with a spiced mixture of onion, green chilli, coriander leaves, which is rolled out and cooked on a hot griddle with oil.

The recipes were cooked in the laboratory of Foods and Nutrition, College of Community and Applied Science, MPUAT, Udaipur. Ingredients required for recipe were weighed on an electronic food balance of 1g accuracy. A series of preliminary trials for preparing recipes were carried out to standardize it. Wheat flour was replaced with soy flour in four preparations 10, 15, 20 and 25per cent and designed as T1, T2, T3, and T4 respectively, whereas T0 (without soy flour) was kept control. The preparation of chapati and seasoned paratha is shown in Fig. - 1 and Fig. -2 respectively. All the preparations were carried out in triplicate.

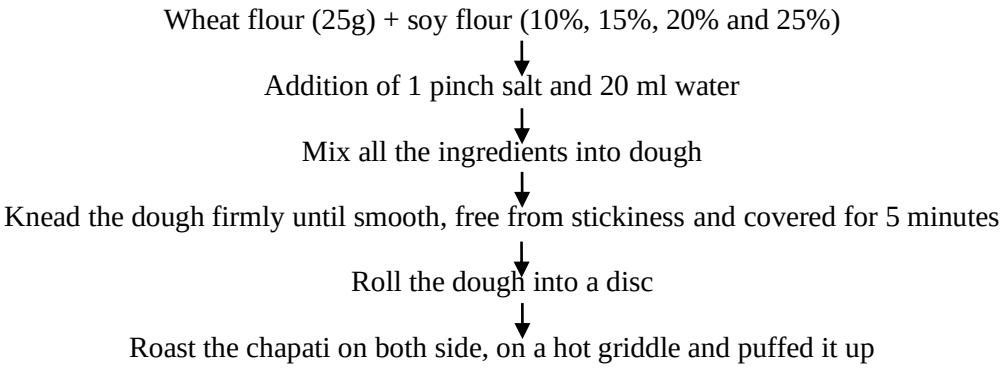

Figure 1: Flow chart for the preparation of chapati

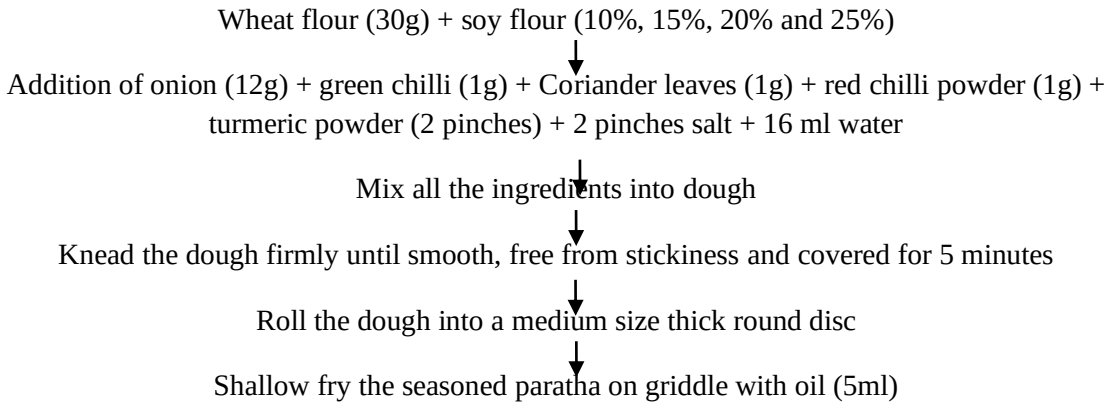

Figure 2: Flow chart for the preparation of seasoned paratha

Organoleptic analysis:-The sensory attributes including taste, colour, texture, flavour and overall acceptability of products were evaluated by a trained panel of ten judges using nine point Hedonic Rating Scale to test liking or disliking of the product. A 9-point Hedonic scale, where "1" representing "extremely dislike" and "9" representing "extremely like" was used (BIS 1971). Coded samples of the same size and temperature were served on a (white) coloured plate to judges in each panel. Most acceptable level of soyflour inchapati and seasoned paratha were further analyzed for its nutrient content.

Chemical analysis: - The chemical analysis of most accepted chapati (blended with 25 % soy flour) and seasoned paratha (blended with 25 % soy flour) were carried out in triplicate. Both were dried in hot air oven at 60°C for 48 h and ground to powder form followed by packing in air tight containers.

Proximate composition: - Moisture, protein, crude fibre, total ash, crude fat in samples were determined according to AOAC (2000) procedures.

- **Carbohydrates**-The carbohydrate content of the samples was estimated by subtracting 100 from the total of percent moisture, protein, fat, fibre, and ash. (Gopalan*et al.*, 2010).
- **Calorific value**-By multiplying the percent protein, fat, and carbohydrate available in the samples by 4, 9, and 4, respectively, the calorific value (Kcal/100g) of the products was calculated.
- **Calcium**- Calcium was determined by titrametric method (AOAC, 2000).
- **Isoflavone**- Isoflavone content of developed products was estimated by using standard method given by Kao and Chen (2002) for the High Performance Liquid Chromatography.

Statistical analysis: Statistical analysis was performed using IBM SPSS (version 21.0). The intragroup comparison was performed using one way analysis of variance (ANOVA) test. All the quantitative data was expressed as Mean ± SD. The p value <0.05 was considered as significant and value <0.001 was considered as highly significant statistically.

RESULTS AND DISCUSSION

Sensory evaluation of chapati: -Results of sensory evaluation of chapati samples containing different level of soy flour substitution as compared to the control is illustrated in Table - 1. The overall mean scores of chapati ranged from 7.9 to 7.3 on 9 point hedonic scale. This indicates that recipes were found to fall under the category of "liked very much to like moderately". As it can be visualized from the table that control (T0) recipe of chapati obtained highest overall acceptability scores (8.6±0.26) as compared to the test recipes i.e. 7.3±0.31 (T1), 7.7±0.31 (T2), 7.8±0.24 (T3) and 7.9±0.53 (T4) with 10, 15, 20, and 25 per cent soy flour respectively. Amongst the test recipes, sensory scores of chapati prepared with 25 per cent of soybean flour has been ranked highest for all sensory attributes i.e. 7.9±0.56 (colour), 7.9±0.73 (texture), 8.1±0.56 (flavour), 7.9±0.56 (appearance) and 8.1±0.73 (taste), than the chapati prepared with 10, 15 and 20 percent level of soy flour (Fig. – 3& 4).

Further it can be discerned that there was an increase in all sensory attributes with increase in the incorporation level of soy flour up to 25 per cent. It can also be seen that chapati incorporated with 25 per cent soy flour (T4) received highest score for flavour (8.1±0.56) and taste (8.1±0.73) as compared to its other sensory attributes i.e. colour (7.9±0.56), texture (7.9±0.73) and appearance (7.9±0.56). It indicates that incorporation of 25 per cent soy flour in wheat chapati improved the sensory attributes particularly due to flavour and taste. Significant difference ($p<0.01$) was observed in colour, texture, flavour, appearance, taste and overall preference respectively.

Table 1: Mean±SD of acceptability scores of control and test chapati

Treatments	Colour	Texture	Flavor	Appearance	Taste	Over all acceptability
T0	8.7±0.48	8.6±0.69	8.4±0.51	8.7±0.48	8.8±0.42	8.6±0.26
T1	7.1±0.31	7.0±0.66	7.3±0.67	7.5±0.52	7.6±0.69	7.3±0.31
T2	7.6±0.51	7.6±0.69	7.8±0.63	7.8±0.42	7.7±0.48	7.7±0.31
T3	7.6±0.84	7.6±0.84	7.8±0.63	7.5±0.70	7.9±0.31	7.8±0.24
T4	7.9±0.56	7.9±0.73	8.1±0.56	7.9±0.56	8.1±0.73	7.9±0.39
p**	0.000**	0.000**	0.000**	0.000**	0.000**	0.000**

Values are Mean ±SD of three replicates, **p-value is significant for ($p<0.001$) at 95% CI
T0 = Control (Wheat flour), T1 = 10% Soy flour, T2 = 15%Soyflour, T3 = 20% Soy flour, T4 = 25%Soyflour

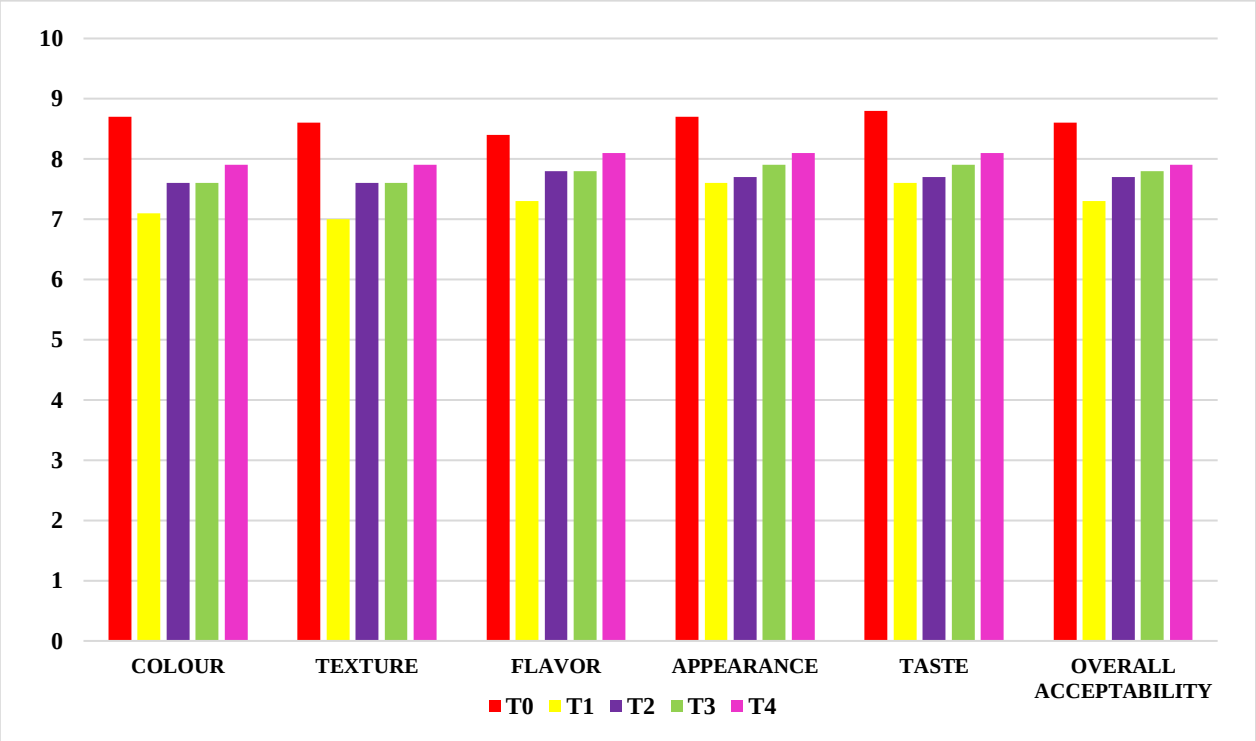

Figure 3: Acceptability scores of control and test chapati

Results of the present study regarding incorporation level of soy flour in chapati are in accordance with the findings as reported by Khan *et al.* (2005), where composite flours were

prepared by replacing wheat flour with 8, 16, 24, 32 and 40 per cent soy flour. Their results showed that incorporation of soy flour at 24 per cent supplementation was acceptable in wheat chapati. Another study conducted by Deshpande and Bargale (2007), found that soy-wheat-sattu fortified up to a level of 30 per cent soybean were acceptable. Salim*et al.* (2017) in their study reported substitution of 10 per cent soy flour in wheat biscuits scored maximum for all sensory quality. However their other treatments were also found to be acceptable.

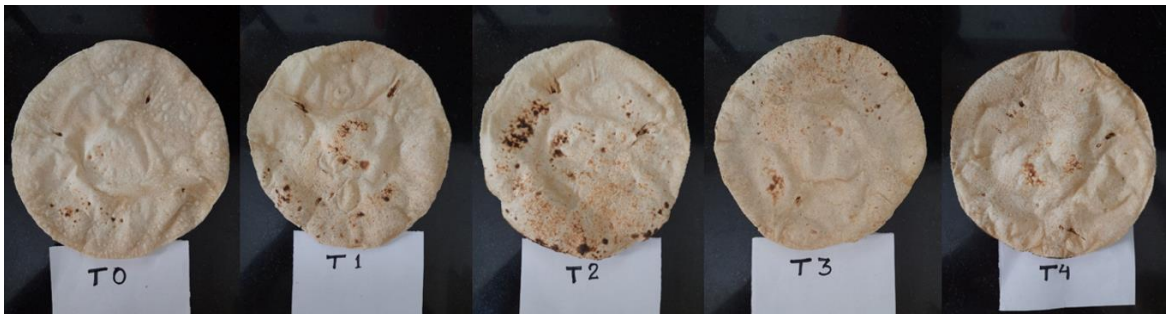

Figure 4: Photograph of chapati [T0 = Control (Wheat flour), T1 = 10% Soy flour, T2 = 15% Soy flour, T3 = 20% Soy flour, T4 = 25% Soy flour]

Sensory evaluation of seasoned paratha: -Table - 2 presents data on acceptability of different level of incorporation of soy flour in seasoned paratha. The overall acceptability scores of seasoned paratha ranged from 8.1 to 7.7 on 9 point hedonic scale. Sensory scores of seasoned paratha prepared with incorporation of 25 per cent soy flour (T4) had been ranked highest i.e. 8.2±0.63 (colour), 8.0±0.66 (texture), 8.1±0.87 (flavour), 8.3±0.48 (appearance), 8.3±0.67 (taste) and 8.1±0.53 (overall acceptability), as compared with control and other treatment samples (Fig. -5). Further analysis of data indicate that incorporation of soy flour at lower level i.e. 10 and 15 per cent obtained lower scores (7.7±0.61 and 7.7±0.39) and as the level of incorporation was increased the acceptability of seasoned paratha improved (Fig. -6).No significant difference ($p<0.05$) was observed in colour, texture, flavour, appearance, taste and overall preference respectively.

Table 2: Mean±SD of acceptability scores of control and test seasoned paratha

Treatments	Colour	Texture	Flavor	Appearance	Taste	Over all acceptability
T0	7.9±0.56	7.8±0.78	7.9±0.73	7.9±0.56	8.1±0.73	7.9±0.48
T1	7.8±0.63	7.8±0.63	7.7±0.67	7.7±0.67	7.7±0.67	7.7±0.61
T2	7.8±0.63	7.7±0.67	7.7±0.48	7.7±0.48	7.7±0.67	7.7±0.39
T3	7.8±0.78	8.0±0.81	7.9±0.56	7.8±0.78	8.0±0.66	7.9±0.55
T4	8.2±0.63	8.0±0.66	8.1±0.87	8.3±0.48	8.3±0.67	8.1±0.53
p*	0.67	0.32	0.69	0.48	0.36	0.49

Values are mean ±SD of three replicates, *p-value is significant for ($p<0.05$)

T0 = Control (Wheat flour), T1 = 10% Soy flour, T2 = 15%Soyflour, T3 = 20% Soy flour, T4 = 25%Soyflour

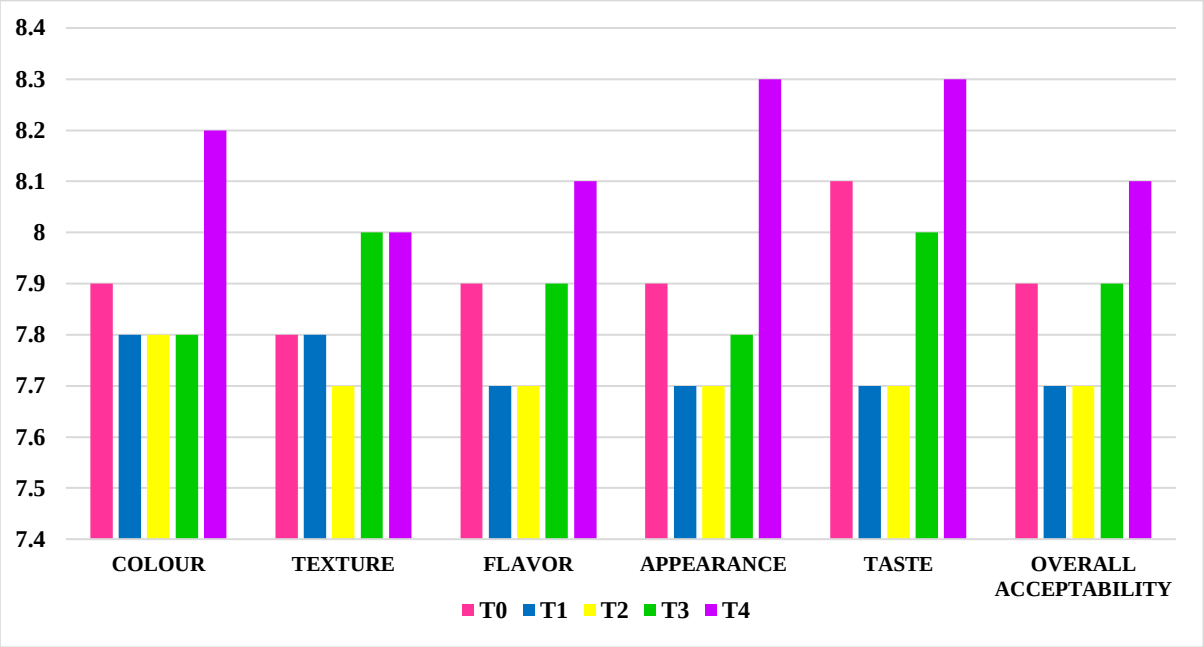

Figure 5: Acceptability scores of control and test seasoned paratha

Results of the present study are in tune with the findings reported by Rani *et al*. (2008). They observed that, use of soy flour in biscuits increased the mean scores for all the sensory attributes and thus, they were liked very much by the panellists. They also reported highest mean scores for colour and flavour of soy flour incorporated biscuit (15% level) as compared to control. Kaur and Kaur (2019) reported higher overall acceptability of tart at 20 percent supplementation of germinated soy.

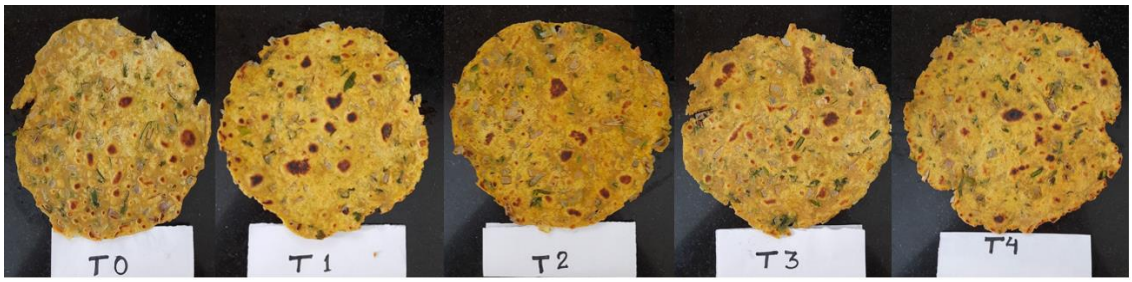

Figure 6: Photograph of seasoned paratha [T0 = Control (Wheat flour), T1 = 10% Soy flour, T2 = 15% Soy flour, T3 = 20% Soy flour, T4 = 25% Soy flour]

Nutritional composition of chapati: -The nutritional composition of chapati substituted with 25 per cent (T4) are shown in Table 3. It was observed that chapati contained moisture 25.13±0.37 g, protein 21.60±1.01 g, fat 1.40±0.26 g, ash 2.59±0.06g, crude fibre 2.08±0.02 g, carbohydrate

72.32±1.02 g, energy 388.29±1.33 kcal and calcium 65±3.05 mg. The isoflavone content of chapati was found to be 31.66 mg/100 g on fresh weight basis.

The protein content of chapati is more than the protein content found by Salim*et al*. (2017). They showed 18.71 per cent protein in biscuit incorporated with 25 per cent soy flour. Sanful*et al.* (2010) in their study, reported 1.5 per cent and 2.0 per cent fat in bread made from soybean and wheat composite flour which is at par with the present findings. Kadam*et al*. (2012), found 2.23 per cent ash content and 67±0.03 mg calcium in blend of wheat and full fat soy flour.

Table 3: Nutritional composition of selected chapati and seasoned paratha (on dry weight basis)

Nutrients	Chapati (SF-25%) (Mean±SD)	Seasoned Paratha (SF-25%) (Mean±SD)
Moisture (g)	25.13±0.37	35.28±0.53
Protein (g)	21.60±1.01	19.55±2.20
Fat (g)	1.40±0.26	3.84±0.20
Ash (g)	2.59±0.06	3.93±0.19
Crude fiber (g)	2.08±0.02	2.19±0.11
Carbohydrate (g)	72.32±1.02	70.48±2.13
Energy (kcal)	388.29±1.33	394.68±0.72
Calcium (mg)	65±3.05	56±2
Isoflavone* (mg)	31.66	27.03

SF – Soy flour, All the values are the average of three observations, *Isoflavone content of products (per 100g) on fresh weight basis.

Nutritional composition of seasoned paratha:-Data from Table - 3 unfold the nutritional contents of seasoned paratha. It could be seen that moisture, protein, fat, ash, crude fibre, carbohydrate, energy, calcium and isoflavone content of seasoned paratha with incorporation of soy flour at 25 per cent was found to be 35.28, 19.55, 3.84, 3.93, 2.19, 70.48, 394.68, 56 and 27.03per cent.

The protein content of seasoned paratha is more or less similar to the protein content reported in a previous study (Salim*et al*., 2017). The fat, ash and crude fibre content of paratha

were comparable as observed by Mishra *et al.*, (2012). The difference in isoflavone content between the products chapati and seasoned paratha may be due to exposure to heat.

CONCLUSION AND RECOMMENDATIONS

In the present investigation sincere efforts was made to enhance the nutritional quality of chapati and seasoned paratha by incorporating soy flour at 10, 15, 20 and 25 per cent level. The results pertaining to overall acceptability of chapati and seasoned paratha, it could be concluded that 25 per cent soy flour incorporation in both preparations were most acceptable. All treatments were also found to be acceptable. On the basis of nutritional analysis of prepared chapati and seasoned paratha, it could be concluded that soy flour incorporation increased the nutritional composition of products due to high quality protein, fat and isoflavone content. As a result, these products may be able to help women cope with the symptoms of menopause and thereby improve their quality of life. Similar studies can be carried out on more traditional recipes. Ready to eat soy based commercial products can also be formulated.

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EFFECT OF WEIGHT LOSS ON LIPID PROFILE AMONG OBESE ADULTS OF BIHAR

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ABSTRACT

It is always suggested that exercise and very low-calorie diets are beneficial in reducing body weight, and cholesterol levels and increasing HDL cholesterol. However, this study was conducted to find the effect of weight reduction on lipid profile through Moderate Fat Balanced Nutrient Reduction Diet practice in overweight and obese individuals. A sample of 24 overweight and obese adults (males-16, females -8) aged 25-60 years attending an urban Diet Clinic in Patna was purposively selected for the study spanning over 180 days. Assessment of weight was done by a standardized weighing machine, and a reputed laboratory did an estimation of lipid profile level at the time of joining and after the weight loss program. Lifestyle modification included a balanced diet plan composed of approximately 1600 kcal per day,55-65% of carbohydrates, 10-20% of proteins, and 25-30% fat of total calories. Exploratory data analysis reveals that the mean reduction in body weight was 11.2+/- 3.06 kg through moderate fat balanced nutrient reduction diet practices within six months. The mean reduction in body weight, Body Mass Index and Waist Circumference of the male was higher than the female. The program also yields a significant decrease in total cholesterol levels, TG and LDL, whereas HDL increased among obese individuals enrolled in a weight loss program within six months. The study concludes that weight loss through a balanced diet can control cholesterol levels in overweight and obese individuals. Overweight and obese individuals should be encouraged to make specific lifestyle changes like a balanced diet, exercise and regular medical follow-ups.

Keywords: Obesity, Balanced Nutrient Reduction Diet, Weight loss, Lipid Profile.

INTRODUCTION

Obesity is a condition of positive energy balance, and it is increasing quickly in almost all of the country. The number of overweight and obese people in Bihar nearly doubled in 2016 compared to 2006; NFHS-4 data shows that one in five people in Bihar weigh far more than they should. Pandit et al. (2014) found that 27.7% of adult students in the Arrah district of Bihar were overweight and obese. Researches indicate that excess body weight is related to dyslipidemia development and increases the risk for CVDs (Kopelman, 2007). According to the lipid association of India expert consensus statement (2016), cholesterol levels are steadily rising among Indians compared with the western populations; Indians tend to have higher TG levels and lower HDL-C levels. However, the total cholesterol and LDL-C levels are generally lower.

Obesity is associated with insulin resistance, alterations in lipid metabolism, and metabolic syndrome, mainly when the excess fatty tissue is located in an intra-abdominal location or the upper chest reported by Bays et al. (2013). Obesity is a predisposing factor for the development of cardiovascular disease. Still, it appears that much of this effect is accounted for by obesity-inducing dyslipidemia, diabetes, hypertension, inflammation, and a procoagulant state (Mandviwala, 2016).

The lipid abnormalities seen in patients who are obese include elevated triglyceride, VLDL, Apo B, and non-HDL cholesterol levels, which are all commonly observed. HDL cholesterol and Apo A-I levels are typically low. LDL cholesterol levels are frequently in the normal range, but an increase in small dense LDL is often seen (Grundy, 2004). These small dense LDL particles are considered more pro-atherogenic than large LDL particles for several reasons (Berneis and Krauss, 2002). Small dense LDL particles have a decreased affinity for the LDL receptor resulting in prolonged circulation. Additionally, these tiny particles enter the arterial wall more quickly than large particles, and then they bind more avidly to intra-arterial proteoglycans, which trap them in the arterial wall. Finally, small dense LDL particles are more susceptible to oxidation, enhancing macrophages' uptake. Postprandial triglyceride levels also increased in subjects with obesity, and these chylomicron remnants are pro-atherogenic (Masuda and Yamashita, 2017). Bays et al. (2013) found that the more significant the increase the lipid levels' abnormalities. Approximately 60-70% of patients who are obese are dyslipidemic, while 50-60% of overweight patients are dyslipidemic. The increased risk for cardiovascular disease in patients with obesity is partially accounted for by this dyslipidemia.

Cameron, Magliano and Soderberg (2013) emphasized that the effects of obesity on lipid metabolism are dependent on the location of the adipose tissue. Increased visceral adipose tissue and trunk (especially upper trunk) subcutaneous adipose tissue are associated with insulin resistance, higher triglycerides and lower HDL cholesterol levels. In contrast, increased subcutaneous adipose tissue in the leg is associated with lower triglycerides. The protective effect of leg fat may explain why women and African-Americans have low levels of triglycerides.

According to Klop and Castro Cabezas (2012), management of obesity-associated dyslipidemia should focus on lifestyle modification, including weight loss, physical exercise and a healthy diet. Lifestyle alterations synergistically improve insulin resistance and dyslipidemia. The quantity of ingested fat and total calories are the most important dietary factors to cause obesity and postprandial lipemia. The type of dietary fat also induces postprandial lipemia reported by Lopez-Miranda, Williams and Lairon (2007). A rat study conducted by Roberts (2007) showed that a diet high in saturated fats diminished LPL protein levels and LPL activity in skeletal muscle.

In contrast, LPL activity was increased in adipose tissue favouring shunting of lipids from skeletal muscle to adipose tissue. Moderate weight reduction (approximately 10%) in obese but contrarily healthy men, which was caused by a diet low on carbohydrates and SFA and high on mono-unsaturated fatty acids (MUFA), resulted in a 27%–46%decrease in postprandial TG levels (Maraki, 2002). Long-term consumption of MUFA resulted in a decrease in postprandial inflammation compared to a diet rich in SFA in patients with the MetS (Cruz-Teno, 2011). The physical exercise showed enhanced LPL and hepatic lipase activity, which resulted in TG lipolysis (Thomas, 2012; Ferguson,1998). A recent study by Harrison (2012) could not confirm that exercise-induced LPL activity remains doubtful, but it hypothesized that exercise excites mostly muscular LPL activity. Exercise-induced reductions in intra-hepatic TG content have also been stated even in the absence of weight loss by Magkos (2010). Moreover, intra-hepatic TG content was decreased in overweight men after a low-fat diet for three weeks, whereas

a high-fat diet increased intra-hepatic TG (Van Herpen, 2012). The plasma TG lowering the impact of exercise and weight reduction is the most logical finding in investigations concerning blood lipids (Mestek, 2009). In contrast, increasing HDL-C levels by physical activity remain doubtful, particularly in those subjects with high TG and low HDL-C levels (Thompson and Rader, 2001). Other dietary factors besides calorie limitation and the type of dietary fat also showed advantageous effects on dyslipidemia. Dietary intake of resistant starch, a dietary fibre, has been shown to promote nutrient absorption and linked to insulin metabolism. Daily consumption of resistant starch from bread, cereals, vegetables and pasta is approximately five g/day in the Western world, not sufficient for potential health benefits (Maki, 2012). A successful dietary management and lifestyle intervention needed for the primary prevention of obesity and dyslipidemia reported by Yasmeen et al. (2017)**.** Vidya (2018) found that weight loss through a balanced diet results in favourable changes in various health parameters, including lipid profiles, reducing the risks for CVDs. Investigators in separate studies have found that weight loss is achieved through diet or exercise, resulting in an equivalent increase in HDL cholesterol and TG levels reduction. Many reviews warrant the efficacy of dietary and non-pharmacologic measures to lower cholesterol compared with pharmacologic actions.

Need of the study: However, there is a scarcity of information on dietary management of obesity and its complications in India. Therefore, the study of dietary efficacy in lowering cholesterol levels is significant to increase the pool of information and awareness in India and also investigate the average weight loss, decrease in BMI and decrease in waist circumference in male and female overweight and obese adults resulting from moderate-fat balanced nutrient reduction diet practices.

OBJECTIVES

The present study is guided by the following specific objectives:

1. To find the effect of Moderate Fat Balanced Nutrient Reduction Diet practice in overweight and obese individuals on weight reduction, waist circumference and BMI.
2. To find the effect of weight reduction on lipid profile through Moderate Fat Balanced Nutrient Reduction Diet practice in overweight and obese individuals.

HYPOTHESIS

Subjects who lost 10-15% of their initial body weight would significantly improve their lipid profile in a relatively short-term diet modification program.

METHODOLOGY

Research Design

The study was carried out in a Diet Clinic, Urban Patna. Out of 100 participants,24 overweight and obese adults, 16 Males and eight females in the age group of 25-60 years have high blood cholesterol levels enrolled in a weight loss program and were purposively selected for the study over 180 days. The data was collected in February – March 2016 and excluded data from patients

who did not complete the program. Formal permission was taken from the authority of the Vidya Diet Clinic.

Tool: Pre-tested and pre-designed interview schedule was used to obtain information from overweight and obese females. The interview schedule included questions regarding General information, Anthropometric measurements, Biochemical estimation, Lifestyle history, Food habits, Medical history, and Follow up record chart. Overweight and obese males and females were interviewed during their clinic visit.

Data collection and Intervention Programme : After recording the medical & lifestyle history of all enrolled overweight & obese participants, they were counselled regarding the concept of moderate fat balanced nutrient reduction diet practices (Freedman, King and Kennedy, 2001). Lifestyle modification included a balanced diet plan composed of approximately 1600 kcal per day, 55-65% of carbohydrates, 10-20% of proteins, 25-30% fat of total calories similar to Moderate-fat, balanced nutrient reduction diets, a Popular diet promoted by commercial weight-loss centres (e.g., Weight Watchers, Jenny Craig, Nutri-Systems). All food groups like whole cereals, whole pulses, non-vegetarian foods, cow's milk and its products, fruits and vegetables, nuts and oilseeds and cooking oils were included in the diet. The meal was planned according to participants' convenience, likes, dislikes and food habits. The weight and anthropometric measurement assessments were done by a standardized weighing machine and an inch tape. Twelve-hour fasting blood samples were collected, and estimation of lipid profile level was done by a reputed laboratory at the time of joining and after the weight loss program. The collected data were tabulated and analyzed.

Statistical Analysis of Data

Exploratory data analysis was carried out; the results obtained are given in Tables 1-3. Changes in lipid profile are illustrated in Figure 1.

RESULT AND DISCUSSION

Twenty-four subjects (16 Males and 8 Females) completed the weight loss programme through the Moderate Fat Balanced Nutrient Reduction Diet. The findings in the table-1 showed that the male's weight, BMI and Waist Circumference was higher than the female subjects. There was also a significant decrease in weight, BMI and Waist Circumference in both males and females.

The study's objective was to find the impact of dietary modification without any strenuous exercise on the weight and lipid profiles among overweight and obese adults. Reductions in weight, BMI and Waist Circumference among participants were significant, which was feasible by administrating a controlled diet scheme. The NHLBI had also supported that the subject who had consumed a moderate-fat balanced nutrient reduction diet lost body fat and decreased waist-hip circumferences. Freedman (2001) found that consuming low caloric diets results in weight reduction. Without physical activity, a diet that contains 1400 to 1500 kcal/day, regardless of macronutrient composition, results in weight loss. A diet high in fruits, green vegetables, complex CHOs, and low-fat dairy is a moderate fat, low-calorie diet that prevents weight gain and results in weight loss and maintenance.

Table 1: Average weight, BMI & WC before & after weight loss program of male & female

	Before		After	
Measurements	Male N = 16	Female N = 8	Male N = 16	Female N = 8
BMI(Kg/m^2)	32.843	31.22	28.443	27.29
Weight (Kg)	96.78	78.246	85.203	67.40
WC(Cm)	104.921	93.21	90.811	82.19

Table 2 and table 3 revealed that the reduction in weight, BMI, and WC of males was higher than females. The rate of obesity reduction through a controlled diet regime was faster for males as compared to females. The weight of male participants reduced on average by 11.58 Kg (482.5gm/wk), and this was 10.84 Kg (451.66 gm/wk) for female participants in six months of weight loss program through VDCBD containing approximately 1600kcal/day. Freedman (2001) stated the goal of moderate-fat balanced nutrient reduction diets is to provide a wide range of food choices to the consumer to allow for nutritional adequacy and compliance while still resulting in a slow but steady weight loss rate of 1 to 2 lbs/wk.

Table: 2. Average reduction in Weight, BMI & WC after weight loss program of male N=16

Measurements	Mean	SD
Weight (Kg)	11.58	5.143
BMI (kg/m^2)	4.40	2.24
WC(Cm)	14.11	5.16

Table: 3. Reduction in Weight, BMI & WC after weight loss program of female N=8

Measurements	Mean	SD
Weight (Kg)	10.846	3.80
BMI (kg/m^2)	4.13	1.51
WC(Cm)	11.21	3.33

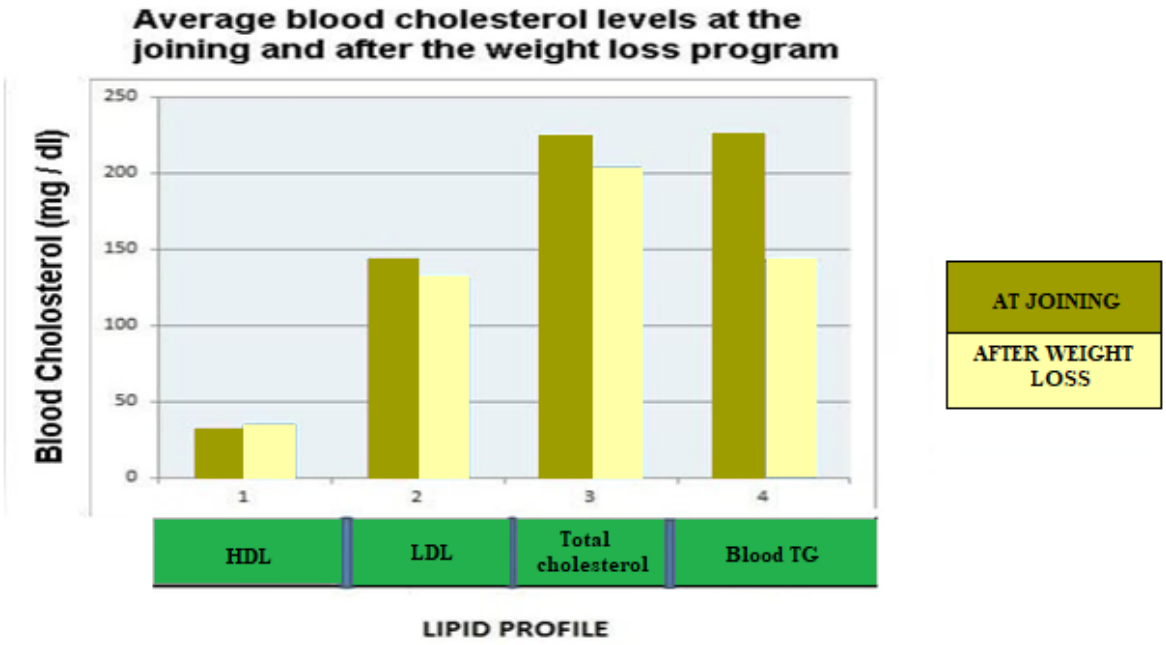

Fig- 1. Average Blood Cholesterol Levels at the Time of Joining and After Weight Loss Program

A significant decrease in total cholesterol level, TG and LDL were found, whereas HDL and good cholesterol were increased in this study, as shown in Figure 1. The systematic review of the effects of the National Cholesterol Education Step I and II dietary intervention programs on cardiovascular disease risk factors also confirmed intake of reduced-fat, high-CHO diets show the changes in blood lipids dominated by the slight weight loss induced by such diets.

Studies reviewed by Golay et al. (1996) reported diets containing 26% fat (either 1000 or 1200 kcal) resulted in reduced TC, HDL cholesterol, and TGs. Skov et al. (1999) reported diets containing 29% fat (but 2600 kcal) reduced TC and HDL but increased TGs. Theusen etal.(1986) reported that subjects consuming 21% fat diets containing1835 to 2026 kcal for one year had decreased total and LDL cholesterol levels, no change in HDL cholesterol, and decreased TGs. Wood et al. (1988) also concluded that fat loss through dieting or exercising produces comparable and favourable changes in plasma lipoprotein concentration.

CONCLUSION

Obesity is an independent predisposing factor for coronary heart disease (CHD). The grade of obesity is directly correlated to CHD development as even moderate overweight showed an increased risk of CHD. When the brain's blood vessels are diseased, they may rupture, or there may be insufficient blood supply to the brain resulting in a stroke. A reduction in weight leads to an improvement in cardiovascular risk factors like hypertension and abnormal lipid levels. The blood pressure becomes routine, and the lipid profile improves. The present study concludes that there is a highly significant decrease in weight, BMI & waist circumference resulting from the diet similarly designed as a moderate-fat balanced nutrient reduction diet for six months of the weight loss program. The program also revealsa significant decrease in total cholesterol levels, TG and LDL, whereas HDL increased among obese individuals enrolled in a weight loss program within

six months.Therefore, all overweight and obese adults with dyslipidemia should be advised to make a specific change in diet to reduce body weight and control cholesterol levels.

It is recommended that future studies should include larger sample sizes and investigate the effects of weight loss through a balanced diet on cholesterol levels.

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AVAILABILITY OF PLAY MATERIALS AMONG HOUSEHOLDS OF PRE-SCHOOL CHILDREN

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ABSTRACT

Preschool period is defined as the period from three to six years, and is a time of remarkable growth with brain/mental development at its peak. During this stage, children are highly influenced by the availability of toys, environment, people surrounded by them and stimulation to grow. Play is one of the important parts of any child's life, and it is one of the major conducts that promotes children's imagination, skills and creativity. Also play materials, play mates have a considerable role in play. Previous studies on children's play have focused on the positive relationship between play and creative thinking ability. In addition to that many previous studies about play and play materials have shown that in recent years creativity in children's play have fallen off and the preference of play materials have altered in some aspects. The development of this present study was influenced by various concerns of parents, educational professionals as to whether every pre-schooler provided with enough play materials in their home and how these play materials promotes overall development of children. Therefore, the main purpose of the present study was to examine the availability of play materials among households of preschool children and their choice of play materials in a materialist and advanced world. A total of 60 preschool children home were selected from Coimbatore district through convenience sampling method. The results predicted that, there was a significant difference observed in the availability of play materials in pre-school children home based on age, income of the family and type of school. This revealed that children among age group of 4.5-6 years studying in private school and their family with high income level found to have many types of play materials in their home in different developmental domains. However, there was no significant difference found in the availability of play materials among households of pre-schoolers based on gender. This result suggests that the learning environment should provide a rich assortment of play materials and equipment for preschool children to have a positive impact on them to learn and explore the world with a rich imagination in a blissful way. Further this study recommends examining the toy preferences, creativity and its significance in developmental aspects.

Key words: play materials; pre-school children; type of school; gender; age; family income

INTRODUCTION

Pre-school period is the most intensive period and is considered as the foundation period for future learning and development. According to Integrated Child Development Services (ICDS), the pre-school age is considered as the age-group of three to Six (3-6) years (Sachdev et al. 2011). Studies have found that by the age five the brain volume is 90% equivalent to adult size (Rintoul 2005) and brain development remains at its peak. As this stage is the most critical period for growth and development of the child, so it needs the utmost attention and appropriate care to

support their development. Exploring environment by creativity and initiating self-expression are the major characteristics seen in this period which they develop through daily activities including play. It is the environment that we provide to the young minds to explore and try out new things around them. Rachel E. White (2012) has stated in his study that providing children with rich play experiences, and helping parents to understand the importance of playful learning in children's lives, we can help children to learn, to express, build relationships, be happy, and find success in their lives.

Play is an integral part of every child's life, and it is a physical or mental activity that is undertaken purely for enjoyment or amusement. Children need to be given plenty of time and varieties of different unstructured materials to play with freely (Elif Celeb iOncua, Esra Unluera, 2010). Through play, they explore their world and world of others, and practice their skills and learning, as young minds are full of curiosity. Play can be considered as universal language of children and is the building blocks of children's growth. Play also offers an ideal opportunity for parents to connect fully with their children (Ginsburg, 2007). Play usually allows children to gain control of their thoughts, feelings, actions, and helps them achieve self-confidence. Play for children should be such that are self- chosen and self-directed and should not be enforced one. According to Parten, there are six major types of play, and they are unoccupied play, Solitary play, Parallel play, onlooker play, Associative play and Cooperative play (Kylie Rymanowicz, 2015).

Playing becomes meaningful and more amusing when play materials are available to children. Play materials are any material, object or anything which children use for fun and play. Play materials are essential in preparing children for adult life (Waweru Joyce Wangui, 2013) Children find play interesting and amusing when they are provided with suitable play materials. Play materials enhance interest among children towards play and also have an effect on children's learning, especially in their creative problem-solving skills (Raja Omer Bahatheg2010). The pre-school children manipulate and explore play materials and learn from them. Play materials influence in syntactic complexity and morphology (Mirtes2014).

A good toy allows children to actively engage in many areas of development and can be used in a wide variety of ways, depending on the child's interests, capacity, and imagination. Young children are naturally curious and providing them with high-quality which may not be expensive, materials is important to the learning process. Therefore, in the selection of the household play materials parents and adults need to be very careful and responsible and intelligent at the same time. The selection of play materials is greatly dependent on age, gender, family-income, and type of school, parental attitudes, utility, likes and dislikes etc. The availability of play material among pre-school children home varies on different variables, so the present study is aimed to assess the influence of age, income of family, gender and types of school on the availability of play materials.

OBJECTIVES

1. To assess the availability of play materials among households of pre-school children based on age.
2. To assess the availability of play materials among households of pre-school children based on family income.
3. To assess the availability of play materials among households of pre-school children based on gender.

4. To assess the availability of play materials among households of pre-school children based on type of school.

HYPOTHESES

- Hypothesis-1: There is no significant difference observed in the availability of play materials among households of pre-school children based on age.
- Hypothesis-2: There is no significant difference observed in the availability of play materials among households of pre-school children based on family income.
- Hypothesis-3: There is no significant difference observed in the availability of play materials among households of pre-school children based on gender.
- Hypothesis-4: There is no significant difference observed in the availability of play materials among households of pre-school children based on type of school

METHODOLOGY

The Coimbatore District was considered as the selected area since there was no previous study focused in this area and researcher also wanted to know the availability of play materials among households of preschool children. The less availability of play materials may result to unhealthy development of the children. This study would be helpful for further research in play materials and its influence on the developmental domains of the children.

The convenience sampling method, which is a non-probability sampling method, where subjects are selected considering their convenient accessibility and proximity for the researcher, was adopted for the present study. A total number of 60 houses were selected and data were collected from both the parents by using questionnaire method to assess the availability of play materials in their home. The age of the children was also kept in mind and 3-6 years age group was selected.

A self-constructed checklist on "Availability of Play materials" was used to know the availability of play materials under five domains i.e. Fine Motor, Gross Motor, Cognitive, Social and Language Development available in their homes. A total of 30 play materials were listed and the researcher categorized the play materials under the above mentioned five domains of development in the checklist. The researcher had prepared three equal class interval levels- Maximum, Average and Minimum by using mean and standard deviation. The level of availability of play materials was considered minimum if the score was (35-46), average if it is (47-58) and maximum if the score was (59-70) A separate questionnaire was also prepared by the researcher to collect the background information among the respondents. Higher the score, better the availability of play materials in their respective homes.

The play materials listed under five developmental Domains were-

Fine Motor- Clay/dough, cutting/pasting materials, threads and beads, painting brush, pencils/crayons, buttons, zipping etc

Gross Motor- Bat/ball, Skipping rope, bicycle/tricycle, hopscotch, wheels, ladder and slides, toy vehicles etc

Cognitive- puzzles, blocks, alphabet board, animal/flower/ vegetable/fruit chart, size and shape blocks etc.

Social development- Kitchen set, ball/bat, chess, carom, doll corner etc

Language Development- story book, interactive toys, rhymes CD, charts etc.

Prior to the data collection the researcher visited the nearby pre-schools to collect the background information of parents. After that, researcher visited some households in Saibaba colony and collected the relevant information by using the questionnaire method. The researcher established rapport with the respondents and made them understand the purpose of the study.

After collecting the required information, the data was then analyzed by appropriate statistical applications like frequency, mean, standard deviation, t-test, ANOVA.

FINDING AND DISCUSSIONS

The findings of the study have presented in two heads-

a. The descriptive statistics of the variables-age, gender and types of school.
b. The availability of play materials among households of preschool children based on age, gender, type of school and family income.

a. **The descriptive statistics of the variables-age, gender and types of school**:

The researcher has selected four variables- age, gender, types of school and income of family from the background information. The descriptive statistics (Frequency, Percentage) of the four selected variables are tabulated in this heading.

Table-1 The descriptive statistics of the variables age, gender, type of school and Income of family

Sr. No	Variables		Frequency N=60	Percentage (%)
1	Age	3-4.5	34	56.7
		4.5-6	26	43.3
2	Family income	Low Income (below 25,000 per month)	17	28.3
		Middle income (25,000-70,000 per month)	23	38.3
		High Income (above 70,000per month)	20	33.3
3	Gender	Male	33	53.3
		Female	27	55.0
3	Type of School	Government	31	45.0
		Private	29	51.7

Table-1 depicts the frequency and percentage of the variables age, gender, types of school and Income of family.

b. The availability of play materials among households of preschool children based on age, gender, type of school and income of family.

The availability of play materials was categorized under three equal class intervals- Maximum, Average and Minimum based on the total mean and standard deviation score derived from the total score from five domains of development i.e. Gross motor, Fine motor, Cognitive, Social and Language development. The option in the questionnaire was given yes and no. The yes was awarded as 2 and no awarded 1. Higher the number of play materials availability, higher was the score and vice versa.

Majority i.e. 56.7% of children from selected households was under the age group 3-4.5, and 43.3% were under 4.5-6 years. With regard to gender, majority were (53.3%) male and 55.0% were female children. With respect to their school, 45.0% of them studying in government school and 51.7% were from private school.

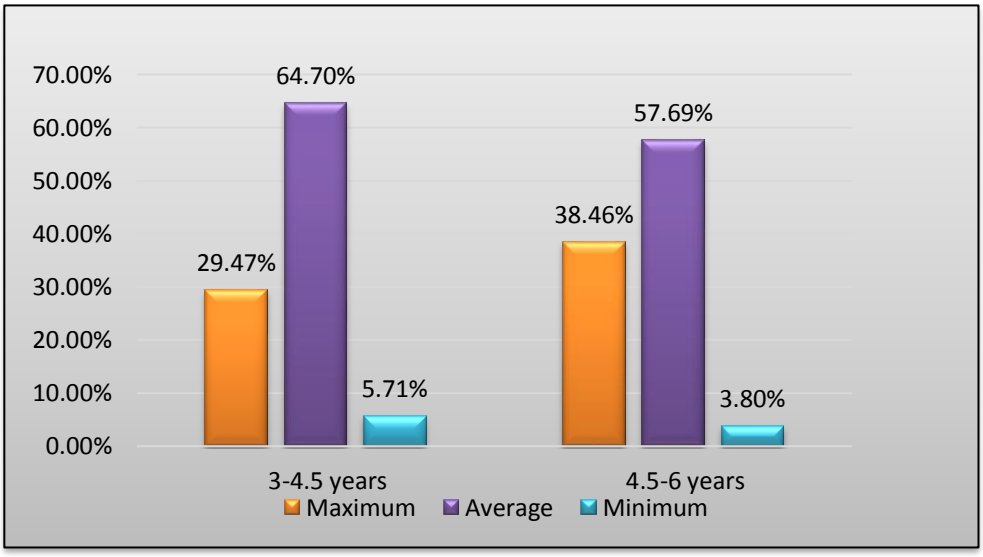

Fig.-1 Availability of play materials based on age

The Fig.-1 depicts the level of availability of play materials among households of preschool children based on age.

Majority i.e. 64.70% of 3-4.5-year-old children had average number of play materials and 29.47% of them had maximum and the rest 5.71% were having minimum number of play materials. On the other hand, children of 4.5-6 years, majority (57.69%) had average number of toys, 38.46% were having maximum and only 3.8%were having minimum number of play materials in their home.

Table-2 Mean, SD and t-values of play materials availability among households of pre-schoolers based on age

Sl. No	Age N=60	Mean	SD	t-value
1	3-4.5 years	61.67	6.10	t= 0.531
2	4.5-6 years	64.68	5.10	p= 0.044**

**Significant at 0.5% level

The table-2 shows the mean, SD and t-values of availability of play materials among households of preschool children based on age. It was observed that, obtained mean and SD value of the 3-4.5 years children homes are 61.67 and 6.10respectively. In case of 4.5-6 years children homes the values were 64.68 and 5.10 respectively. The observed t-value is 0.531 and p value 0.044 which is significant at 0.5% level. It can be concluded that 4.5-6 years children's household were having more play materials as compared to the 3-4.5 years household. Hence, hypothesis-1 could be rejected.

This finding is supported by a study of Carolyn Pope Edwards et al. (2001), they found that "As they grow older, boys and girls differ in selection of playmates and also in their preferences of toys, games, and activities. The difference in toy preference appears around the age of two and strengthens by the age of five, as children come under the socializing influences of peers, parents, and the media."

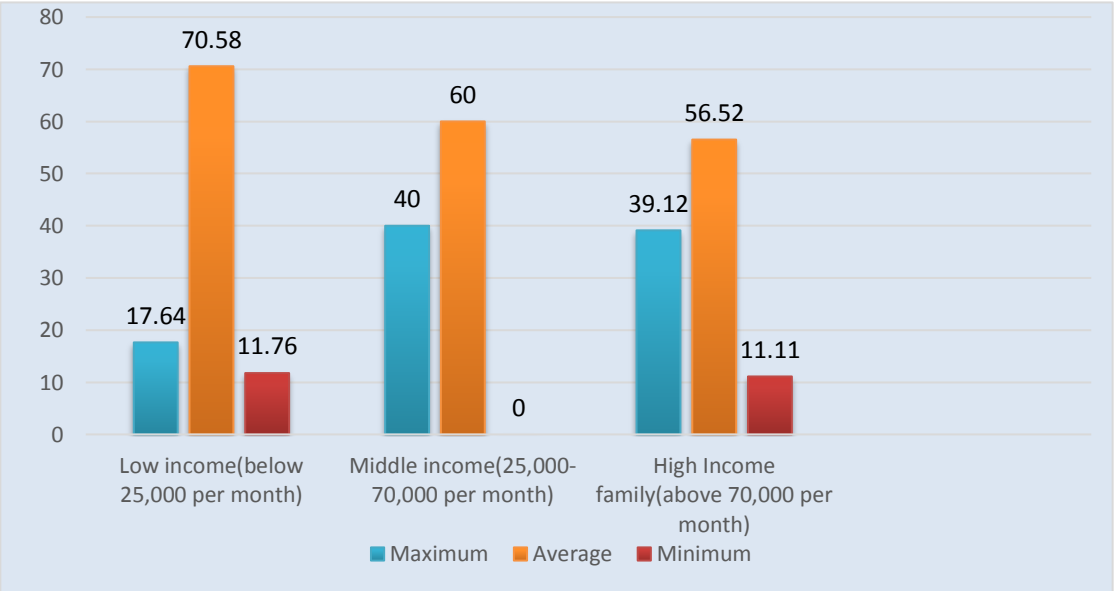

Fig.-2 Availability of play materials based on family income

The Fig.-2 shows the availability of play materials among pre-schooler's households in relation to income of the family.

This figure depicts that majority of pre-school children i.e.70.58% of low-income family (below 25,000 per month) were having average number of household play materials and 17.64% were having maximum number of play materials and the rest 11.76% are having minimum number of play materials.

The majority of pre-school children i.e. 60% of middle-income family (25,000-70,000 per month) were having average number of play materials and 40% had maximum number of play materials. Regarding the children from high income family (above 70,000 per month), 56.52 % had average number of play materials, 39.12% were having maximum number of play materials, 11.11% were having minimum number of play materials.

Thus, it is found that the children of middle-income group family had maximum number of household play materials than the other groups.

Table-3 Mean, SD and t-values of play materials availability among households of pre-schoolers based on income of family

Sl No	Family income (n=60)	Mean	SD	F-value
1.	Low Income (below 25,000 per month)	60.64	4.47	F=3.43 p= 0.039**
2.	Middle Income (25,000-70,000 per month)	60.64	6.68	
3.	High Income (70,000 and above per month)	62.91	5.7	

**Significant at 0.05% level.

Table-3 shows the mean, SD and t-value of play materials availability among households of preschool children based on family income.

Among the children of low family income family, the Mean and SD value was 60.64 and 4.47 respectively and this value for middle income children was 60.64 and 6.68 respectively and in case of children of high-income family the mean and SD value was 62.91 and 5.7 respectively. The obtained F-value was 0.039 which is significant.

This result predicted that higher income families are having better and more number of play materials than those of others, hence hypothesis-2could be rejected.

This finding is supported by a study by Halpern (2000) "Early Intervention for Low Income Children and Families". This study says "At least 20 percent to 30 percent of families below the poverty threshold do not have the minimal financial, material, or social resources to meet their children's needs."

Table-4
Availability of play materials based on gender

Sl. No.	Gender	Maximum		Average		Minimum	
		N	%	N	%	N	%
1	Male (33)	10	30.3	22	66.6	1	3.0
2	Female (27)	10	37.0	15	55.5	2	7.4
Total	N=60	20	33.3	37	61.6	3	5.0

Table-4 depicts availability of play materials at the households of preschool children based on age.

This table shows among male children majority i.e. .66.6% were having average number of play materials, 30.3% were having maximum and only 3.0% of them have minimum play materials in their home. In case of female children household's, majority (55.5 %) were having average number of play materials. 37.0% were having maximum and rest7.4% were having minimum number of play materials in their house.

Table-5 Mean, SD and t-values of availability of play materials among households of pre-schoolers based on gender

Sl no	Gender N=60	Mean	SD	t-value
1.	Male (33)	62.30	6.44	t=4.0 p=0.22NS
2.	Female (27)	64.14	4.99	

Table-5 shows Mean, SD, and t-values of availability of play materials in the households of pre-school children based on gender.

The Mean, SD value among male children were 62.30 and 6.44 respectively, in case of female children the scores were 64.14 and 4.99 respectively. The obtained t- value is 4.0 and p=0.22 which is not significant. The results predicted that there is no significant difference observed among households of preschool children's toys availability based on gender. Hence, hypothesis-3 could be accepted.

But in another study by Carolyn Pope Edwards et al. (2001) found that "girls may play with different types of toys, but boys more predictably turn to the masculine stereotyped play items. Girls' play often centers on themes related to family and domestic life. In many communities, girls are often be seen playing with dolls, household objects, dress-up clothes, and related materials. The play activity of boys may be different in form and goals from that of girls. Boys are often observed playing with, weapons, transportation toys and building materials"

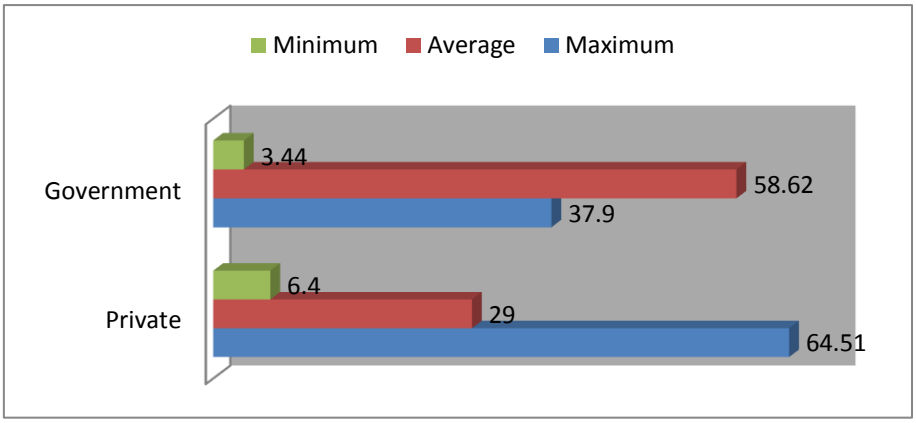

Fig.-3: Availability of play materials based on type of school

The Fig.-3 shows the level of availability of play materials at households of pre-school children based on Type of School. This figure depicts that among the private schoolchildren majority i.e. (64.51%) were having maximum number of toys, 29.0% were having average and the rest 6.4% were having minimum number of toys in their home. On the other hand, among the government schools' children majority i.e. (58.62%) were having average number of toys, 37.9% have maximum and the rest 3.44% were having minimum number of play materials.

Table-6 Mean SD and t-test of availability of play materials among households of pre-schoolers based on types of school

Sl. No	Type of school N=60	Mean	SD	t-value
1.	Government	61.67	6.18	t= 3.6 p=0.046**
2.	Private	64.68	5.16	

**Significant at 0.5% level.

Table-6 depicts the Mean, SD, and t-value of availability of play materials in households of pre-school children on the basis of type of school.

The Mean, SD value of the respondents among government school children were 61.67 and 6.18 respectively. And on the other hand, the Mean, SD value of the respondents among private school children were 64.68 and 5.16 respectively. The observed t-value is 0.046 and p value is 0.046 which is significant at 0.5% level. So, this result proved that private school children have better number of play materials than government school children in their household's. Hence, the hypothesis-4 could be rejected.

SUMMARY AND CONCLUSION

Play materials are among the most essential things in life of every child. Play materials provide opportunity to experience and to build perspective of the world they are living around. Play and learning are the two sides of a same coin for children. Hence, it is the utmost responsibility of every parent to provide necessary play materials and also to be aware of the importance of play materials to their children's lives.

From the current study it was observed that the children among the age group of 4.5-6 years have more play materials as compared to the children of age group 3-4.5 years. Again, the study found that the preschool children of from high income group family of Coimbatore city have more household play materials. The study also found that the children from private school are having more play materials as compared to the children of government schools.

Bell and Wolfe (2004) argues that play has a direct contribution to children's social and emotional development. But it is the play materials that stimulate and prolong play. Bell and Wolfe (2004) further observes that if children are to discover their potential, what they prefer, they will need variety in their play, and a broad assortment of toys to make it possible. Children would play longer when they are allowed to choose their play things (Eccles and Templeton, 2002). Toys should be chosen in such a way that children can enjoy playing alone and with others, in active as well as passive manner. Some toys like field games, board games, ball games, and large-weight blocks will encourage co-operation in children.

This study is one of very few studies which have investigated the availability of play materials in preschool children homes. It reinforces an understanding that play should not be optional in the process of teaching and learning for children. The essence of play materials in homes rather than school is a necessary core factor to enhance physical, emotional, and social development. This study identified that private school children of aged 4.5-6 years whose family income level higher are found to have better and good number of play materials based on developmental domains. Further study should focus on identifying correlation with developmental milestones and play materials availability.

IMPLICATIONS

- Developmental milestones could be focussed in further study
- Unable to sort out traditional and modern play materials.
- Future research can focus on comparison of rural and urban households and parental involvement

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THE MORAL REASONING OF 4–10-YEAR-OLD CHILDREN ABOUT STEALING

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ABSTRACT

Moral cognitivism broadly requires people to accept that moral judgments can either be right or wrong. Examining the reasoning behind moral judgments can provide a deeper insight into the processes with respect to moral development in children from different cultural backgrounds. This paper is based on a doctoral study on moral judgment and reasoning related to lying, hitting, disloyalty, disobedience and stealing among 4-to 10-year-old school-going children from rural and urban India. Findings showed that culturally adapted tasks worked well in generating detailed responses from children about their perspectives on the situations presented, as well as their imagined reactions to their being in similar situations. The children's judgment and reasoning about stealing is presented in this paper. It was found that children's responses were significantly inclined towards social appropriateness while answering how they would react in a particular situation (steal or not) versus what the protagonist of the story would do. Children from the older age group (8- to 10-year-olds) responded differently as compared to the younger and older age groups.

Keywords: moral judgment, moral reasoning, stealing, childhood, culturally relevant tasks

INTRODUCTION

Theories on moral development have mostly attempted to present a picture of children's thinking and beliefs which are expected to be applicable universally. In the eighteenth and nineteenth centuries, conceptual shifts occurred which were so drastic that it was termed as 'the great transformation' by Danziger (1997), which paved the way for modern psychology (Brinkmann, 2011). The construction of childhood and development is predominantly based on Western theory and method that has contributed to constricting the scope of examining culturally situated processes in the value system of non-Western populations. (Chaudhary and Sriram, 2020).

Theoretical perspectives

To understand children's development, it is imperative to examine it from different perspectives to come to a more complete understanding. Moral development in general has two aspects, emotional and rational. The interplay between these two could probably contribute to

determining moral processes with greater accuracy. Three theoretical perspectives which could be of value to this study have been mentioned:

1. Social intuitionist perspective (Haidt, 2001): Moral judgments according to the social intuitionist perspective could be defined as evaluations of the actions of a person made with respect to emotions attached to a particular value in a particular culture or subculture.
2. Theory of mind (Bora, et, al., 2009): According to the theory of mind, children start paying attention to the perspective of others and develop the ability to attribute mental states in the preoperational stage.
3. Dual process theory (Greene, et, al., 2004): Intuitive emotional responses and controlled cognitive responses play a crucial role in arriving at moral decisions.

These perspectives explain how rational and emotional processes help a person arrive at decisions which are morally appropriate keeping in mind the perspective of others. Being able to gauge other's perspective helps the person to come to his/her own perspective in relation to others and the values held by a particular culture or subculture in which the person resides.

Moral development: Morality, moral judgment and moral reasoning

Moral development is an umbrella term used to include features of moral judgment, moral reasoning and morality in general. Morality could be defined as a code which incorporates moral rules, ideals and virtues (Gert, 2005). Moral reasoning is a "conscious mental activity through which one evaluates a moral judgment for its (in)consistency with other moral commitments" (Paxton and Greene, 2012). Moral development is life-long, socially generated and context-dependent (Menon, 2003). Varma (1976) states that "morality is a learned set of criteria consisting of statements ranging from verbal to completely non-verbal conscience which determine the choices of behavior including verbal behavior on the dimension of right and wrong".

Considering intellectual and emotional aspects while giving little or no attention to behavioral aspects could probably give an incomplete picture. Studying behavior is a tricky task so it is better to start with rational and emotional aspects and progress towards behavioral aspects.

Cultural transmission

In the process of development, children are expected to imbibe social codes though the process of observation, imitation and intuition. During this process they constantly suppress their desires in order to conform to social standards under adult and peer pressure which in turn affects the development of moral concepts (Desai, 1971 as mentioned in Gupta, 1982).

It could be assumed that no culture supports stealing, yet it does happen at all ages. It would be interesting to investigate what is considered stealing, when is stealing permissible and how children perceive acts of stealing. Studies show that young children are able to reason in morally adequate ways about moral transgressions (Turiel, 1983). Preschool children can successfully identify another person's feeling state (Borke, 1971; Deutsch, 1974, 1975). Concentration on hypothetical universal tools to study aspects of moral development rather than on culture specific tools could probably affect

developmental outcomes. While investigating a sensitive issue as that of stealing, it is important to outline that mere investigation does not guarantee a complete picture because the verbal aspects of development may or may not differ from the actual behavioral ones.

Stealing

Psychologists believe that it is the most pervasive form of juvenile delinquency yet most people tend to avoid terming it as 'stealing' due to the excessive emotional load attached to it. Stealing is rarely acknowledged as something to delve into or write about. Most schools, communities and even parents tend to avoid the subject although it is a large part of antisocial behavior later on in life if it becomes an activity which is continuously carried out by children. Hardly any literature exists on the investigation of stealing among children.

Kohlberg's (1979) well known Heinz dilemma was used to study stealing behavior. Dilemmas like these are drastic and extreme which are appropriate for use with older children of the middle school age and beyond. Acts of stealing in childhood are usually small and covert in nature. To understand these acts or to get acknowledgement from children about these is a tricky scenario.

OBJECTIVES

The paper is based on the doctoral research study 'Moral reasoning among 4-to-10-year-old children: The cultural relevance of moral development theories' (Raees, 2021). The objectives of the study were:

1) To examine moral reasoning among 4–10-year-old children
2) To investigate continuities and discontinuities with existing research
3) To explore the cultural relevance of theories of moral development
4) To recommend methods for the culturally relevant study of moral reasoning among children

METHOD

Research design: Sampling, tools and data collection

Sampling: The study sample was taken from 4 government schools and one Anganwadi in Delhi, NCR and district Bijnor in Uttar Pradesh, India. The children were in the age group of 4-to 10-year-olds. To explore age trends in moral development and reasoning, the sample was divided into three age groups: 4-to 6-year-olds, 6-to 8-year-olds and 8-to 10-year-olds. Convenience sampling technique was applied to select the schools. Systematic and purposive sampling technique was used for sample selection. A total of 96 children with equal number of boys and girls were selected.

Tool: The process of designing the tools consisted of reviewing already existing tools for the study of moral development followed by applicability of standardized tests. Initially moral dilemma stories of studies done by Piaget and Kohlberg were tried and tested but they lacked familiarity with respect to the context. Standardized tests like the Moral Judgment Scale (Lind, & Wakenhut, 1985),

Padua Moral Judgment Scale (Comunian, 2011), Self-Appraisal Scale (Franklin, 2009), and several others were also studied and found ineffective even after adaptation. Some tests developed for Indian children were also considered but these tests were better applied to older children and adolescents.

Culturally relevant tasks were designed and developed using picture cards, story books and video films followed by interviews/interactions which were conducted to delve deeper into the reasoning given for the moral judgments made. Three types of tools were designed, repeatedly tested and adapted to be used to elicit responses from children on five themes of moral judgment and reasoning: lying, hitting, disloyalty, disobedience and stealing. All tools were developed in Hindi. The tools described below were specific to the theme of stealing.

1. Picture card (What would Manish do?)
2. Story narration (Bird and the sea)
3. Animated Video film (Naughty Sherry)

Picture card (What would Manish do?): In this story, two classmates Rahul and Manish were told by the teacher to bring money from home to pay for a school picnic. Next day, Manish asked Rahul if he had got money. Rahul responded that the money was in his bag. After the recess bell rang, the children got out of the class for lunch break. Manish kept thinking, "I forgot to bring the money, how do I give the money to the teacher?" The children in the study were asked:

1. What would Manish do?
2. What would you have done if you were in his place?

Story-narration (Bird and the sea): A bird had kept her eggs near the seashore. She went to collect food. On coming back, she saw that her eggs were not where she had kept them. She became sad and started crying. The sea started laughing at her to show how powerful he was that he drowned her eggs. The sea warned her to not keep her eggs on the seashore ever again. Children were asked:

1. Did the sea do the right thing? Yes/No
2. Why?
3. If you were the sea what would you have done?

Video film (Naughty Sherry): In this video film, a boy named Sherry is shown to have the habit of stealing. He stole his classmate Rahul's pencil box. When the teacher asked, he remained quiet. He stole another classmates' diary one day. Suddenly the teacher saw that the diary in Sherry's bag so she questioned him. The participants were asked:

1. Is it okay to steal?
2. Can we ever steal?
3. Can we steal from our own house?
4. Have you ever stolen?

Qualitative analysis:

Qualitative methods of data analysis were applied to analyze the data. Content analysis of interview responses was doneto draw themes and meaning from children's responses. The analysis was divided into three phases starting with primary analysis, content analysis and lastly comparative analysis. In primary analysis, the descriptive data were continuously examined for highlighting points in the text. These markings served to note contradictions and inconsistencies. Many of these first attempts at analysis helped in shaping ideas as further data collection and analysis proceeded. A matrix was prepared to be used for entering the responses of the different tools that were used in the study. The dimensions of theme, responses to the picture cards, responses to post story narration questions and responses to questions on the video film were tabulated. Once entered in the matrix, these responses were coded by the process of open coding, categorized and analyzed.

Comparative analysis: It was done, and comparisons were made to establish trends by age group, region and sex of the child. Instances were compared over a period of time through a variety of methods. Comparisons were made in bringing out the distinctive elements of a category and establishing generalities and discrepancies within a group.

RESULTS AND DISCUSSION

The findings showed that the culturally adapted tasks worked well in generating detailed responses from children about their perspectives on the situations presented, as well as their imagined reactions under similar situations.

In response to the picture-card task, the protagonist was portrayed to be stealing in almost one fourth of the responses by the children whereas for their own responses few children gave stealing as the answer. Diverse responses to the picture-card portraying a situation where a child had the opportunity to steal based on his immediate needs, included trying to dodge the question by giving answers like the protagonist would sit, get scolded by the teacher, cry or not go for the picnic. It was followed by responses for the protagonist going home to get the money from his parents or to borrow the money from his friend, this number came out to be 30 (*N=96*). Twenty-two (*N=96*) children responded that the protagonist would steal whereas when it came to their own response in a similar situation, 9 (*N=96*) children responded that they would steal. Thirty-five (*N=96*) children responded that they would go home and get the money or ask their friend to lend them the money to be given for picnic.

In response to the story-narration task, almost all the children seemed to be aware that stealing was wrong still approximately half of the total number for children mentioned taking the bird's eggs as their response in a similar situation. 80 (*N=96*) children responded that the act of taking the eggs away and drowning them was wrong, yet 30 (*N=96*) children responded that they would do the same. Children answered that if they were in a similar situation they would pick, steal, hide or drown the eggs despite saying that drowning the eggs by the protagonist of the story and not letting the bird keep her eggs near the shore was reason they found the act to be wrong.

In response to the video film on stealing where a child named Sherry is shown stealing a pencil box, most children said 'no' as their response to question 1 (Is it ok to steal?) implying that a majority

of children did not consider it to be okay to steal. Eighty-six (*N=96*) children did not consider stealing to be okay by the protagonist whereas when asked about their action under a similar circumstance, 67 (N=96) children said that they would not steal under any circumstance. Stealing in their own house was not considered acceptable by a majority of children. In response to the question 'Have you ever stolen?', 83 (*N=96*) children mentioned not stealing anything ever.

Age trends

Age trends showed that children from older age groups (8-to 10-year-olds) clearly stated that the protagonist would steal. Lowest number of 4-to 6-year-olds answered that the protagonist of the picture card would steal. When asked 'what would you have done in a similar situation?', stealing was mentioned most infrequently by 4-to 6-year-olds. Frequency of responses for self in case of the picture card remained same for all the age groups.

In response to the story, stealing or picking response was highest for the 4-to 6-year-olds whereas older children reported a higher number of not stealing, drowning or hiding response in a similar circumstance. There was a difference in responses from the 6-to 8-year-olds. Almost negligible number of children judged the act as right and those who did cited reasons like 'It should not have been kept here, if something came so it would have been broken by their feet' and 'I would have drowned. Why did you keep it here? Then I would take the eggs out and give'. Here the child talked about the positive side of picking the eggs. Another example, could be 'Right so that she starts keeping it somewhere else', 'I will not throw because if I throw in the sea, her babies would have died' showcases the reasoning provided by children in defense of their judgment.

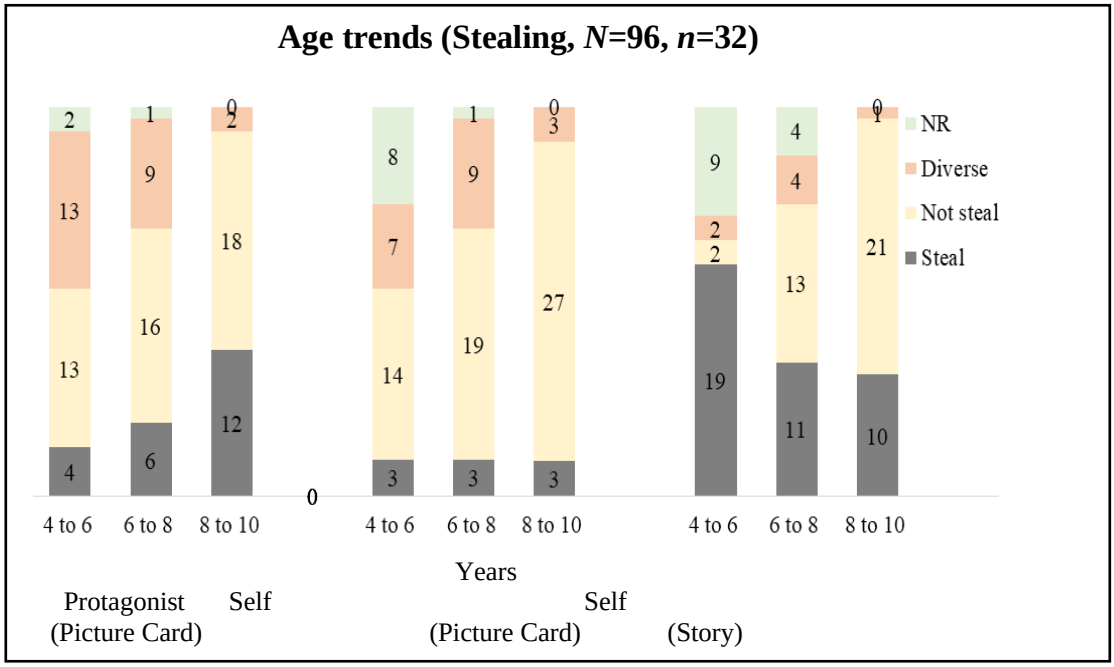

Fig.-1. Age trends

When asked about stealing from the perspective of the protagonist and the self directly, stealing was not considered to be okay by a majority of children from all age groups. Not stealing responses were lower from 6-to 8-year-olds. Similarly, stealing in one's own home was seen as wrong but a decrease in frequency of 'no' responses was observed from 6-to 8-year-olds. Lowest number of 'no' responses for the questions 'Can we ever steal?' and 'Have you ever stolen?' were recorded from the oldest age group i.e. 8-to 10-year-olds. Majority of 6-to 8-year-olds considered it acceptable to steal and also nodded in yes when asked if it was okay to steal in one's own house.

Gender patterns

In response to the picture-card on stealing, girls mostly avoided answering directly, did not talk about stealing compared to the boys. Their responses were more inclined towards expressing helplessness in solving the problem. Girls mentioned more of 'sit', 'cry' and 'do nothing' responses for themselves as well as for the protagonist whereas boys answered that the protagonist 'would not give the money', 'not go for picnic' or that 'they would stand in punishment' and 'get scolding from the teacher'. Boys more specifically responded that the protagonist would escape from the situation by giving responses like 'he will not go to the school or picnic'. Boys chose stealing as their own response as well under a similar circumstance.

After observing the responses to the story (ending provided) on stealing, a higher number of girls mentioned drowning the eggs as the basis of their judgment of the act as wrong. Although the girls considered the act of damaging, hiding or stealing the eggs as wrong yet they chose to mention more of drowning, throwing or stealing bird's eggs response while giving answers for their own actions in a similar situation.

CONCLUSION

In general, children tended to be more attentive to rules while answering about their own projected actions as compared to answers for the protagonist. Questions regarding response to family and friends were attended to carefully as compared to the questions regarding response to 'others'. Children from collectivistic cultures have been reported to consider kinship ties in providing reasoning (Markus &Kitayama, 1991). Reasoning was found to be context as well as domain specific. Responses were also dependent on the situation faced by the protagonist as well as the location of the participant. Children in the middle age group (6-to 8-year-olds) responded differently than the rest whereas older children considered social conventions and their own intrinsic motivations. This difference leads us to consider the age specific changes taking place in children's moral development.

Pre-school age children may be hesitant in responding clearly due to lack of appropriate vocabulary, comprehension, lack of exposure or other unforeseeable circumstances as was seen in the research conducted by the authors of this paper. It is believed that by age 5 children differ in differentiation of acts as right and wrong throughout the world and hence the development of moral code also differs. A complete picture cannot be obtained without taking into account the other factors responsible for comprehension of the tasks at hand. There are few theories which include many of

these factors in nested layers of progressive distance from the developing person (Bronfenbrenner, 2005).

A clear difference in responses can be observed when the children were asked directly as compared to when they were asked questions about stealing indirectly. Direct questions elicited a lot of disagreement to the act of stealing. The story that was used in this study was indirectly mentioning stealing and the protagonist was not a human or an animal, it was a much bigger entity which probably could have been difficult to imagine for young children. It helped to get a wide range of responses where stealing was not mentioned directly but for young children it could have been too indirect.

Usually, moral dilemmas consist of conflicts between moral obligations and personal desires therefore it becomes imperative to use realistic moral dilemmas. The dilemmas were devised and adapted to keep the cultural familiarity in mind. The test items were not solely focused on academic capabilities which help in encapsulating information from children in an unbiased manner. Open ended test items provided a larger bandwidth of responses to be received. In this study, sequence of the tasks to be presented was fixed. The tasks began from incomplete stories (picture cards) to partially complete (story-narration) and lastly, complete stories (video films) with consequences. This sequence provided the children with the opportunity to think through and involve their reasoning capabilities to come up with an answer rather than providing them with choices and influencing their judgment. This approach was crucial in capturing the unbiased responses first and the rest of detailed responses to cross check the already received responses. Moral reasoning was guided by both controlled cognitive responses as well as emotionally driven responses. Specific tasks showed that there is a significant presence of subjectivity in children's reasoning at all ages, which was related to context as well as developmental understanding.

IMPLICATIONS

Some implications from the study are as follows:

1.When constructing methods based on narrations or interviews, it is important to consider whether children's responses are about the self or the other in hypothetical situations.

2. Findings can be used as a foundation to move away from a reliance on adult assumptions, allowing researchers to draw on context specific knowledge of childhood.

SUGGGESTIONS FOR FUTURE RESEARCH

Understanding moral development in children from diverse backgrounds would highlight the need for culturally appropriate methods to investigate developmental patterns. These findings suggest a need to move away from a reliance on adult assumptions, allowing researchers to draw on knowledge of childhood in its specific context.

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