

Research Reach

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Research Centre,
College of Home Science,
Nirmala Niketan
49, New Marine lines,
Mumbai - 400 020.

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EDITORIAL

In recent years there has been a lot of research happening in areas relevant to the textile and garment industry. This January 2014 issue of Research Reach has four papers from this domain of Home Science research. Eri and Muga are two local Assam silk fabrics that have great potential for use both in the national and international market. The paper by Kaveri Dutta *et al* examines the optimal conditions for dyeing of these two wild silks using reactive dyes. Nanotechnology uses particles in nanometre range which greatly enhances the material properties and functions. The application of nano finishes on textile fabrics and the acceptability of products developed using such fabrics has been the focus of the paper by Parasrampuriah and Dedhia. Fabrics like silk georgette, poly georgette, viscose georgette, voile, silk crepe, organdy and silk chiffon will always remain in fashion but manufacturing garments using such delicate fabrics is always a challenge for the garment industry. This has been examined in detail in the paper by Vandana Singh & Sangita Saini. Using traditional designs to create modern outfits has always been a successful venture in the garment industry. The paper by Soocheta & Samynaden has used this concept to create innovative Mauritian séga outfits.

This issue also includes three papers from the domain of nutrition and health. Osteoporosis is a major health problem among women particularly after middle age. The paper by Apeksha Ekbote & Usha Devi, therefore examines the relationship between bone mineral density, life style factors and nutrition knowledge. The paper by Gifta Rachel Dhanam *et al* presents data on the hypercholesterolemic effect of consumption of a soya beverage among adult male subjects. Dietitians play a very important role in patient care in a hospital set-up. The paper by Canday Eileen & Machado Perpetua that documents the role of dietitians in a sample of public and private hospitals in Mumbai has therefore been included in this issue.

I am sure the readers would benefit greatly from the research articles included in this issue of the journal.

Chief Editor,

Dr. Malathi Sivaramakrishnan

INSTRUCTIONS TO THE AUTHORS

Research Reach-Journal of Home Science (ISSN 0974 – 617X) is devoted to original Research and Development in all branches of Home Science. It is a bi-annual publication from the Research Centre, College of Home Science, Nirmala Niketan, 49, New Marine Lines, Mumbai – 400020.

The format of the journal includes (using **Font- Times New Roman 12**):

1. Review paper on specific topics of current trends pertaining to Home Science. It should be a mini review with around 15-18 typed pages.
2. Research papers with a maximum of 7-14 pages
3. Research notes limited to a maximum of 2-6 typed pages
4. Paper / Book Review of not more than 1 typed page each.

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Submission of the manuscripts to Research Reach- Journal of Home Science implies that “the data reported is authentic and original with clear objectives, materials used, methods employed and the results obtained. It is not published or offered for publication elsewhere”

The article should cover:

Title page: Title of the paper, the names of authors and the name of the department should be given

Abstract: The abstract should start on a new page (DO NOT MENTION THE AUTHOR OR INSTITUTION NAME ON THIS PAGE). Give an abstract of about 250 words reporting concisely the objectives, approach and the principal findings. The abstract should be followed by 5 key words

Text: The text can follow the abstract in the same page with introduction, materials and methods, results, discussion, conclusion, acknowledgement, if any and references. References should be cited at the appropriate point in the text by giving author's name and year. (Example: Machado, 2006)

References should also be typed at the end of the paper giving full details. The format should be as follows

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For Web references:

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<http://www.health.sa.gov.au/pehs/Food/survey-health-claims-jan07.pdf> accessed on 11th Jan 09
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<http://www.health.sa.gov.au/pehs/Food/report-food-colours-nov05.pdf> accessed on 25th April 08.

Figures & illustrations: For clarity purposes, the figures, diagrams in the paper should be in grayscale or black& white format or drawn using excel program. (Do not send colored graphs)

Tables: Tables should have proper title on the top. Each table should not exceed 8 columns. Column headings should be brief. The values in the table should be rounded-off to 2 decimal places or less.

The editorial board deserves the right to edit the manuscripts in order to make them suitable for publication in the journal and the judgment of the reviewing expert regarding the quality of the paper is final.

Information / Views / Data published in the journal are of the authors only.

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MERGING TRADITION WITH MODERNITY TO CREATE INNOVATIVE MAURITIAN SÉGA OUTFITS

A. Vaidya Soocheta and Periaarasi Samynaden

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Mauritius fashion presents a multi-ethnic character in its dressing patterns influenced by those of Indian, African, European and Chinese. Mauritius is a tropical country and clothing of Mauritius exhibits a dominance of colour. Adding ambiances to Mauritian ethnicity, the Séga song and dance are a soulful expression of feelings for many locals. Times have changed but the Séga has maintained its significance in the society. A very sexy dance, the Séga involves a lot of hip movement and only the brightest and most colourful costumes are good enough to dance the Séga. The skirts are long, ruffled and cut very wide to allow for the spinning movements. The Séga outfits sways freely with the swinging movement of the dancers adding rhythm to the bright flowery printed motifs. The current study aims at exploring the use of innovative surface embellishments to augment the printed motifs in Séga dress. It introduces versatility in ornamentation that is developed through mixed media techniques. Various surface manipulation techniques such as embroidery, crocheting, appliqué, flower loom and painting are imaginatively used to create unique Mauritian designs. The decorated fabrics are subjected to washing treatments to test the successful application and durability of the embellishments. The acceptability and feasibility of the project is warranted by the development of prototypes for a collection of Séga garments. Results substantiate its application through the success of a creative and original collection of Séga garments in harmony with the theme 'Colours of Mauritius'. The study thus anticipates opportunities for developing designs and materials by a value addition approach enhancing the novelty of Séga garments. It strives to introduce innovation whilst preserving the essence of the traditional Séga dance costume of Mauritius.

Keywords: innovation, manipulations, Séga, surface embellishments, tradition

INTRODUCTION

The fashion world aesthetically combines a wide range of colours to create patterns and styles which are worn every day, or on special occasions. It is influenced by cultural and social latitude which vary over time and place (Fiore, A.M et. al.ITAA, 2011). A feeling of the living culture of a nation is best sensed from its folklore and music. Mauritius is blessed with the sounds and rhythms of the Western, Eastern and African civilisation. This legacy has been preserved and passed on through generations. The most typical folkloric dance of Mauritius is the 'Séga' of African origin (Mauritius Views, 2011). This erotic dance is pulsated by the beat of the ravane, a circular drum, and other rhythmic instruments like the maravane and triangle. Danced and sung by the slaves, the Séga has been adopted by Mauritians and is played on all occasions. It is mesmerising when danced in its vibrant 'Séga' attire which adds to the vigour. With the evolution of the tourist industry in Mauritius, Séga has become a fine way of promoting Mauritian culture to the world. The entertainment industry has grown to accommodate the numerous Séga troupes who perform in hotels, restaurants, public events and wedding parties. This has created an

enthusiastic market for Séga related products such as music, crafts and the Séga dress. The colourful prints such as the Hibiscus and Frangipani flowers are typical Mauritian motifs seen on a local Séga dress that are bought by both Mauritians and tourists. The fashion world is one based on creativity and resourcefulness (Fashion united, 2012). The Séga garments however are stereotype and to a certain extent reflect a lack of novelty and inventiveness. The project aimed to revitalize the distinct Mauritian Séga dress by adding an innovative fragment with creative unique surface embellishments. The study aspired to develop a collection of exclusive avant-garde Séga dresses that preserve its traditional look to echo the soul of the Mauritian culture.

Objectives:

- To modernize the Séga dress in its form, silhouette, style and mode in accordance with the traditional characteristics and classic Mauritian features of the dresses
- To explore new surface embellishments for developing and adapting motifs to reflect the essence of the island
- To test the feasibility, durability and acceptance of the modernized Séga dress

METHODOLOGY

Realisation of Mood board: Visual research was carried out to realize the mood board based on the theme 'Colours of Mauritius'. The theme relates to the diverse ethnic source of the Mauritian population which has brought people of different origins together. The dominance of colours is exhibited in the dresses of these people. Flame, trees, palms, the shimmers of ocean greens and blues under the glazing sun, the chatter of colourful birds next to colourful local temples are only a few of the elements which beautifully colour the Mauritian landscape. The development of the theme springs from the blend of Mauritian cultural heritage with contemporary fashion ideas to create unique Séga outfits. Inspiration was drawn from the Mauritian flag colours that symbolise the local values. The mood board as seen in figure 1 includes the four colours of the Mauritian Flag in its colour palette.



Figure 1: Mood board

Motif development: Local flora and fauna were the main sources of inspiration for developing motifs as in figure 2.



Figure 2: Flora and fauna (www.Flickr.com; www.shutterstock.com)

Flower designs are bountiful on Séga outfits; however the national flower 'Trochetia' has been rarely seen in its designs or motifs. To build up the spirit of a typical Mauritian flavour in the garment, the national flower was chosen as a source of inspiration for motif development. The Frangipani flower is maintained which has been significantly explored in Séga dresses and tropical wear around the world (Encarta Encyclopaedia, 2011). In Mauritius, Frangipani grows in sugarcane fields and is used for prayers and decoration. To enhance the motifs with fauna, the 'Madagascar Fody' an exotic bird of Mauritius was used. The older generation relates this bird to the times they used to clean rice in their backyard and birds would flock around to enjoy the tit-bits thrown to them. Inspiration drawn from the foliage provides a background interest to both the flora and fauna.

Selection of fabrics: Fabrics of different textures were chosen to enhance the concept of mixed media. A range of fabrics were chosen in line with the colour palette. Shiny and matt surfaces, soft and coarse fabrics were selected for the final collection as in figure 3. In Mauritius, jute was very popular and extensively used for packing grains and in the craft market. The craze for synthetic and plastic alternatives quickly replaced it (Sproutingforth, 2007). However, with the greening of the fashion market, jute has been re-valued as a biodegradable choice. Following an international trend, the Mauritius craft market today is promoting jute crafts (Farlex Encyclopedia, 2012). Jute has been profusely explored in the craft market but it is barely used in garment making. Jute fabric is less flexible than cotton, thick, coarse, porous and it has a tendency to unravel easily. Viewed as a challenge, if restrained, it was experimented to present a novel surface look and feel for Séga outfits.

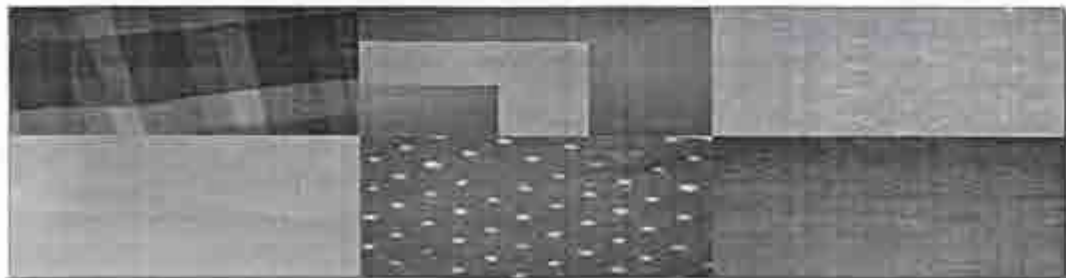
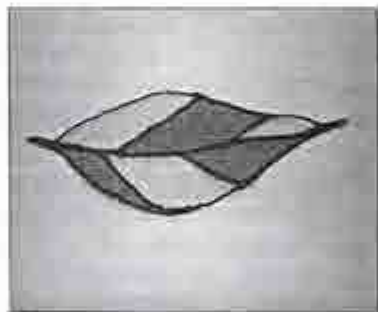


Figure 3: Fabric swatches for the collection

Sample development: A variety of surface ornamentation techniques such as creative embroidery, quilling, patchwork, appliqué, quilting, macramé, crochet, flower loom, braiding, yoyo making, painting and printing was used to embellish and develop samples (Julie Johnson, 2011). Methods and skills used were directed towards the creation and crafting of various mixed media techniques. Using a combination of manipulation techniques, various materials were amalgamated to put together original surface textures and feel. Figures 4 and 5 show manipulated samples representing the flora and fauna using jute and variety of fabrics. Innovative buttons were crafted using jute. Each button was painted with motifs as in figure 6.



Jute flowers, Braiding, Flower loom



Painted Trochetia Flower,

Figure 4: Manipulated samples of flora



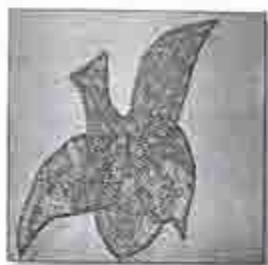
Quilling & Quilting



Quilling & Bead Embroidery



Quilling, Braided Lace Crochet



Appliqué Amalgamation
of Fabrics



Thread & Bead Embroidery



Appliqué Quilting and Lace Ruffles



Appliqué Amalgamation
of Fabrics



Mixed Media



Thread & Bead Embroidery

Figure 5: Manipulated samples of fauna



Figure 6: Painted jute buttons

Splash effect: A water splash effect as in Figure 7 was created on silk fabric, making an effect of the waves, Mauritian lagoon and blue sky. The fabric was stretched on a frame and given a wet wash of blue acrylic paint. Salt was sprinkled on the fabric which absorbed and spread the dye, creating tones and patterns on the surface. Drops of alcohol or liquid bleach were then added using a brush in some areas to partially bleach off the surface for a pronounced effect.

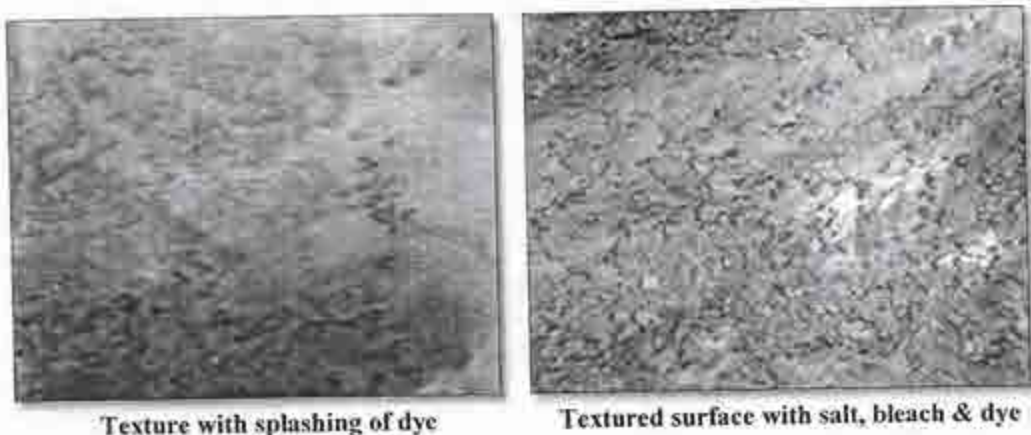


Figure 7: Water splash effect

Testing of samples: The manipulated samples were tested to assess the feasibility and suitability of application for the collection. Laundering, colour fastness, friction and shrinkage resistance tests were carried out to evaluate the properties of the manipulated samples

Laundering Test: As seen in figure 8 the samples were gently washed with soap, hot and cold water, to test the resistance to water and washing. They were then thoroughly rinsed. The samples were sponged with an absorbent white cloth and dried in the open.



Figure 8: Laundering the samples

Colour fastness test: Subsequent to washing, the samples were pressed between absorbent white fabrics to assess the colour fastness and bleeding of dye from each sample. They were then dried in the open.

Dimensional stability test: To assess the durability and dimensional stability of each manipulated sample, they were held between two hands and twisted lightly in a circular motion to check for any deformation or change in shape or size.

Friction resistance test: To measure the sample's resistance to friction, they were rubbed over each other and observed for any abrasion.

Shrink resistance: The samples were immersed in water for an hour. Removed and dried. They were observed for any deformation or reduction in size.

Design development: Inspired from the mood board, fifty sketches were developed for women's, men's and children's wear. Six final designs were chosen for the collection. Before finalizing the designs, a Marquette Séga outfit was made using some of the manipulated samples to find out if the assembling of the different fabrics and textured parts worked well together. The final collection resulted in developing the prototypes. Garments were stitched as per the final selection of fabric, manipulations and design. An emphasis was laid to the surface design techniques, creativity of each design and the commercial and production aspects.

RESULTS AND DISCUSSIONS

Laundering test: There were no alterations observed in colour or brightness of the washed samples. The fluff on the embroidered jute threads and the jute fabric was reduced and the jute fabric became more flexible with washing but no distortions were observed.

Colour fastness test: While no alteration occurred to colour or brightness with cold water washing, paints were seen to bleed in hot water. It is advisable to avoid washing the garments with hot water.

Dimensional stability test: Embellishments showed some deformation and appropriate care and maintenance is required.

Friction resistance test: Jute fabric was easily deformed on rubbing; the manipulated samples with three dimensional effects were vulnerable to deformation. Proper handling and meticulous sewing of these structures is necessary.

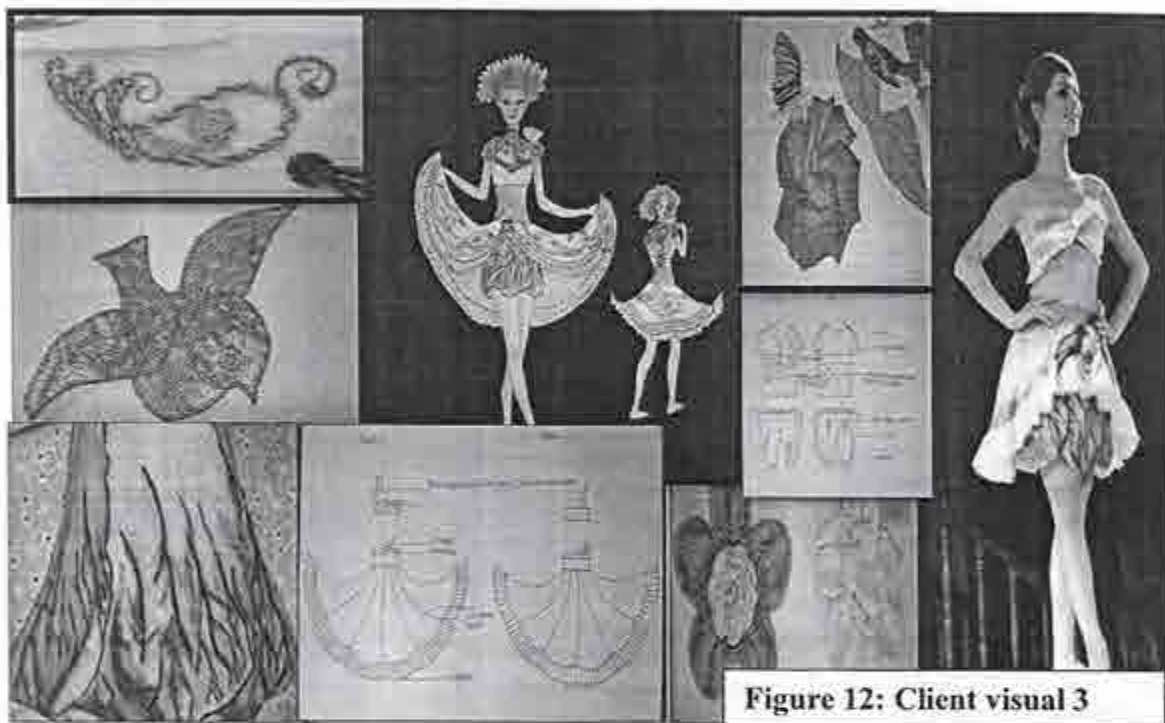
Shrinkage test: Samples retained their original shapes and sizes, no structural deformations were noticed.

Marquette Séga outfits as seen in Figure 8 show a demonstration of the proposed prototypes. They were assembled with manipulated samples and represent a perfect total outlook of the amalgamated fabrics and textures.



Figure 9: Marquette Séga outfit

Client Visual: Client visuals were developed to display the story of the collection for three age groups as seen from figures 10 to 15. They present the designs in an aesthetic way to be used as a platform for communicating the collection. Included in client visuals are the design sketches,





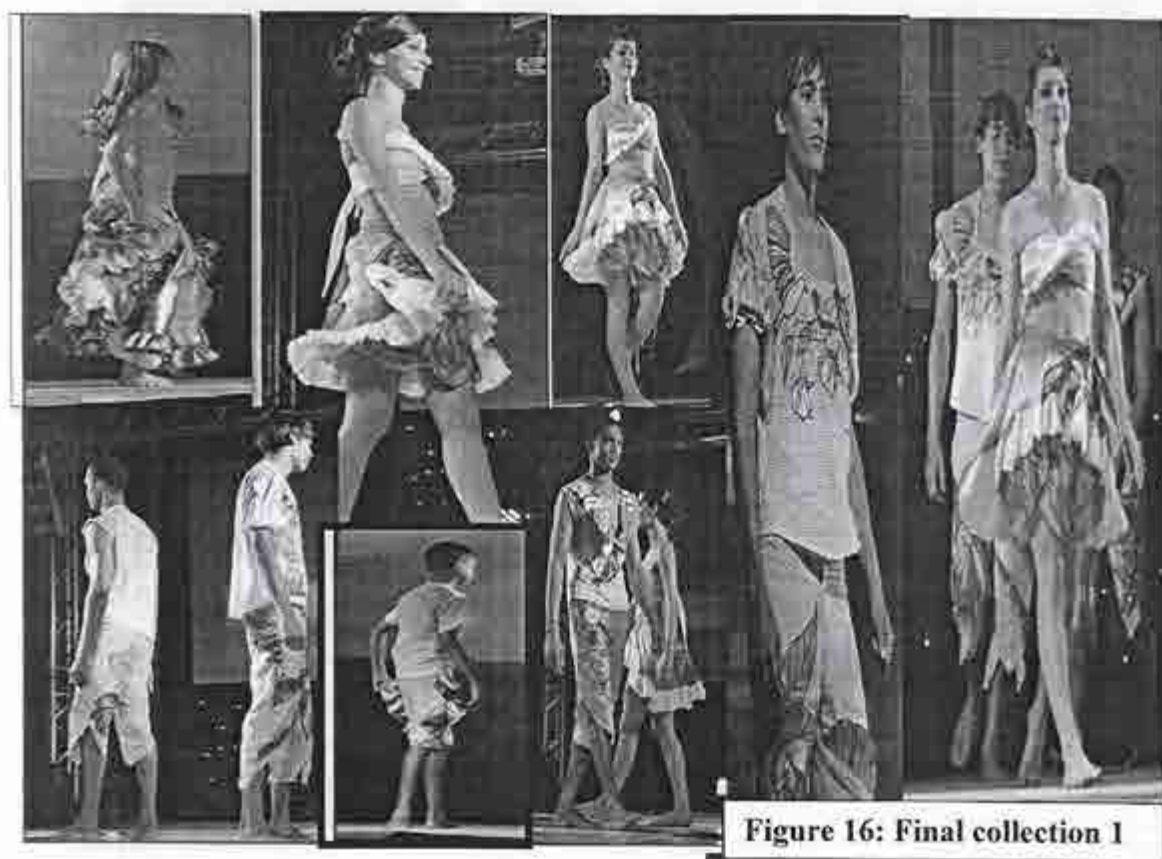


Figure 16: Final collection 1



CONCLUSION

Merging of tradition with a contemporary fashionable look to create innovative Mauritian Séga outfits unravels an innovative approach of embellishing garments. It explores the versatility and feasibility of using an amalgamation of materials and techniques to make elegant and original surface ornamentations. Various techniques such as embroideries, printing, appliqué and crochet are explored and successfully combined to develop three-dimensional surface decorations. A step in the direction of eco-consciousness is presented in the course of manipulating jute fabric and the concept offers a glimpse of the vast potential that is open. The flora, fauna and foliage used as the main sources of inspiration with their vibrant colours aptly match the motifs. The effects accomplished are interesting and overwhelming. They communicate the bountiful appearance of the paradise on the Séga garments. The designs are commercially viable as they would be appealing to tourists. Moving towards new styles in haute couture, the garments are unique, artistic and purposefully designed to express the Mauritian tradition.

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A STUDY ON THE BONE DENSITY OF MIDDLE AGED WOMEN IN RELATION WITH THEIR LIFESTYLE AND NUTRITIONAL AWARENESS

Apeksha Ekbote & Dr. Usha Devi.C

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Diminished bone density is a common occurrence among menopausal women which raises their risk of osteoporosis, bone fractures and subsequent complications. 65 million Indian women suffer from osteoporosis and about 23 lakh are added every year. The more risk factors a woman has, higher is the likelihood of developing osteoporosis. Therefore identification of risk factors is necessary in analyzing this disorder.

This study was conducted to analyze the bone density of middle aged women in relation to their lifestyle and nutritional awareness in Bangalore city. 50 respondents aged between 40-65 years were selected by purposive sampling. Information on anthropometry, dietary, behavioral and lifestyle pattern were recorded by questionnaire method. Bone density was recorded by using Portable DEXA (p-DEXA) and levels were compared to the WHO standards. Nutrition and Health education was conducted by individual counseling and distribution of pamphlets to all the respondents in their vernacular languages.

The study revealed most of the respondents had attained menopause and were overweight. A majority of them were Osteopenic (62%) and a smaller percentage were Osteoporotic (26%). The total dietary calcium intake in Osteoporotic (539mg/d) and Osteopenic (566mg/d) women was found to be significantly less than the RDA. Majority of them did not indulge in any physical activity. Low Nutritional Knowledge was observed in a majority of the respondents (72%).

The study revealed that bone density of the middle aged women is influenced by their dietary intake and lifestyle pattern. Increased awareness levels through nutrition and health education would prevent such occurrences.

INTRODUCTION

Osteopenia is the term used for bones that have become somewhat less dense than normal, but not as severe as in osteoporosis. A person with osteopenia is at risk for getting osteoporosis. Osteoporosis is characterized by low bone mineral density (BMD) and micro architectural deterioration of bone tissue leading to bone fragility and susceptibility to fracture.

Indian women have poor bone health, and osteoporosis is common in India. Peak bone mass achieved during puberty in women is a strong predictor of whether development of osteoporosis can take place in later years. High prevalence of vitamin D deficiency in India is a major contributor to low bone mass. (Malhotra and Mittal, 2008)

The risk of osteoporosis increases with age. Osteoporosis is most common in women after menopause, between the ages of 45 and 55. Women have less bone mass than men and lose bone mass sooner. After menopause women tend to produce less of the hormone estrogen. Estrogen helps women's bones stay strong. For example, it helps to deposit calcium in the bones. Low levels of estrogen cause a weakening of the bones.

Added to the uncontrollable factors such as age, sex and menopause, several controllable factors also effect osteoporosis which can be classed under the different categories like early menarche,

early menopause, multiparity; lifestyle factors (both inactivity and excessive exercise), nutritional (prolonged low calcium intake, high animal protein), medical factors (degenerative diseases) and drugs (thyroid replacement drugs etc.)

Menopause imposes special perils on women's bones. Bone dwindles rapidly when the hormone estrogen diminishes and the menstruation ceases. As women mature, different strategies for preventing osteoporosis are needed. The more risk factors a women have, the higher the likelihood that she will develop osteoporosis. Therefore identification of risk factors is necessary along with intervention such as advice on nutritional issues, giving up smoking and increasing physical activity.(Mercy Paul, 2002)

Hence, the present study attempts to elicit the information regarding the bone mineral density levels of the middle aged women who are in the pre-menopausal and post-menopausal state and see their dietary habits and lifestyle pattern which could be a risk factor for developing osteopenia or osteoporosis. The study also aims to find out the general nutritional awareness and to provide nutrition education to these individuals.

MATERIALS AND METHODS

Pretesting of the questionnaire was done for 10% of the study population i.e, the pre and post menopausal women aged between 45-65 years in Bangalore City.

A total sample size of 80 were selected randomly from 2 study locations among which 50 women were qualified for the study as they fell within the age group of 45-65 years and were pre and post menopausal which was the criteria for the selection of the respondents.

The study was conducted in Bangalore (Karnataka) One diagnostic center and one Free BMD camp organized in a hospital by Novartis India Ltd. were selected for the collection of samples in this study. The objectives of the study were as follows:

1. To assess the nutritional status of middle aged women
2. To assess the physical activity level of the middle aged women
3. To analyze the BMD level of women and compare it with respect to the dietary calcium intake
4. To assess the nutritional knowledge of the respondents

An interview schedule was developed to elicit information from the respondents on their family background, dietary habits, frequency of consumption of foods, anthropometric, clinical, behavioural pattern, physical activity level and nutritional knowledge assessment. The schedule was pretested and necessary modifications were made. The final modified schedule was used for data collection

Height and Weight of all the participants were noted and Body mass index (BMI) was calculated using the formula = $\text{Weight (Kg)} / \text{Height (m}^2\text{)}$. Waist to Hip ratio (WHR) was also calculated by using the formula $\text{WHR} = \text{Waist (cm)} / \text{Hip (cm)}$

Dietary intake was recorded by using the 24 hour dietary recall method which was then compared with the RDA. The Bone density of all the respondents was measured by using a Portable Dual Energy X-ray Absorptiometry (p-DEXA) machine. The BMD of the heel was calculated and compared with the WHO standards (2004).

Physical activity pattern was assessed by knowing their activity pattern, types of exercises performed and the duration with the help of a well designed questionnaire. Physical activity is any body movement that works your muscles and requires more energy than resting. Walking, Jogging, dancing, swimming, yoga, and Gardening are a few examples of physical activity which were assessed. Any one or more activities performed during a day for a minimum duration of 30 minutes per day was taken as a standard norm. This was explained to the respondents during the face-to-face interviews with them

According to the Department of Health and Human Services' "2008 Physical Activity Guidelines for Americans," physical activity generally refers to movement that enhances health.

Nutrition knowledge assessment was done orally by asking their opinion on twenty five statements pertaining to Menopause, Osteoporosis and Nutrition. The Nutritional Knowledge score was arrived by classifying the groups into three segments – Group 1, Group 2 and Group 3 ranking 1 point to every correct answer and therefore the scoring was done as follows:

Those who scored a total score of Less than 50% formed group 1

Those who scored a total score between 50% to 75% were grouped under 2

Those who score a total score of more than 75% were under group 3

The respondents were given Nutrition and Diet counselling in their respective vernacular languages and a prepared pamphlet was well explained and handed over to all the respondents.

The data obtained was tabulated, and analyzed, the differences in the mean of various parameters were compared using student's t-test and ANOVA. The Statistical software namely SPSS 15.0, Stata8.0, MedCalc 9.0.1 and Systat 11.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

RESULTS

Table 1 clearly illustrates that only Twelve percent of women had normal BMD as per WHO criteria ($T = 1$ or higher), 62% of them had osteopenia ($T < -1$ or > -2.5) while 26% had osteoporosis ($T = 2.5$ or lower). {Fig: 1}

Table 1- BMD status of the respondents

BMD	Number (n=50)	Percentage (%)
Normal bone density	6	12.0
Low bone density	31	62.0
Osteoporosis	13	26.0

Figure 1: BMD status of the respondents

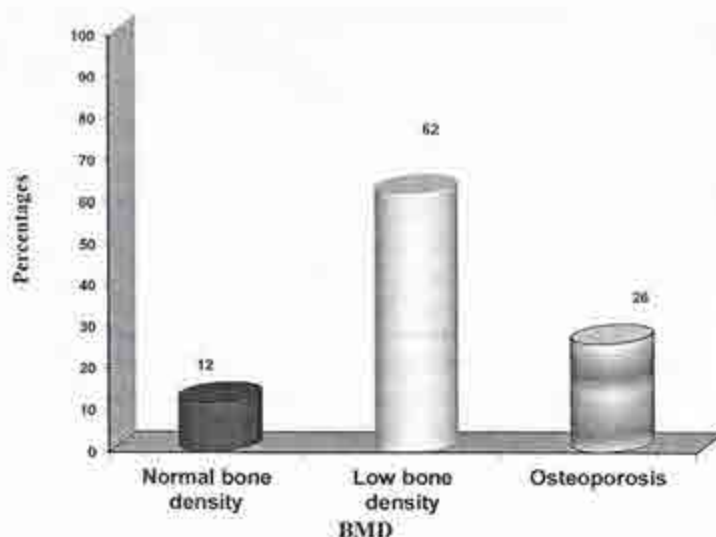


Table 2: Anthropometry parameters of the respondents according to BMD

Anthropometry	BMD			P value
	Normal bone density	Low bone density	Osteoporosis	
Age in years	47.33±7.42	47.81±6.51	58.85±6.99	<0.001**
Height (cm)	160.67±3.68	160.19±4.38	157.00±4.04	0.060+
Weight (kg)	67.83±9.84	65.52±14.53	60.69±19.61	0.558
BMI (kg/m ²)	26.32±3.86	25.96±6.16	24.83±8.37	0.851
WHR	0.82±0.05	0.83±0.05	0.84±0.06	0.669

** Significant at 1% level (P value: $P \leq 0.01$)

+ Suggestive significance (P value: $0.05 < P < 0.10$)

It was observed that the Mean age of the osteopenic respondent was 48 years and in the osteoporotic respondents, the Mean age was 59 years. The statistical test indicates that the difference in the mean age of the two groups was found to be statistically significant at 1% level. The mean BMI of the respondents (entire sample) was found to be 25.7 which signify that the respondents were overweight. The waist to hip ratio of the individuals obtained was non-significant when compared with the normal values. However, the osteoporotic individuals had a higher WHR.

Table 3- Nutrient intake of the respondents in comparison with BMD status

Nutrients	BMD			P value
	Normal bone density	Low bone density	Osteoporosis	
Energy(kcal)	1916.17±409.15	1932.42±409.53	1741.31±413.06	0.36
Proteins(gm)	57.33±6.83	47.61±16.65	47.31±14.57	0.34
Fat(gm)	40.67±20.39	36.54±14.90	47.38±13.93	0.11
Calcium(mg)	669.50±213.25	566.19±262.74	539.00±228.22	0.56
Iron(mg)	12.33±3.61	10.19±4.66	9.85±3.72	0.48
Vitamin C(mg)	109.18±55.49	75.74±70.81	98.84±161.21	0.68

The above table clearly depicts that the mean dietary calcium in osteoporotic respondents (539mg/dl) was low when compared to that of the osteopenic (566mg/dl) and normal bone density respondents (670mg/dl). However, statistically the results were found to be non significant.

Table 4: Physical activity pattern of the respondents

Physical activity	BMD		
	Normal bone density	Low bone density	Osteoporosis
Yes	50%	41%	47%
No	50%	59%	53%

It was observed in the above table that a higher percentage of the Osteopenic (59%) and Osteoporotic (53%) respondents did not indulge in any kind of physical activity which is a risk factor for developing low bone density.

Figure 2: Physical activity pattern of the respondents

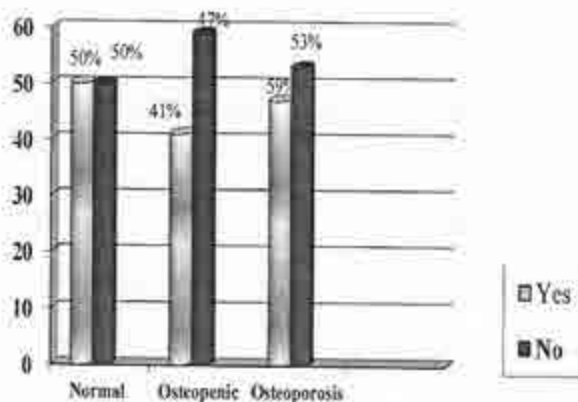


Table 5 - Nutrition Knowledge of the respondents

Nutrition knowledge	Number(n=50)	%
Group 1	36	72.0
Group 2	10	20.0
Group 3	4	8.0

It was observed in above table that a majority of the respondents (72%) in Group 1 had Low Nutritional Knowledge as they had scored <50%, and only a smaller percentage of the respondents (8%) in Group 3 had High Nutritional Knowledge as they scored >75%.

Figure 3: Nutrition knowledge of the respondents



DISCUSSION

Measurement of BMD is the gold standard test for the diagnostic evaluation of osteoporosis. DEXA is the method which is commonly used for this. DEXA scan can detect even a 1% loss of bone mass. BMD is an important diagnostic tool that not only measures the amount of calcium in certain bones but can also be used to estimate the risk of fractures. The test is easy, fast, painless and non-invasive.

The incidence of Osteopenia in this study was 62% and Osteoporosis 26%. It was evident that most of the Osteoporotic individuals were in the mean age group of 58 years and the Osteopenic individuals were in the age group of 47 years and the statistical findings ($p > 0.001^{**}$) established significance of the findings.

The mean BMI of the respondents was found to be 25.7 which signify that the respondents were overweight which is a risk factor for the development of Osteoporosis.

Majority of the respondents had attained menopause (64%) that is to say that the levels of estrogen in the body decreases in the post menopausal state leading to Bone loss.

In the study conducted it was observed that the dietary calcium intake was found to be the least in Osteoporotic (539 mg/dl) women followed by the Osteopenic (569mg/dl) women when compared with respondents having normal bone density (669 mg/dl)

It was observed that a higher percentage of the Osteopenic (59%) and Osteoporotic (53%) respondents did not indulge in any kind of physical activity which is a risk factor for developing low bone density.

The study revealed that majority of the respondents (72%) had Low Nutritional Knowledge, Hence it is essential that "Awareness Levels" about Nutrition and its benefits need to be enhanced substantially through various means of nutrition education

SALIENT FINDINGS OF THE STUDY:

1. Almost 2/3rd of the respondents were osteopenic and around a forth of them were Osteoporotic
2. The Dietary habits among the segment of women surveyed indicated that the calcium intake was least in Osteoporotic individuals followed by osteopenic and Normal which needs to be increased substantially by change in the dietary pattern
3. A sedentary lifestyle was one of the major reasons for the development of this disorder
4. The demographic profile of the women having such disorders was found to be amongst the lower income group with low literacy levels.
5. Awareness levels of the nutritional aspects leading to such disorders were found to be very low among the respondents.

CONCLUSION

Menopause brings with it many changes and unfortunately, bone density loss from a reduction in the hormone estrogen is one of these physical changes. There are, however, ways to build up bone prior to menopause as well as prevent excessive bone loss during this important change of life.

Osteoporosis-related bone fractures are a significant cause of mortality and morbidity, with women being particularly affected. Osteoporosis is a condition of bone fragility resulting from micro-architectural deterioration and decreased bone mass; adult bone mass depends upon the peak attained and the rate of subsequent loss; each depends on the interaction of genetic, hormonal, environmental and nutritional factors.

The study concluded that the Middle aged women were found to be overweight. Osteopenia and Osteoporosis was highly prevalent in the pre and post menopausal women. The dietary calcium intake was found to be lesser than the RDA and Lack of physical activity was also observed in these women. This reveals that dietary habits, nutrient intake and lifestyle does influence the Bone Density of the middle aged women. Imparting Nutrition and health education to such women can go a long way in preventing and managing this disease.

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STUDY OF NANO FINISHES ON TEXTILE FABRICS

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Industrial and apparel textile fabrics refers to a protective covering for human being. The main aim of this research study was the application of nano finishes on textile fabrics. Nanotechnology uses particles in nanometre range which greatly enhances the material properties and functions. The finishes were applied on different textile fabrics such as polyester-viscose suiting and shirting fabric, 100% polypropylene tent fabric, 100% polyester white and texturized t-shirt fabric and 100% cotton t-shirt fabric. The fabrics were treated with Water and Oil Repellent finish, Soft finish, Easy Care finish, Moisture Management finish, Wellness finish, Seam Slippage Resistance finish, Soil release finish and Antimicrobial finish and certain combinations were also applied. Three different concentrations were tried and tested to find results and check the best concentration that can be used for combination finish. The results of individual finish and combination finish were then compared and both gave excellent results when tested. The products made with the combination finishes were assessed for acceptability by industrial experts and consumers and it was found highly acceptable.

INTRODUCTION

Finishes

Textile finishing improves the appearance and usefulness of the fabric and is applied after weaving or knitting. Finishing is the final series of operation taking place to produce finished textile fabric from grey goods. (<http://www.textileschool.com/School/TextileFinishing.aspx> date: 8/11/2011) The finishing applied on the textile materials improves the appearance, feel and handle, wearing quality and the special finishes applied give properties like covering the faults, increasing the weight, sale value, natural attractiveness and serviceability of the fabric. (Nalankilli and Jayaprakasam, 1997)

Nanotechnology

Nanotechnology deals with the science and technology at dimensions of roughly 1 to 100 nanometers (1 Billion Nanometers = 1 Meter), although 100 nanometers presently is the practically attainable dimension for textile products and applications. (Kim, 2010)

Nanotechnology uses small constituents, components or subsystems to make products such that they provide greatly enhanced material properties and functions. Minuscule particles are gaining fast pace as innovation is proceeding. Nanotechnology covers a wide range of technologies concerned with structures and processes on the nanometer scale. (Gopalakrishnan, 2009)

Antimicrobial Finish

Antimicrobial finish applied to textile fabrics using nanoparticles gives outstanding results. This reduces the growth of micro-organisms on textile fabrics (Dastjerdi, 2009). Micro-organisms affect the color of the fabric, produce unpleasant odour and increase health risks. The organisms are found in the environment, especially on the places where nutrients, temperature and moisture exist, they can also multiply affecting textiles negatively. (Gao, 2008).

Use of nano technology in textile finishing

Lei Qian et al, summarizes the improvements in the textile areas in finishing as well as formation of textile with advanced technology called nanotechnology. The nano-size particles and specific technique were used to create nano-size structure in the fabric which has detail importance in the study of nanotechnology. The nano-fillers and their performances with addition to the nano-layer created a new concept to coat textile surface which was studied and addressed for future developments of nanotechnology. (Lei Qian et al, 2004)

Gopalakrishnan studied that nanotechnology is very small constituents, components or subsystem which enhances the functional properties of a material. Nanotechnology is a multitude rapidly growing to make more precise and minimized particles for future use. Nano finishing relates with processing technology in sub nano meter range to play a role in fabrication of precise and fine particles of fiber structure. (Gopalakrishnan and Mythili, 2009)

Yadav et al, stated the functional finishing of cotton fabrics with the use of nano zinc oxides along with different nano-meter size for the construction of the cotton fabrics. The physical properties of conventional textiles were enhanced with the nanostructures creating anti-microbial properties, water repellence, soil-resistance, anti-static, anti-infrared and flame retardant properties which then resulted in dye-able, color fast and strong textile materials. The UV blocking was done with the use of zinc oxide nano particles. Then further study on wash fastness, antimicrobial properties, abrasion properties and fabric handle properties were done. (Yadav et al, 2006)

Nazari et al, attempted to bring about crosslinking finish using nano titanium dioxide photo-catalyst under Ultraviolet radiation done on bleached cotton fabric. The two crosslinking agents were used in the presence of sodium hypo-sulphite and nano titanium dioxide which were applied on bleached cotton fabric and cured at different conditions like UV irradiation, high temperature and their combination. (Nazari et al, 2009)

SIGNIFICANCE OF THE STUDY:

The aim of this research was to study the nano finishing effects on textile fabrics. These finishes were applied and tested to check their efficiency. The nano finishes gave excellent results with the entire tests and on the different fabrics used, thus they are accepted for industrial as well as apparel purpose. Nano finishes add to the wide range of acceptance with the minimum use and maximum effects.

OBJECTIVES:

- To evaluate various nano finishing chemicals on textile substrate.
- To evaluate the application of nano finished fabrics.
- To evaluate the products developed from it for apparel and industry.
- To assess acceptability of finished fabrics and products.

METHODOLOGY

Finishes like Water and oil repellent finish, Soft finish, Easy care finish, Moisture management finish, Wellness finish, Seam slippage resistance finish, Soil release finish and Antimicrobial finish were applied on fabrics such as Polyester-viscose suiting (70:30 blends), Polyester-viscose shirting (70:30 blends), Polyester T-Shirt fabric (100% polyester texturized), Polyester T-Shirt

fabric (100% polyester), Cotton T-Shirt fabric (100% cotton), Polypropylene tent fabric (100% polypropylene).

Method: Method of application was by Pad, Dry and Cure used for all finish application

Equipment: Padding mangle

Time and temperature: Padding with 80% liquor pick-up, Drying at 110°C for 2min, Curing at 150°C for 2min

Water and Oil Repellent Finish: WOR 1

Concentration: different concentrations such as 30gpl, 50gpl, 80gpl of WOR 1 were used.

Chemical content: Fluorocarbon

WOR 2

Concentration: different concentrations such as 30gpl + 10gpl, 50gpl + 10gpl, 80gpl + 10gpl WOR 2 were used

Chemical content: Modified poly-iso-cyanate

Soft Finish: SF 1

Concentration: different concentrations such as 10gpl, 20gpl, 30gpl and 1gpl acetic acid respectively were used

Chemical content: Silicone microemulsion

SF 2

Concentration: different concentrations such as 10gpl, 20gpl, 40gpl and 1gpl acetic acid respectively were used

Chemical content: Silicone

Easy Care Finishes: ECF 1

Concentration: different concentrations such as 40gpl, 60gpl, 80gpl ECF 1, 50gpl respectively and 3gpl respectively were used

Chemical content: Modified dimethylol-dihydroxy-ethylene urea

ECF 2

Concentration: different concentrations such as 40gpl, 60gpl, 80gpl ECF 2, 10gpl, 40gpl and 30gpl respectively were used

Chemical content: Modified dimethyl-dihydroxy-ethylene urea

Moisture Management Finish: MMF 1

Concentration: different concentrations such as 20gpl, 60gpl, 100gpl of MMF 1 and 40gpl respectively were used.

Chemical content: Hydrophilic polyurethane micro emulsion

Wellness Finish: WF 1

Concentration: different concentrations such as 40gpl, 80gpl, 120gpl WF 1 and 1gpl acetic acid respectively were used

Chemical content: Silicone-based preparation containing aloe vera gel, jojoba oil and vitamins

WF 2

Concentration: different concentrations such as 60gpl, 80gpl, 100gpl WF 2 and 1gpl acetic acid respectively were used

Chemical content: Silicone with aloe vera

Seam Slippage Resistance Finish: SSR 1

Concentration: different concentrations such as 10gpl, 30gpl, 50gpl of SSR 1 were applied

Chemical content: Silicic acid dispersion

Soil Release Finish: SRF 1

Concentration: different concentrations such as 30gpl, 60gpl, 90gpl and 1gpl acetic acid were used

Chemical content: Modified polyester

Antimicrobial Finish: AMF 1

Concentration: different concentrations such as 20gpl, 40gpl, 60gpl AMF 1 and 8gpl respectively were used.

Chemical content: Halogenated phenoxy compound

Testing and analysis of the fabrics on which finishes were applied using the following tests:

Water and oil repellent test: Spray test (AATCC 22) and Oil release test (AATCC 118-1997)

Soft finish test: Handle and feel of the fabric was tested subjectively.

Easy care finish test: Formaldehyde test (ISO 14184-1), Shrinkage test (DIN 53892) and Crease recovery test (AATCC 66-2008)

Moisture management test: Surface evaporation test (Marks and Spencer test TM 136 A), Drop absorbency test (AATCC Test 79-1995)

Wellness finish test: UFL test and DyStar Vital test (Is recommended although not undertaken)

Seam slippage resistance test: Seam Slippage test (Is recommended although not undertaken)

Soil release test: Soil release test (AATCC TM 130-2000)

Antimicrobial test: Antimicrobial test

Combination Finishes Were Applied on Textile Fabrics based on Optimum Results:

Combinations such as Water and oil repellent, soil release and antimicrobial finish; Easy care finish, soft finish and soil repellent finish; Moisture management and soft finish were applied on big width fabrics and garments were produced. The acceptability of these garments was checked through an industrial and consumer survey.

RESULTS AND DISCUSSION

The fabrics were tested after the application of individual finish

Spray test:

Spray test rating	Fabric	concentration	untreated	Treated	After 10 wash	After 20 wash	After 30 wash
	PV suiting fabric	30gpl	50	100	100	90	80
		50gpl	50	100	100	100	90
		80gpl	50	100	100	100	100
	Polypropylene	30gpl	0	90	80	80	80
		50gpl	0	100	100	90	90
		80gpl	0	100	100	100	100

Table no. 1 Spray test ratings for PV suiting fabric and polypropylene

All the treated samples showed better water repellency compared to untreated samples.

- The best results were observed with fabrics treated with finish concentration of 80gpl (100 ratings) as seen in table no.1
- Even samples treated with 50gpl continued to show good results up to 10 washes (100 ratings) and those treated with 30gpl also showed good results when treated (90 rating).
- The drop in the rating shown in samples with 50gpl at 20 and 30 washes and in samples with 30gpl at 20 and 30 washes however shows very little wetting (80-90 ratings)

Oil repellency test:

AATCC oil repellency grade number	Fabric	concentration	Untreated	Treated	After 10 wash	After 20 wash	After 30 wash
	PV suiting fabric	30gpl	0	5	4	3	3
		50gpl	0	5	4	3	3
		80gpl	0	5	5	4	4
	Polypropylene	30gpl	0	5	5	4	4
		50gpl	0	5	5	4	4
		80gpl	0	5	5	5	5

Table no. 2 Oil repellency test for PV suiting fabric and polypropylene

All the treated samples showed better oil repellency compared to untreated samples.

- The best results were observed with fabrics treated with finish concentration of 80gpl (Grade 5) as shown in table no. 2
- Even samples treated with 50gpl and 30gpl continued to show good results up to 10 washes (Grade 4 to 5).
- The drop in the rating shown in samples with 50gpl and 30gpl at 20 and 30 wash shows less staining (Grade 3 to 4).

Hand and feel for soft finish:

A survey was conducted with 60 respondents of age group 18-23 years through convenient sampling technique to assess the hand and feel of the fabric. The fabrics treated with soft finish gave very good results.

Formaldehyde test:

Parts per million	Fabric	concentration	untreated	Treated	After 10 wash	After 20 wash	After 30 wash
	PV shirting fabric, t-shirt fabrics and cotton fabric	40gpl	20	17	15	13	80
		60gpl	22	20	18	16	90
		80gpl	23	20	19	17	100

Table no. 3 Formaldehyde test for PV shirting fabric, t-shirt fabrics and cotton fabric

All the treated samples showed lower formaldehyde content compared to untreated samples.

- The best results were obtained with fabrics treated with finish concentration of 40gpl (20ppm) as can be observed in table no.3
- The samples treated showed same results as with the shirting fabric but the formaldehyde content changes after certain washes.
- As the wash treatment increases the formaldehyde content reduces, 40gpl gives lowest formaldehyde content after 30 wash (13ppm) and 60gpl and 80gpl gives little higher formaldehyde content (16 and 17ppm respectively).

Shrinkage test:

% shrinkage	Fabric	concentration	Untreated	Treated	After 10 wash	After 20 wash	After 30 wash
	PV shirting fabric,	40gpl	50	0	0	1	1
		60gpl	50	0	0	0	0
		80gpl	50	0	0	0	0
	Polyester texturized	40gpl	1	0	0	0	0
		60gpl	1	0	0	0	0
		80gpl	1	0	0	0	0

Table no. 4 shrinkage test for PV shirting fabric and Polyester texturized

All the treated samples showed no shrinkage compared to untreated samples.

- The best results were observed with fabrics treated with finish concentration of 80gpl and 60gpl (0% shrinkage). Refer table no. 4
- Even samples treated with 40gpl continued to show good results up to 10 washes (0% shrinkage).
- The shrinkage increased in the samples treated with 40gpl at 20 and 30 wash (0 to 1% shrinkage)

Crease recovery test:

Fabric	concentration	Untreated	Treated	After 10 wash	After 20 wash	After 30 wash
PV shirting fabric	40gpl	67	170	170	160	153
	60gpl	67	178	177	165	162
	80gpl	67	181	180	173	168
Polyester texturized	40gpl	90	190	180	177	174
	60gpl	90	193	187	179	170
	80gpl	90	197	191	180	178

Table no.5 Crease recovery test for PV shirting fabric and Polyester texturized

All the treated samples showed better crease recovery compared to untreated samples.

- The best results were observed with fabrics treated with finish concentration of 80gpl as shown in table no.5
- Even samples treated with 60gpl and 40gpl continued to show good results.
- After certain washes also the finish gave good results with all the concentrations.

Surface evaporation test:

Fabric	Time	Untreated	Treated	After 10 wash	After 20 wash	After 30 wash
PV shirting fabric	10min	7	14	13	15	17
	20min	14	30	26	24	22
	30min	21	46	46	40	33
Cotton fabric	10min	9	17	18	19	18
	20min	17	30	29	22	21
	30min	21	43	40	31	28

Table no. 6 Surface evaporation test for PV shirting fabric and Cotton fabric

The samples showed better evaporation taking place compared to untreated samples.

The fabrics showed greater evaporation in comparison to untreated fabrics from 0-30mins. All the concentration of chemicals 100gpl, 60gpl and 20gpl showed approximately equal results as observed in table no. 6)

Drop absorbency test:

Time in seconds	Fabric	Concentration	Untreated	Treated	After 10 wash	After 20 wash	After 30 wash
	Polyester t-shirt fabric	20gpl	35	3	3	4	4
		60gpl	35	2	2	3	3
		100gpl	35	1	2	2	2
	Cotton fabric	20gpl	50	3	3	3	4
		60gpl	50	2	2	3	3
		100gpl	50	1	1	1	1

Table no. 7 Drop absorbency test for Polyester t-shirt fabric and Cotton fabric

All the treated samples showed more absorbency compared to untreated samples.

- The best results were observed with fabrics treated with finish concentration of 100gpl (1second). Refer to table no.7
- Even samples treated with 60gpl and 20gpl showed good results of 2 and 3 seconds up to 10 to 20 washes.

Soil release test:

	Fabric	Concentration	Untreated	Treated	After 10 wash	After 20 wash	After 30 wash
Stain release grade	PV suiting fabric	30gpl	1	4	4	3	3
		60gpl	1	4	4	4	3
		90gpl	1	4	4	4	4
	Polyester texturized	30gpl	0	4	4	3	3
		60gpl	0	4	4	3	3
		90gpl	0	4	4	4	4

Table no. 8 Soil release test for PV suiting fabric and Polyester texturized

All the treated samples showed better stain removal compared to untreated samples.

- The results observed with fabrics treated with finish concentration of 90gpl showed good results (Grade 4as can be viewed in table no. 8
- Even samples treated with 60gpl continued to show good results up to 20 washes and 30gpl continued to show good results up to 10 washes (Grade 4).
- The drop in the rating shown in samples with 60gpl at 30 wash and 30gpl at 20 and 30 wash was moderate (Grade 3 to 4).

Antimicrobial test:

	Fabric	Concentration	untreated	Treated	After 10 wash	After 20 wash	After 30 wash
Gray scale rating	PV suiting and shirting fabric	20gpl	1	5	4	3	2
		40gpl	1	5	5	4	3
		60gpl	1	5	5	4	4
	Polyester texturized	20gpl	1	5	5	4	3
		40gpl	1	5	5	4	3
		60gpl	1	5	5	4	4

Table no. 9 Antimicrobial test for PV suiting and shirting fabric and Polyester texturized

All the treated samples showed better antimicrobial results when compared to untreated samples

- The sample was tested with bromo phospho blue solution and checked against gray scale rating as shown in table no.9
- The treated samples showed excellent results showing the presence of antimicrobial finish. The sample treated with 60gpl showed the highest results (Grade 5) and after 30 wash also it gives good results (Grade 4).

- The samples treated with 40gpl and 20gpl showed excellent result when treated and as wash processes increased the gray scale ratings reduced to Grade 3.

The fabrics were tested after the application of individual and combination finish.

On analysis it was observed that the test results were similar for both the finish applications (individual finish and combination finish) when applied on different fabrics. All the concentrations used in the individual finish and combination finish gave good results for the following tests conducted: spray test, oil repellency test, hand and feel for soft finish, shrinkage test, crease recovery test, surface evaporation test, drop absorbency test and soil release test.

Formaldehyde test: It was observed that the test results for formaldehyde test showed that the fabric which was treated with combination finish showed more amount of formaldehyde than the fabric treated with individual finish. All the concentrations used in the individual finish gave good results.

Antimicrobial test: On analysis it was observed that the fabrics treated with antimicrobial finish gave good results although after certain washes the effect reduces. The antimicrobial finish when applied with combination finish gave similar good results. It was found that the combination of finishes enhances the fabric properties giving good results. The fabrics treated with individual finishes also gave good results with all the three concentrations.

SUMMARY AND CONCLUSION

The textile fabrics like polyester-viscose suiting and shirting fabric, 100% polypropylene tent fabric, 100% polyester white and texturized t-shirt fabric and 100% cotton fabric treated with nano finishes showed excellent result to the tests undertaken and can be used for apparel and industrial purpose. These fabrics were tested for their efficiency after certain washes. The tested fabric gave excellent results. The end products such as shirt, trouser and industrial products made through the treated fabrics were widely accepted by industry experts. The only issue of concern is the presence of nano particles in clothing and its effects on the health of individuals. Further studies need to be done to address this issue.

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**DYEING OF ERI AND MUGA SILK FABRICS WITH REACTIVE DYES:
IMPACT ON MECHANICAL AND COLOUR FASTNESS PROPERTIES.**

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Silk – the splendid gift of nature is an inimitable natural fibre with lustre and spectacular in vision. The colouration of silk has a long and highly cultured past, yet has always been adapted to the latest state of Technology in the course of rapid technical developments. In the present study attempt was made to find out the dye-ability of Eri and Muga silk of Assam with Bi-functional Reactive dyes in alkaline and acidic medium. This work was carried out to overcome the limitation of colour in the two silk fabrics that have great potential in local market (Assam) and abroad. The impact of pre-treatment and dyeing on the mechanical and colourfastness properties of these fabrics were studied. All the constructional and performance properties showed significant difference in values between control and scoured-bleached state, whereas a marginal to no difference between scoured-bleached and dyed state. From the present study it can be concluded that dyeing of Eri and Muga silk with reactive dyes in acidic medium showed better results as compared to dyeing in alkaline medium. The colour strength of Eri silk dyed with bi-functional ME dyes in acidic medium showed almost double the colour value for all the dyes (G.yellow, Red and Blue) studied as compared to Muga. The fastness to washing with respect to change in colour and staining of the adjacent fabrics was found to be very good (4-5) for both Eri and Muga silk for all bi-functional HE and ME dyes studied. The colour fastness to perspiration of Eri silk dyed with bi-functional reactive dyes showed very good ratings (4-5) in both acidic and alkaline perspiration test. However the results are to some extent inferior in case of Muga silk. Results of the colourfastness to washing of Eri and Muga silk dyed in acidic medium showed very good ratings (4-5).

Keywords: Eri and Muga silk, reactive dyes, mechanical properties and colour fastness properties.

INTRODUCTION

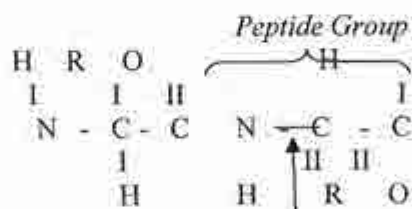
Silk, the splendid gift of nature to mankind has a unique combination of properties not possessed by any other fibre, hence it is called the "Queen of Textiles". Natural silk is identified as one of the fast growing foreign exchange earner for the country. However, India is considered as the second largest silk producing country in the world after China. Though China produces superior power loom fabrics, Indian silks are unique in designs using the traditional handloom and power loom weaving techniques. India has also the unique distinction of being the only country producing all the four commercially know silk varieties viz. Mulberry, Tassar, Eri and Muga. Silk is a natural continuous protein fibre lustrous, smooth and elastic unwound from the cocoon made by the caterpillars. Silks are distinguished as- cultivated silk and wild silk. Wild silk filaments are coarser, more irregular and beige brownish in the natural state. The silk worms that

hatch from a wild species of moth, the *Antheraea mylitta*, live on oak leaves. This coarser food produces an irregular and coarse filament that is hard to bleach and dye. The tannin in the oak leaves gives wild silk its tan colour. Wild silk is less lustrous than cultivated silk, as only a low percentage of sericin is removed in the degumming process.

Among the wild silks, Eri (produced by the worm *Attacus Ricini*) fabric has remained as "the poor man's silk". Eri fabric has been the regular winter wear and bedspreads for an average Assamese villager. Attempts have recently been made to bleach and dye Eri fabrics. Because of the uneven yarns, there has always been difficulty of uniform colouration, but the snag has somehow been overcome by further technological developments.

Muga silk (produced by *Antheraea Assama*) is one of the popular wild silks reared and produced only in Assam. The state of Assam is a pioneer in the production of the beautiful traditional garment "*Mekhela Chaddar*" of Assam. The Muga fabrics and sarees produced in Assam are rich in lustre and colour and hence separate dyeing of Muga fabric is not generally practiced. Because of its natural limitations and the difficulties associated with the Muga silk rearing, the development of Muga silk production is in a slow pace.

In the view of the changing market trends, fashion and consumer demands, today silk is emerging as a fashion fabric both in India and abroad. In case of Eri and Muga silk of Assam, due to the limitation of colour of these fabrics, they have limited use as dress material. In the present investigation, attempt was made to find out the suitability of reactive dyes on Eri and Muga silk and to study the impact on mechanical and colour fastness properties of the dyed fabrics, so that dyed Eri and Muga silk would have greater potential in local (Assam) as well as in export market. Like wool-keratin, silk is formed from amino acids. However, silk contains many H-bonds and relatively few salt linkages. The important chemical groupings of silk polymer are the peptide groups which give rise to H-bonds and the $-COOH$ and amino groups that give rise to salt linkages.



Peptide Bond

Fig.1 General Formula for silk polymer

Dyeing is the process of colouring textile materials by immersing them in an aqueous solution of dye liquor. Dyes are applied to protein fibre under slightly acid condition. Formation of the covalent link between the dye molecule and fibre polymer occurs as the temperature increases. However, the level of temperature depends on the specific reactive dyes used. Application of heat to the dye liquor effects exhaustion as well as covalent bond formation between the dye and fibre. The pH of the dye bath can be increased to 8-8.5 by adding ammonia.

Bi-functional type reactive dyes have a linear structure having two vinyl sulphone groups at the two ends. These dyes have low affinity and high exhaustion and fixation rate. These bi-functional dyes are of two types –

1. Homo Bi-functional
2. Hetero Bi-functional

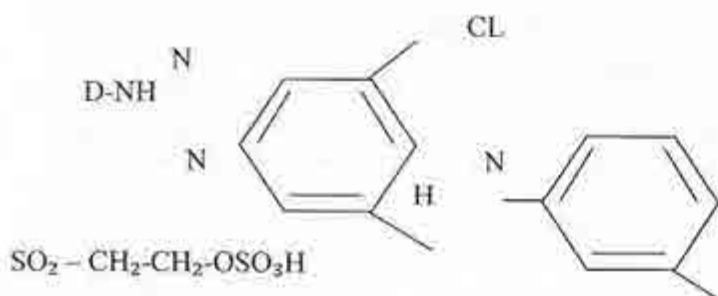


Fig 2: Formula for Bi-functional reactive dyes

Bi-functional reactive dyes:

Reactofix HE dyes possess significantly high exhaustion and fixation which results in appreciable cost reduction in comparison to conventional reactive dyes. Due to higher fixation of reactofix HE dyes, the drain and wash liquor after dyeing contains much less quantity of unfixed dyes which is very much essential for making it environmental friendly. Exhaustion of these dyes can be controlled by salt addition and temperature to maintain dyeing before alkali addition. This class of reactive dye consists of two monochlorotriazine groups.

Reactofix ME dyes are considered as bi-functional reactive dyes due to presence of monochlorotriazine and vinyl sulphone group. These dyes also have an advantage of high degree of exhaustion and fixation rates, better alkali stability and excellent levelling properties.

METHODOLOGY

- 1) **Fabric selection:** Plain weave Eri and Muga silk fabrics were procured from a silk cooperative store in Guwahati and Silkalaya, Jorhat, Assam respectively.

The basic physical characteristic of original Eri and Muga silk are –

	ERI	MUGA
Ends	34	64
Picks	41	116
Linear Density(Tex)	50/60	10/20
Fabric Weight (GSM)	178	66

- 2) **Experimental procedure:** The experimental procedure adopted for the study is illustrated briefly below. The various constructional and performance properties of the Eri and Muga silk fabrics were tested in three different states –

- Control state
- Scoured-bleached state
- Dyed state

The following parameters were measured –

- 1) Fabric count and cover factor

2. Linear density (yarn count)
3. Fabric weight per unit area and per running length
4. Fabric thickness
5. Dimensional stability (% shrinkage)
6. Single yarn strength and % elongation
7. Fabric tensile strength and % elongation
8. Crease recovery
9. Fabric stiffness and flexural rigidity
10. Fabric drape coefficient
11. Abrasion resistance
12. Fastness to washing
13. Fastness to light
14. Fastness to perspiration

Light, wash and perspiration fastness of the samples were tested after dyeing.

- 3) **Selection of sample:** The above parameters were measured using 5 samples each in control, scoured-bleached and dyed state. The average values of results of constructional and performance parameters of Eri and Muga silk fabrics in the control, bleached and dyed state were computed. Each of the fabric samples were tested in the textile testing laboratory. Generally the tests are to be carried out under standard atmospheric conditions of $65\% \pm 2\%$ RH and $27\% \pm 2^\circ\text{C}$ temperature (IS: 6359-1971), where the samples are conditioned in standard atmosphere, at least for a period of 24 hours before the tests are carried out. Since the SNDT P.G Department research laboratory is not conditioned, the test samples were placed in a dessicator containing saturated solution of Ammonium Chloride having RH of $65\% \pm 2\%$.
- 4) **Pre-treatment (scouring and bleaching single bath method):** Scouring was done to remove the impurities and bleaching to remove the natural colour as well as to improve absorbency and evenness of colour on dyeing.

Recipe:

MLR	1:30
Sodium carbonate	30% owf
Sodium silicate	1.5% owf
Wetting agent (TRO)	1% owf
Hydrogen peroxide	1% owf
Temperature	$70^\circ\text{C} - 80^\circ\text{C}$
Time	1hr 30mins
pH	10.5

Procedure: The fabric was scoured and bleached taking MLR as 1:30. Chemicals as per recipe for scouring were added to the boiling water one at a time. When chemicals dissolved the wetted silk was immersed in the vessel and allowed to boil for 45 mins by stirring at regular intervals. The pH of the bath was 10.5. Then bleaching agent was added to the scouring bath and allowed to boil for another 75mins. The fabric was removed, and rinsed in running water thoroughly. Fabric was rinsed 4-5 times. The pH of the washed fabric was assessed to be neutral. After rinsing the fabric was dried at room temperature.

Parts of the pre-treated fabrics were again tested for their constructional and performance properties by following the same procedure as for the control.

- 5) **Dyeing:** Dyeing was carried out by two classes of bi-functional reactive dyes viz HE (high Exhaustion) and ME (Moderate Exhaustion) dyes. The impact on the mechanical properties of Eri and Muga silk fabrics after dyeing were tested along with colour strength and colour fastness properties.

Dyeing was carried out in both alkaline and acidic media.

Dyes used for the study (Bi-functional reactive dyes)

HE class of dyes

1. R/F G.Yellow HERI
2. R/F Red HE3BI
3. R/F N Blue HERZ

ME class of dyes

1. R/F G.Yellow MERL
2. R/F Red ME4BL
3. R/X N Blue ME2GL

Standardization (of Alkaline medium) : Using the recipe below a part of the pre-treated silk fabrics were dyed with both the classes of dyes at two different temperatures (60°C and 85°C) to standardize the dyeing condition for alkaline medium.

Recipe:

MLR	1:40
Dye shade	1% & 2%
Sodium chloride	2.5 gm per litre
Sodium carbonate	2.5 gm per litre
Temperature	65° & 85°C
Time	1hr 30 mins
pH	10.8

Procedure: The fabric to be dyed was weighted. Taking MLR as 1:40, 1% stock solution of the dye was prepared pasting 1g of dye powder with little warm water first and then adding the remaining quantity of water to make a volume of 100ml of the solution. Requisite amount of NaCl was also dissolved in the dye bath at 30°C. The sample to be dyed was wetted and immersed in the dye bath allowing boiling for 15 mins at the same temperature. Another lot of NaCl of the same amount was added. Dyeing was carried for 15 mins and added required amount of pre-dissolved Sodium carbonate to the dye bath. The process was carried on for another 45 mins raising the temperature up to 60°C and 85°C and then the sample was removed from the bath, rinsed thoroughly 4-5 times till pH was neutral. Later soaping was done with a non-ionic soap solution, washed thoroughly and dried.

Dyeing at 85% was taken as standard dyeing condition for both the silk fabrics as the depth of colour and evenness was as expected. This standard condition was then applied to dye both the pre-treated silk fabrics

Standardization (of Acidic medium): The acid method dyeing was carried out in three different pH levels (5.5-6.0, 4.5-5.0 and 3.0)

Recipe:

MLR	1:40
Dye shade	1% & 2%
Acetic acid	as per required pH
Temperature	85°C
Time	1hr
pH	3.0, 5.5-6.0, and 4.5-5.0

Procedure: The fabric to be dyed was weighed. Taking the MLR as 1:40 required amount of water was taken and glacial acetic acid was added to the bath drop by drop by constant stirring till the required pH was attained. Then required amount of dye was taken from the stock solution and added to the bath. The fabric to be dyed was wetted and immersed in the dye bath. The temperature of the dye was raised from 50°C to 85°C and was allowed to run for an hour. Constant stirring was done to avoid patchy dyeing. Then sample was removed, rinsed in cold tap water thoroughly and soaked in soap solution for 10 mins. Later it was washed thoroughly and dried.

Further the dyed samples were assessed for the following parameters –

4. Colour strength (k/s)
5. Fastness to washing (IS:687-1979)
6. Fastness to light (IS:2454-1967)
7. Fastness to perspiration (IS:971-1956)

Along with the above categorisation of assessment, other constructional and performance parameters were also assessed.

RESULTS AND DISCUSSIONS:

The present study was undertaken to explore the possibility of using bi-functional reactive dyes (i.e. HE and ME Dyes) for dyeing the two selected silk fabrics by alkali and acid medium. Results of various physical tests performed on control, scoured bleached and dyed fabrics are illustrated in Table 1.1 & 1.2 –

Table 1: Average values of results of constructional parameters of Eri and Muga silk fabrics (control, scoured-bleached and dyed state)

Test Fabric state	Direction	Fabric count & cover factor		Linear density (yarn count)			Fabric wt/unit Area (GSM)	Fabric thickness (mm)
		Avg threads/inch	Cloth cover factor	Nc=590.5/tex	Tex= wt x 1000/L	Denier= wt x 9000/L		
Eri silk (spun)								
Control	Warp	34	18.66	11s	54t	486	178	0.57
	Weft	41		10s	60t	540		
Scoured-bleached	Warp	37	17.87	17s	34t	306	164	0.63
	Weft	50		15s	40t	360		
HE-dye	Warp	37	19.08	16s	38t	342	166	0.64
	Weft	51		12s	48t	432		
ME-dye	Warp	37	19.16	16s	36t	324	167	0.64
	Weft	51		12s	50t	450		
Muga silk (filament)								
Control	Warp	64	23.34	-	10t	90	66	0.15
	Weft	116		-	20t	180		
Scoured-bleached	Warp	69	19.14	-	6.8t	61	57	0.19
	Weft	122		-	10t	90		
HE-dye	Warp	69	24.24	-	10t	90	64	0.19
	Weft	122		-	20t	180		
ME-dye	Warp	69	24.24	-	10t	90	64	0.19
	Weft	122		-	20t	180		

- **Fabric count and cover factor** - The values for the warp and weft threads per inch in Eri silk after bleaching have increased to 37 and 50 from 34 and 41 respectively (control state). Further on application of bi-functional reactive dyes the values have remained the same as in bleaching state. The increase in warp and weft threads per inch after bleaching is due to the relaxation and swelling of the yarns. Similarly in Muga silk fabric the warp and weft count was observed to be increased to 69 and 112 after bleaching. After dyeing there is no change in values of warp and weft threads per inch. The increase in threads per inch is due to relaxation of the yarns from the initial and also swelling of the fibre molecule because of the wet process, making the structure compact. However the overall cover factor of the Eri silk fabric has not changed significantly after bleaching and dyeing. But in case of Muga silk there is a significant difference in the values of overall cover factor after bleaching as well as dyeing.
- **Linear density** - The Tex of warp and weft yarns after bleaching and dyeing has become finer because after the scouring and bleaching process the gum and impurities like wax and surface finishes are removed, whereby both these yarns have become fine i.e. Tex has decreased. Whereas after dyeing it is observed that there is increase in yarn thickness because of the penetration of dye molecules into the fibre molecules thereby increasing the Tex of both the yarns slightly. The same has been observed in case of Muga silk fabric also.
- **Fabric weight** - The Eri silk fabric weight after bleaching has reduced to 164g than the control sample weight (178g). The decrease in weight is because of the removal of surface finish, gum and the impurities from the fabric. After application of reactive dye the weight has slightly

increased (166g) due to the penetration of dye molecules into the fibres and also because of the increased number of ends and picks after bleaching.

However in Muga silk after scouring and bleaching there is a significant loss in weight (from 66g to 57g). While after dyeing there is an increase in weight from 57g to 64g because of the deposition of dye particles in the yarn structure.

Table: 1.2 Average values of results of performance parameters of Eri and Muga silk fabrics in control, bleached and dyed state.

Sample No.	Direction	Dimensional stability (% shrinkage)		Single yarn strength & % elongation		Fabric tensile strength & % elongation		Crease recovery	Fabric stiffness & overall flexural rigidity			Fabric drape	Abrasion resistance including fabric wt & thickness			
		Avg shrinkage (%)	Overall shrinkage (%)	Total breaking load (lb)	Total elongation at break (cm)	Total strength (kg)	Total elongation (cm)		Total CRA (degree)	Bending length L/2	Total bending (cm)		Overall FR mg/cm	Drape coefficient %	% loss in wt (g)	% loss in thickness (mm)
Warp with (open)																
1	Warp	6	4.5	0.79	5.18	37.8	6.98	78.49	1.52	1.65	7.85	79.68	2.63	3.57	285	Heavy pills & formation of holes
	Weft	3							1.79							
2	Warp	4	3	0.87	5.77	43.65	8.43	93.16	1.25	1.3	3.62	41.09	2.94	1.56	245	More pills & formation of holes
	Weft	2							1.35							
3	Warp	2	1.5	0.73	4.96	30.45	7.05	98.99	1.15	1.22	3.64	39.58	2.56	1.56	220	Losses fibres protruding with formation of holes
	Weft	1							1.30							
4	Warp	-	-	-	-	31.8	7.14	-	-	-	-	-	-	-	-	-
	Weft	-							-							
Warp with (filament)																
5	Warp	5	4	0.35	4.4	38.63	5.74	47.43	1.58	1.98	5.42	95.42	7.69	13.3	85	Heavy pilling & formation of holes
	Weft	3							2.38							
6	Warp	2	1.5	0.27	5.85	44.33	7.73	51.41	1.06	1.39	1.77	60.02	8.33	10.5	79	Heavy pilling & formation of holes
	Weft	1							1.73							
7	Warp	1	1	0.28	5.93	39.16	8.08	56.99	1.25	1.45	2.19	58.99	7.35	5	75	Loose fibres protruding with formation of holes
	Weft	1							1.65							
8	Warp	-	-	-	-	38.99	8.3	-	-	-	-	-	-	-	-	-
	Weft	-							-							

- Fabric thickness -- After bleaching and dyeing the thickness has increased to 0.63mm and 0.64 respectively than the control sample (0.57). However, after scouring and bleaching it was found that the twist of both warp and weft yarns had loosened because of the removal of sericin and surface finish.

The control sample value for fabric thickness in Muga silk is observed to be 0.15mm. But increase in fabric thickness is observed after bleaching and dyeing (0.19mm) due to the loosening of twist in the yarn due to which the diameter of both the yarns may have increased.

- Dimensional stability (% shrinkage) – In case of Eri silk maximum shrinkage was observed in the warp and weft direction in the control state which got reduced after scouring and bleaching from 6% to 4% and 3% to 2% respectively. These dimensional changes were due to the relaxation of yarns from the strain which was introduced during weaving and processing. However after dyeing there was a marginal difference in the shrinkage values of both the yarns as maximum shrinkage had already taken place in the control state.

In Muga silk % shrinkage in both warp and weft direction after bleaching reduced to 2% from 5% and 1% from 3% respectively. After dyeing % shrinkage is negligible.

- Single yarn strength (g) and elongation (cm) – After bleaching the Eri silk fabric there is an increase in both strength and elongation at break by 0.87g and 5.77cm respectively than control sample. This is because of the increase in twist per inch and increase in linear density of the yarns. But after dyeing the average strength and elongation at break of yarn are found to decrease. However in Muga silk after bleaching there is a decrease in breaking load and increase in elongation which is due to the increase in linear density of the yarn. After dyeing the strength and elongation of yarns are found to be decreased (0.28gm and 5.93cm resp.)
- Crease recovery (degree) – The overall crease recovery angle has increased after bleaching from control state in Eri silk (93.16° from 79.49° resp.). This increase is because of the removal of surface finish and gum from the fabric making it softer. After dyeing the CRA further improved (101.16°) as both warp and weft yarns have become coarser after dyeing thereby making the fabric flexible.

However in Muga silk the crease recovery angle has slightly increased after bleaching than control sample. After dyeing the CRA has further improved.

- Fabric stiffness (cm) and overall flexural rigidity – The original overall stiffness and flexural rigidity of Eri silk is observed to be 2cm & 8mgcm resp. After bleaching and dyeing the stiffness and overall flexural rigidity has improved (1.30cm/4mgcm & 1.13cm/3mgcm resp.) due to removal of impurities, sericin and surface finish from the fabric making it soft.

In case of Muga silk the overall stiffness and flexural rigidity is observed to be 1.98cm & 8mgcm respectively in control state. After bleaching there is a significant improvement in values of stiffness and flexural rigidity (1.39 cm and 1.77 mgcm) due to removal of gum, fabric impurities and surface finish. Further on dyeing there is a slight increase in overall stiffness and flexural rigidity of the Muga samples.

- Fabric drape coefficient (%) – The % drape coefficient value of Eri silk fabric reduced drastically after bleaching to 41% from the original value. This is due to removal of gum, fabric impurities and surface finish which has made the fabric softer and also with the increase in ends and picks per inch making the fabric compact and thus increasing the drapability. After dyeing % drape coefficient value remains same as in bleaching.

Whereas in Muga silk the % drape coefficient value reduced drastically after bleaching to 60.02% from the original value of 95.42%. After dyeing it further reduced to 58.99%. This reduction is because of removal of gum, fabric impurities and surface finish which has made the fabric softer and thus increasing the drapability.

- Abrasion resistance (no. Of rubs) – The control Eri silk sample required 285 rubs to abrade the fabric because in the original state it consisted of sericin and surface finish coating which

protected the yarn from abrading. After bleaching and further dyeing the number of rubs required to damage the fabric reduced gradually.

However in Muga silk the control sample required 85 rubs to abrade the fabric because in the original state it consisted of sericin and surface finish coating which protected the yarn from abrading. After bleaching and further dyeing the number of rubs required to damage the fabric reduced gradually from 79 to 75 rubs respectively.

Pre treatment of the selected Silk fabrics –The Eri fabric procured for the study has a natural crème colour. The single bath scouring and bleaching treatment showed a significant difference in the visual appearance of the fabric, i.e. the scoured bleached Eri fabric gave a brighter creamish colour. Also it was found that the pre- treated Eri specimen gave significant difference in moisture absorption in comparison to the original sample. The scoured bleached sample showed absorption of water drop within 5 seconds which was initially 9-11seconds.

However, Muga fabric have a natural golden brown colour which on scouring and bleaching showed a significant change in colour compared to the original sample. Also water absorption showed a marked difference between the controlled state and scoured – bleached state, while the former require 13 seconds and latter 7 seconds to absorb water.

Standardisation of dyeing temperature-The scoured bleached Eri and Muga silk fabrics were dyed at two different temperatures of 60°C and 85°C. At 60°C there was moderate exhaustion of the dye bath at pH 10.5. After subsequent soaping of the samples considerable amount of unfixed dye was washed away resulting in the samples being lighter as compared to the expected shade whereas, the dyeing carried out at temperature of 85°C for 1 and ½ hour resulted in uniform dyeing and satisfactory exhaustion of the bath. Further subsequent soaping left very little unfixed dye for both ME and HE dyes. Therefore all the dyeing (3HE and 3ME dyes) was carried out at temperature 85°C at PH10.5 for the Silk fabrics.

Standardisation of dyeing Eri and Muga silk with bi-functional reactive dyes in acidic medium at pH-3 - The ERI and MUGA Silk samples were dyed at PH3, 4.5-5 and 5.5-6. At PH3 the dyeing was uniform and darker shades were obtained. Therefore dyeing (3HE and 3 ME dyes) was carried out at pH-3 for both the silk fabrics.

Comparative results of Eri and Muga silk dyed with HE and ME at 1% 2% shade on alkaline medium - The colour data of scoured bleached Eri and Muga silk taken as standard showed that the fabric before dyeing exhibits yellowish colour after bleaching and the K/S values are 0.71 and 1.27 respectively. When dyed Eri and Muga silk are compared it was observed that sample of Muga were brighter due to the lustrous nature of the filaments of Muga silk whereas the Eri samples showed well defined hue of the dyes used this is because the more yellowness of the Muga silk interfered with the hue of the actual colour. It was also observed visually that the samples dyed with the ME dyes are brighter than the HE dyes for the silk fabrics. (Refer to fig 3 & 4)

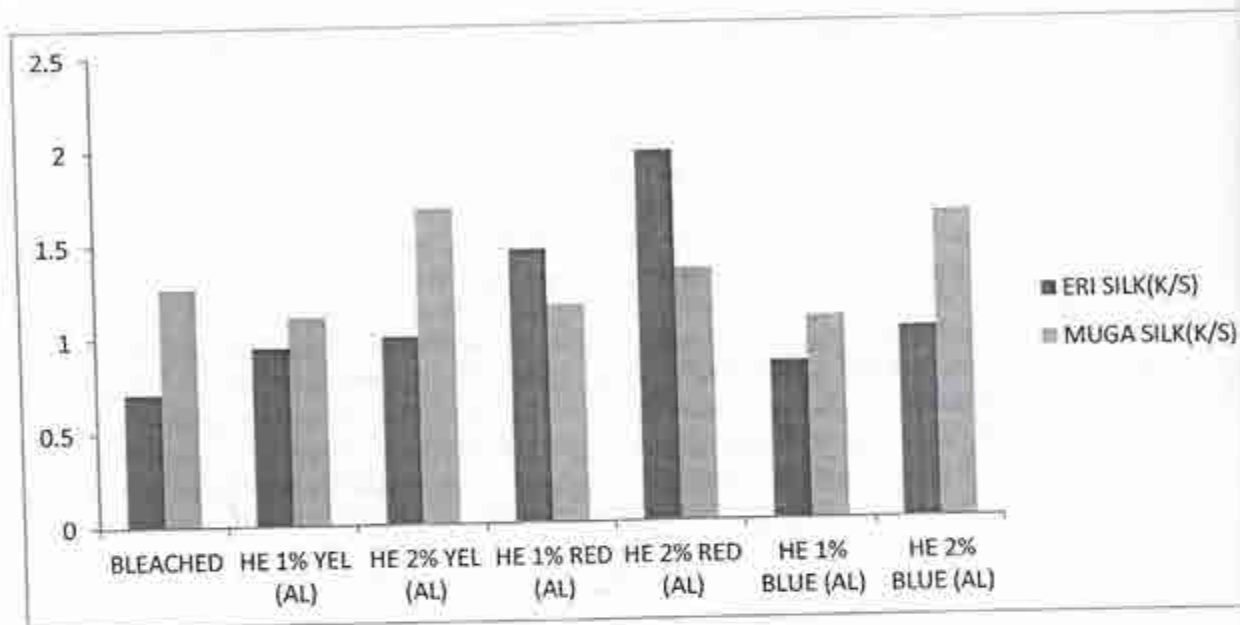


Fig.3 Colour Strength (K/S) of Eri & Muga Silk Dyed with HE Dyes @ 1% & 2% depth of shade in alkaline medium

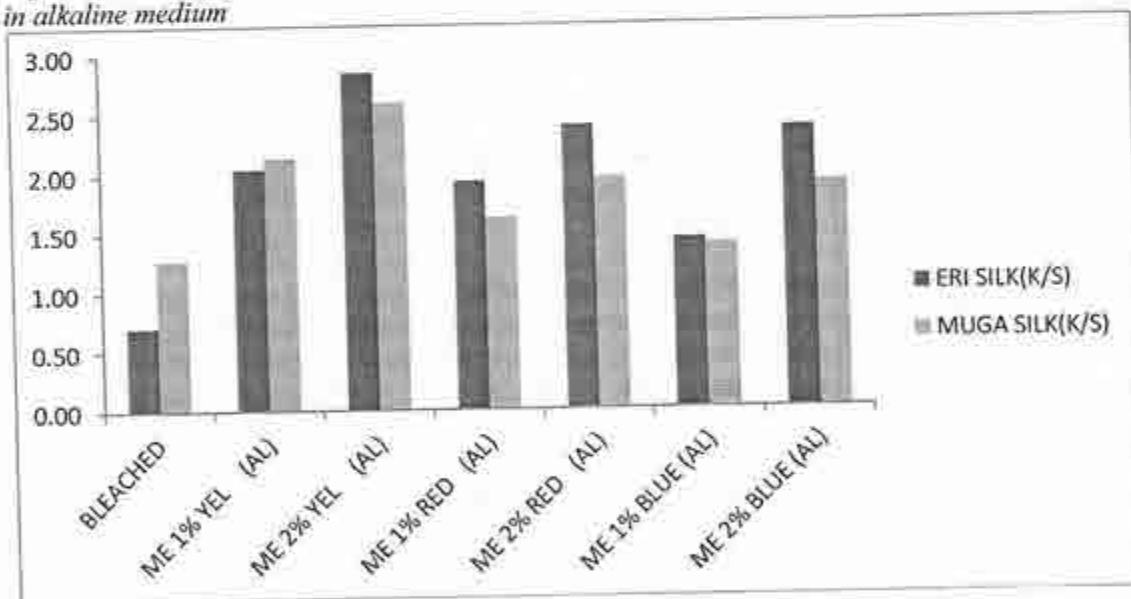


Fig. 4 Colour Strength (K/S) of Eri & Muga Silk Dyed with ME Dyes @ 1% & 2% depth of shade in alkaline medium

Comparative results of Eri and Muga silk dyed with HE and ME dyes at 2% shade in acidic medium – The ME dyed Eri silk samples showed increased K/S values in comparison to the ME

dyed Muga silk samples. Similarly the standardisation i.e. the chroma values of ME yellow and ME Red of Eri silk samples was maximum than Muga silk. It is clear from the values observed that the dye uptake of the ME dyes is higher in Eri silk compared to the Muga silk in acid pH condition of dyeing. (Refer to Fig. 5)

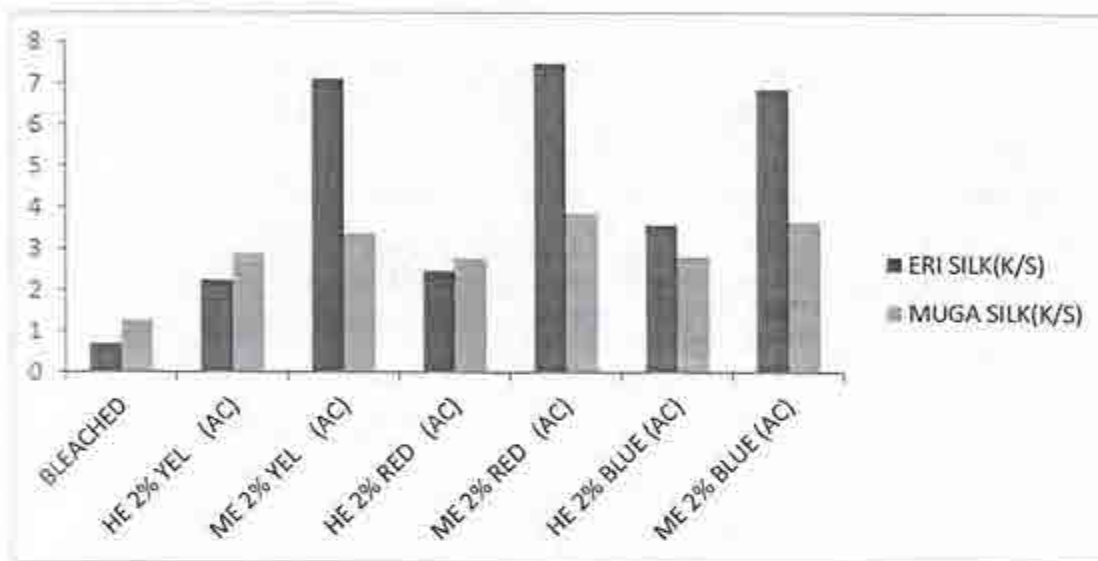


Fig.5 Colour Strength (K/S) of Eri&Muga silk Dyed with HE & ME Dyes in acidic medium @ 2% depth of shade in pH- 3

Assessment of colour fastness properties

As far as the light fastness is concerned the yellow HE and ME dyes showed very good light fastness rating of 6-7 on both Eri and Muga silk. The fastness to washing with respect to change in colour and staining of the adjacent fabrics was found to be very good (4-5) for both Eri and Muga silk for all HE and ME dyes studied at 1% and 2% depth of shade.

The fastness of Eri silk dyed with the 3ME and 3HE dyes showed very good rating (4-5) in both acidic and alkaline perspiration test. However the results are to some extent lighter in the case of Muga silk where ratings were 3-4/4 for red and blue dyes in case of acidic perspiration test showed rating 4-5 for colour change and 5/4-5 for staining.

The results of colour fasteners to washing of Eri and Muga silk dyed in the acidic medium showed very good rating 4-5 for colour change and about 5/4-5 for staining on silk and cotton. The light fasteners of both Eri and Muga Silk dyed with both selected bi functional dyes showed improved ratings when dyed in the acidic medium.

CONCLUSION

From the present study it can be concluded that Eri silk dyed with the selected class of reactive dyes will be much more durable as compared to Muga silk. And between the two media of dyeing (alkaline and acidic) acidic medium showed better results on Eri as well as Muga silk than

alkaline medium of dyeing with respect to colour strength and colour fastness. It can be observed that from wear ability point of view Eri silk will be much durable and long lasting as compared to Muga silk. The wear life of Muga silk fabric can be enhanced by using slightly coarser filament yarns during weaving this fabric.

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AN INVESTIGATION FOR SUSTAINABILITY OF GARMENT INDUSTRY DEALING WITH SEE-THROUGH FABRICS

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D.E.I., Dayal Bagh, Agra

Soft, delicate, fluid, fragile, light, airy, see through and sumptuous - these are the words that come to mind when describing a garment made from a sheer fabric. Due to these properties delicate fabrics require some special techniques at each and every step of handling and finishing. The literature and forecast show that delicate fabric was in fashion, is in fashion and will be in fashion for many years. Hence, the present study was undertaken to assess the problems faced in sewing department of garment industry while manufacturing garments from delicate fabrics. An attempt was made to analyze the best techniques which could be used during sewing of delicate fabrics. This was done through survey of industries along with experiments. 50 leading units were surveyed from Delhi and neighboring regions. The respondents included individuals from sewing department of export houses, boutiques or other stitching units. Seven commonly used delicate fabrics were selected for further investigation which included silk georgette, poly georgette, viscose georgette, voile, silk crepe, organdy and silk chiffon. Suitable self designed interview schedules and observation method were used in order to gather information from industries which actually deal with such fabrics. Thus, the problems which were faced at various levels while sewing of such fabrics were identified. The data revealed that industry was facing lots of problems at sewing stage of delicate fabrics. Among them the major problems identified were seam puckering and seam slippage. Fabric mechanical properties and physical properties of selected fabrics were determined to find out the factors and extent to which they affect seam slippage and seam puckering. To minimize the problem of seam puckering and seam slippage, stitching of fabric samples was done considering various combinations of sewing parameters on the selected fabrics. Best combinations of sewing parameters were identified for each fabric.

Key Words: Sheer fabric, fabric mechanical properties, fabric physical properties, seam puckering, seam slippage

INTRODUCTION

The Indian textile industry is one of the largest and oldest sectors in the country and among the most important in the economy in terms of output, investment and employment. The sector employs nearly 35 million people and after agriculture, is the second highest employer in the country. Its importance is underlined by the fact that it accounts for around 4% of Gross Domestic Product, 14% of industrial production, 9% of excise collections, 18 % of employment in the industrial sector, and 16% of the country's total exports earnings. The textile and apparel industry is one of the largest source of foreign exchange earnings for India. Balaji (2012) The dominant process in garment assembly is sewing. In the past, garment production was done manually or with the help of simple machines. However, now a days clothing industries are equipped with high speed sewing machines. Much of the application of technology to clothing manufacture is concerned with the achievement of satisfactorily sewn seams. (Turvey, 2001) The objectives of sewing are the construction of seams which combine the required standards of

appearance and performance with an appropriate level of economy in production. (Cooklin, 1999) The most recurring and troublesome problems facing the apparel industry for over several decades are seam pucker and seam slippage.

Seam pucker is more common in woven fabrics than knits. Seam puckering is defined as a wrinkle, distortion or corrugation of the sewn fabric running across the seam. It generally appears as if there is too much fabric and not enough thread in the seam. (Bake, 1992) Factors that affect Seam Pucker include -

- Type of fabric and their characteristics
- Properties of sewing thread
- Needle size
- Sewing Machine Settings

Type of presser foot	Type and Angle of feed dog
Size of throat plate	Needle and Bobbin Thread Tension
Stitch length	

Slippage of yarn is broadly defined as the sliding or shifting of one set of thread (warp or weft) over the other, resulting in some sort of opening in the fabrics, under the influence of a load or tension lower than that which is normally required to rupture the fabric itself. (Laing, 1998). Factors that affect Seam slippage include -

- Fabric Properties

Type of Yarn	Yarn Count & Crimp
Thread Density (EPI & PPI)	Cover Factor
Fabric Thickness	Finish
- Sewing Thread Properties:

Thread Count	Co-efficient of Friction
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- Sewing Parameters

Stitch Length	Needle Size
Seam Allowance	Type of Seam
Thread Tension	

(Mehta, 2000)

In the present study, an attempt was made to optimize some of the above mentioned parameters to get a good seam in light weight woven fabrics and to thereby improve the garment appearance and quality. The specific objectives of the study were as given below.-

Objectives

- To study the factors responsible for seam puckering and seam slippage in seven types of commonly used delicate fabrics (silk georgette, poly georgette, viscose georgette, voile, silk crepe, organdy and silk chiffon).
- Optimization of sewing parameters to reduce incidence of seam pucker and seam slippage.

MATERIAL & METHODS

The study was a combination of exploratory field study and laboratory work. An exploratory field study was planned, in and around the outskirts of Delhi. Self prepared interview schedules and observation method were used in order to gather information from individuals from industries which actually deal with such fabrics. The respondents included individuals from sewing department of export houses, boutiques and other stitching units. A Total sample of 50 units from Delhi and NCR region were surveyed. The problems which were faced at the sewing department while dealing with such fabrics were identified.

Seven commonly used delicate fabrics were selected for further investigation which included silk georgette, poly georgette, viscose georgette, voile, silk crepe, organdy and silk chiffon. Experimental trials were carried out in laboratories to minimize the identified problems. Mechanical and physical properties of selected fabrics were determined.

To minimize the problem of seam puckering and seam slippage, fabric samples were prepared using single needle lockstitch machine. Various combinations of sewing parameters were tried out on the selected fabrics. To abide by the industrial practices followed for stitches per inch in garments made from delicate fabrics, 50 garments were collected from various export houses and stitches per inch were counted using a measuring scale. It was found that in the garments, the stitch per inch varied from 10 to 14. Based on recommendation by Aggarwal (2008), in the present study 12 stitches per inch were used.

Lower thread tension was adjusted to 20 cN (centi newton) by slightly moving the screw fitted on the bobbin case whereas upper thread tension was adjusted to 40 cN by the tension nut. Both upper and lower thread tension were measured by tension gauge (Fig. 1).



Fig.1 Tension gauge to measure upper and lower thread tension

The pressure of the sewing machine was adjusted to 4Kg by adjusting the height of pressure spring regulator located above pressure foot. As suggested by "*Sewing factory operators manual*" of Juki, the height of pressure spring regulator was maintained to 32mm for the experiments. Thus the sewing parameters adapted during experimental trials are given in Table 1.

Table 1 Sewing parameters considered as Constants while preparing samples

Thread	Stitch Per Inch	Tread Tension		Pressure on Presser Foot	Height of Feed Dog	Speed	Type of Stitch
		Upper	Lower				
3 ply spun polyester thread	12	40cN	20cN	4Kg	0.6mm	4000rpm	Single needle lock stitch

McGinnis (1984) and Aggarwal (2008) explain that there are several factors which contribute to seam related problems and sewing parameters are one of the most important factors among them.

In the present study in order to reduce seam puckering and seam slippage, an attempt was made to analyze appropriate sewing parameter which could be use during garment manufacturing from delicate fabrics. Sewing needles are available in wide range of sizes and shapes. The selection of needle size and point style was done on the basis of fabric properties and guidelines given by ASTM Test standard D-1683-04. Various types of presser foot and feed dogs are available in the market. In the present study two sets of throat plates 12 and 14 number were used which were selected according to the size of needle and fabric. Various samples were stitched using the various possible combinations which are given in Table 2.

Table 2 Variables during experiments

Fabric Code	Needle Size (FG Point)	Presser Foot	Type Feed dog	Angle of feed dog	Throat plate
A(A1- A72)	7	Simple	Simple	Straight	12 no.
B(B1- B72)		Roller			
C(C1- C72)		Teflon Coated with ring			
D(D1- D72)	9		Teflon coated	Front up	14 no.
E(E1- E72)	11				
F(F1- F72)					
G(G1- G7)					

To study the mechanism of seam puckering test method AATCC 88B-1996 was used and seams were observed under projective microscope. To study the mechanism of seam slippage test method ASTM D 1683-90a was used. Best combinations of sewing parameters were identified.

RESULT AND DISCUSSION

During data collection through survey it was revealed that at the level of sewing, industry is facing a lot of problems. Some of the identified problems are outlined below –

- Sewing marks and hole formation in fabric due to stitching
- Seam ginning
- difficulty in achieving a finished look in the garment
- Seam puckering
- Seam slippage

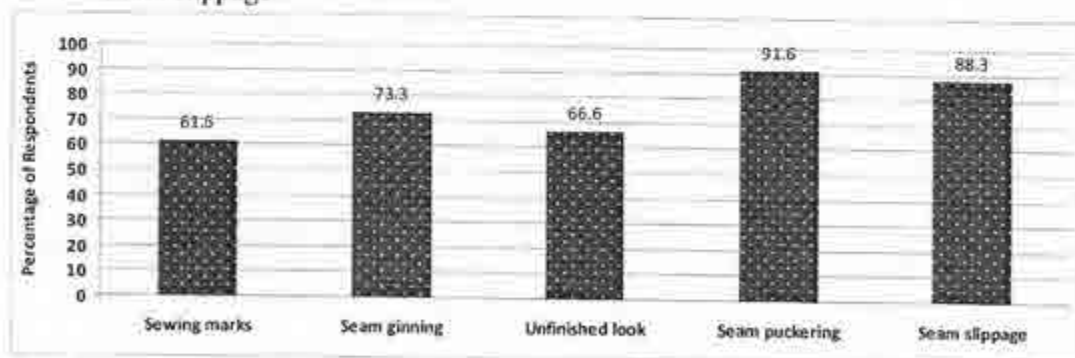


Fig.2 Problems faced by garment manufacturers at sewing stage while dealing with delicate fabrics

It is clear from Fig. 2 that seam puckering 91.6% and seam slippage 88.3% are the two major challenges faced by people working with delicate fabrics at sewing stage. In general terms seam puckering means the seam does not lay flat and smooth along the stitching line. Seam slippage means that the yarns in the fabric pull out of the seam edge. It can also be due to sliding or shifting of one set of threads (warp or weft) over the other, resulting in some sort of opening in the fabric. Due to these problems garments lost their sophisticated look.

The selected fabrics were evaluated to find out the factors and extent to which they affect seam related problems. For developing an understanding of fabrics, the mechanical properties and physical properties of selected fabrics were also determined and are given in Table 3.1 and 3.2.

Table 3.1 Properties of Fabrics

Fabric	Type of yarn	Thread density		GSM (gm/m ²)	Yarn Count (Denier)		Fabric Cover Factor	Fabric thickness at 20 gm/cm ²
		EPI	PPI		Warp	Weft		
Silk Georgette	FXF	106	98	40.4	36.53	36.8	14.39	0.175
Poly Georgette	FXF	83	78	72	89.3	91.2	17.05	0.301
Nylon Georgette	FXF	72	48	81.2	124.7	136.4	15.61	0.225
Silk chiffon	FXF	112	89	35.2	33.2	37.8	13.98	0.115

Table 3.2 Properties of Fabrics

Fabric	Type of yarn	Thread density		GSM (gm/m ²)	Yarn Count (Denier)		Fabric Cover Factor	Fabric thickness at 20 gm/cm ²
		EPI	PPI		Warp	Weft		
Voile (cotton)	SXS	74	69	65.6	44.3	45.6	17.26	0.178
Organdy (cotton)	SXS	39	67	37.2	48.8	51.7	13.04	0.100

Fabric samples were prepared according to acceptable test standards. To study the mechanism of seam puckering test method AATCC 88B-1996 and for seam slippage test method ASTM D 1683-90a was used. Various combinations of garment sewing parameters were tried out on the selected fabrics to minimize the problems.

Experiments suggest that in order to get seams which fulfill the requirements of good appearance and performance correct selection of fabric, sewing thread, needle and machine parameters should be done. On the selected sheer fabrics sewing conditions mentioned in Table 4 were found to be most appropriate.

Table 4 – Sewing conditions for selected delicate fabrics

Fabric	Needle	Pressure foot type	Feed dog	Angle of feed dog	Throat plate number
Silk Georgette	7	T.C. with rings	T.C.	Front up	12
Poly Georgette	7	T.C. with rings	T.C.	Front up	12
Viscose Georgette	7	T.C. with rings	T.C.	Front up	12
Voile	7 or 9	T.C. with rings or roller	T.C. or simple	Front up or straight	12 or 14
Organdy	9 or 11	Roller	T.C.	Front up	12
Chiffon	7	T.C. with rings	T.C.	Front up	12
Silk Crepe	7	T.C. with rings	T.C.	Front up	12

*T.C. indicates Teflon coating

Experiments revealed that sewing machine parameters seem to have much greater effect on seam pucker than the fabric parameters. Use of finer needle (No.7) gives rise to least seam pucker. However, the effect was least in case of organdy fabric. In case of fabrics made from filament yarns, Teflon coated presser foot with rings gives least seam pucker while in case of fabrics made from spun yarns, roller type presser foot gives best results. This could be attributed to surface characteristics of the fabrics. The filament yarn fabrics require much greater control while feeding which is provided by the Ring type presser foot. In most of the cases, type of feed dog did not have any significant effect on Seam Pucker. However, it is recommended to use Teflon Coated feed dog to avoid presence of sewing marks on the fabrics. Effect of Angle of Feed Dog: In most of the cases, front-up position of the feed dog gives slightly better results on seam pucker, though the effect is only marginal. Size of Throat plate did not have any significant effect on Seam Pucker.

The effect of fabric parameters on seam slippage is much more pronounced than the sewing machine parameters. Fabric properties such as thread density (EPI and PPI), type of yarn (Spun vs Filament), fabric cover factor and fabric thickness influence seam slippage. Fabric having low EPI & PPI, low cover factor and thickness and that are made from filament yarns are likely to cause more seam slippage. Amongst the various sewing machine parameters selected in the study, only needle size seems to have some impact on seam slippage.

CONCLUSION

On the basis of the study following conclusions could be drawn –

- Various problems were faced by garment manufacturers at sewing stage while dealing with delicate fabrics. Among them seam puckering was the most frequently faced problem (91.6%), followed by seam slippage (88.3%).
- Most of the problems which the industry is facing could be minimized by sharing the experiences regarding procedure and techniques among people working with sheer fabrics.

- In all the cases, use of finer needle (No.7) gave rise to less seam pucker and seam slippage. However, the effect was least in case of organdy fabric.
- In case of fabrics made from filament yarns, Teflon coated pressure foot with rings was found to be most suitable while in case of fabrics made from spun yarns, roller type pressure foot resulted in less seam related problems.
- In most of the fabrics, type of feed dog did not have any significant effect on seam pucker and seam slippage. However use of teflon coated feed dog to avoid sewing marks on the sheer fabrics is recommended.
- For all the fabrics, front-up position of the feed dog gave slightly low seam pucker and seam slippage, though this effect was only marginal.
- The size of throat plate had some effect on seam pucker. In general, the seam pucker increased while using bigger throat plate. Hence use of throat plate no.14 should be avoided in case of delicate fabrics.
- Sewing machine parameters, especially needle size, type of presser foot and angle of feed dog have a much more pronounced effect on seam pucker behavior than the rest of the parameters amongst the various parameters studied.

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EFFECT OF SOY BEVERAGE SUPPLEMENTATION ON THE LIPID PROFILE OF HYPERCHOLESTEROLEMIC SUBJECTS

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Cardiovascular diseases are major cause of mortality and morbidity in India. To effectively control and reduce the burden of the fast growing cardiovascular disease risk particularly in developing countries, dietary modification are suggested to combat or prevent the risk. Soybean is one of the very few plants that provide a high quality protein with minimum saturated fat. Several clinical trials indicate that soybean reduces the risk of cardiovascular disease. The present study was designed to evaluate the effect of soy beverage on the anthropometric parameters, blood pressure and serum lipid profile of twenty four adult male subjects with hypercholesterolemia in the age group of 40-50 years. A pre-test, post-test design, with test group on supplementation (n=12) and control group without supplementation (n=12) was used for the experimental study. Supplementation of Soy beverage for 45 days exerted significant positive effects on the anthropometric parameters, blood pressure levels and serum lipid profile of hypercholesterolemic male subjects. Thus results indicated that, the active soy based dietary supplements have beneficial effects regarding reduction of cardiovascular risk markers in hypercholesterolemic males aged 40 – 50 years. The study highlights the recommendation of the Food and Drug Administration (FDA) which suggested consumption of at least 25 g/day of soy protein as part of a diet. The study strongly recommends the dissemination of information about soy-related health benefits through education program.

Key words:- soybean, soy protein, hypercholesterolemia, isoflavones.

INTRODUCTION

Hypercholesterolemia is one of the risk factors that have contributed to the incidence of cardiovascular disease. There is an increased incidence of hypercholesterolemia affecting millions of people around the world. The non-controllable risk factors such as smoking, faulty dietary habits and physical inactivity are on the rise which leads to this condition. To treat hypercholesterolemia numerous drugs are introduced in the market which on prolonged use cause a lot of side effects. Natural food which does not have any side effects can play a vital role in treating and controlling hypercholesterolemia and also help control other lipid levels.

Soybean is one of the very few plants that provide a high quality protein with minimum saturated fat. Soybeans contain all the three macronutrients required for good nutrition, as well as fiber, vitamins and minerals. It provides all the essential amino acids in the amounts needed for human health (Nilausen et al., 1998). Almost 40% of the calories from soybeans are derived from proteins. The amino acid pattern of soy protein is virtually equivalent in quality to that of milk and egg proteins. Unlike many other good sources of protein, soybeans have high quality fatty acid profile. It has low saturated fat content with high amount of PUFA and is a readily available source of essential fatty acids (Patterson, 2001).

Several clinical trials indicate that soy protein with isoflavones intact was associated with significant decreases in serum total cholesterol, LDL cholesterol, and triacylglycerols and significant increases in serum HDL cholesterol (Zhan, 2002, Wofford et al., 2008).

Soy beverage is fortified with all the essential nutrients and is a healthy and nutritious beverage for all age groups. It is a high quality protein product and contains all the essential amino acids required for a healthy living. It lowers the LDL cholesterol and keeps the heart healthy ((Erdman, 2000)). Furthermore, it is locally available, low cost and affordable and can be used in all seasons by all groups of the society. Hence the present study examines the effect of Soy beverage as an effective and tolerated regime for controlling hyperlipidemia in borderline hypercholesterolemic subjects.

MATERIALS AND METHODS

The study was carried out in accordance with the guidelines of the Independent Institutional Ethics Committee; a written informed consent was obtained from all the subjects. An Ex post facto design was used in the descriptive study. Kerlinger (1973) states that ex-post facto research is systematic, empirical research, in which the researcher does not have direct control over independent variables because their manifestations have already occurred, or because they are inherently not manipulated (-). A pre-test, post-test design, with test group on supplementation and control group without supplementation was used for the experimental study. The study was conducted in the following phases.

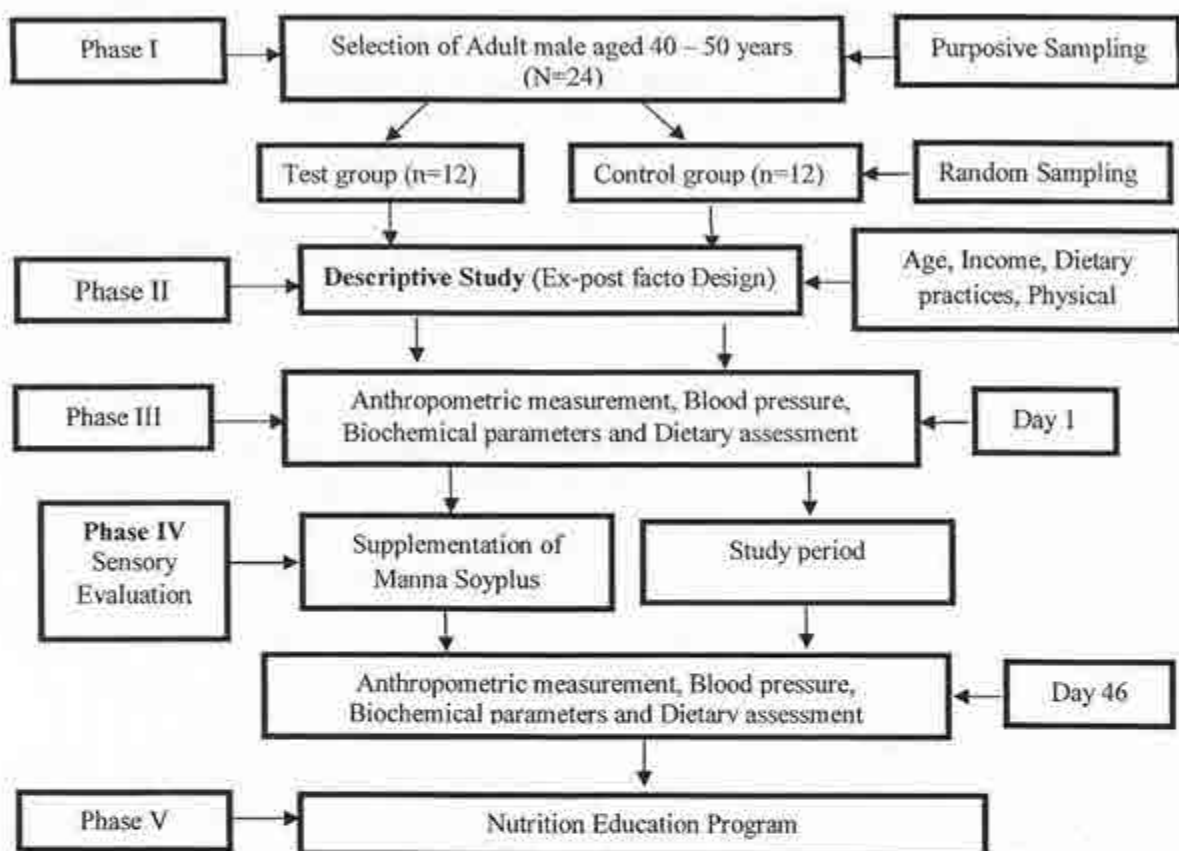
Phase I: Twenty four adult male subjects aged 40 – 50 years were selected by purposive sampling method and were subjected to an initial screening; Subjects with serum cholesterol level between 200-240 mg/dl were selected from the screening procedure. The selected men with hypercholesterolemia were assigned randomly to test (n =12) and control group (n =12).

Phase II: Ex-post facto approach was used to elicit information on the demographic profile

Phase III: The subjects from both the groups were asked to report on Day 1. The anthropometric measurements, blood pressure levels and biochemical parameters were assessed on Day 1. Throughout the study and the supplementation period, all the participants from both the groups were asked to follow individualized diet plan (seven day diet plan) with a balanced food allowance and no change in their physical activity pattern. The subject's food intake was monitored using a 24-hour dietary recall during the study period.

Phase IV: Subjects in the test group were administered a daily supplement of 30 g of Soy beverage for a period of 45 days. The anthropometric measurements, blood pressure levels and biochemical parameters were assessed again on Day 46 for both the groups.

Phase V: Nutrition education programme was conducted at the end of the study for all the participants.



Design of the study

Criteria for sample selection

The criteria for the selection of the subjects are

- Should be willing to participate in the study
- Adult male subjects with total cholesterol levels between 200-240 mg/dl of blood
- Subjects in the age group (40-50 years)
- Should not be under any other medication
- Subjects who do not smoke or consume alcohol.

Test Material: Thirty grams of Soy beverage mixed in 100 ml of water was administered for 45 days with breakfast to the subjects in the test group. The Soy beverage was evaluated for its sensory attributes like taste, colour, texture, flavor, taste and overall acceptability using a 5 point hedonic scale by a panel of judges consisting of 10 adult males.

Ingredients of Soy beverage: Isolated soy protein, vegetable fat powder, sugar, maltodextrin, malt extract, dipotassium phosphate, tricalcium phosphate, monoglycerides, mineral and vitamin premix. The composition of the supplement is presented in table 1

Table 1: Composition of Soy beverage

Nutrients	Composition/100g	Composition per 30g (Supplement)
Energy	392.9 Kcal	117.8Kcal
Carbohydrate	78.7g	23.6 g
Sugars	12.7g	3.8g
Protein	13.8g	4.1g
Fat	2.5g	0.7g
Calcium	555.3mg	166.5mg
Phosphorus	661.9mg	198.5mg
Iron	5.8mg	1.7mg
VitaminB1	0.55mg	0.1mg
VitaminB2	0.15mg	0.04mg
Pantothenic acid	0.24mg	0.07mg
Folic acid	31mcg	9.3mcg
Lysine	0.48g	0.1g
Tryptophan	0.15g	0.04g
Phenyl Alanine	0.50g	0.1g
Methionine	0.17g	0.05g
Theronine	0.33g	0.09g
Leucine	0.65g	0.1g
Isoleucine	0.47g	0.1g
Valine	0.41g	0.1g

SPSS was used to conduct the statistical analyses. A p value of <0.05 was considered statistically significant for all statistical tests conducted.

RESULTS AND DISCUSSION

General information

The subjects were equally distributed in the age group of 40-44years and 45-50 years. Fifty percent of the subjects in both the test and the control group had sedentary activity and, 50 percent were moderate workers. More than 50 percent of the subjects from both the groups belonged to the middle income group, 25 percent were in the low income and the rest in high income groups. Data on dietary pattern of subjects indicate that all the subjects were non-vegetarians.

Sensory Evaluation of the supplement

The sensory characteristics were evaluated using a five point hedonic rating scale. Results revealed that the mean sensory score for all the attributes like appearance, color, taste, texture, flavour and overall acceptability of the supplement was rated as very good (4 ± 0.4) on a maximum score scale of five.

Effect on Soy beverage on Anthropometric measurements

Anthropometric measurements and indices of the subjects were ascertained before and after the supplementation period. They included height, body weight measurements, and waist circumference and body mass index (Table 2 & Fig 1)

Table 2: Effect on soy beverage supplementation on Anthropometric measurements

Group	Variable	Before Supplementation Day 1	After Supplementation Day 46	Day 1 vs Day 46		't' value	'p' value
		Mean \pm S.D	Mean \pm S.D	Mean difference \pm S.D	Percent increment/ decrement		
Test	Body Weight(Kg)	87.0 \pm 7.8	85.33 \pm 7.9	- 1.7 \pm 0.9	\downarrow 2.0	6.280	0.000**
	Height (cm)	167.6 \pm 3.1	167.6 \pm 3.1	0 \pm 0	0	NC	NC
	BMI (Kg/m ²)	30.4 \pm 2.4	30.35 \pm 2.6	- 0.6 \pm 0.3	\downarrow 2.0	6.244	0.000**
	Waist Circumference (cm)	105.5 \pm 9.6	104.96 \pm 9.8	- 0.5 \pm 0.7	\downarrow 0.5	2.600	0.025*
Control	Body Weight(Kg)	84.2 \pm 6.5	84.6 \pm 6.0	0.3 \pm 1.5	\uparrow 0.4	0.771	0.457 ^{NS}
	Height (cm)	172.0 \pm 5.8	172.0 \pm 5.8	0 \pm 0	0	NC	NC
	BMI (Kg/m ²)	28.5 \pm 3.2	28.7 \pm 3.1	0.1 \pm 0.5	\uparrow 0.4	0.785	0.449 ^{NS}
	Waist Circumference (cm)	98.9 \pm 11.4	99.6 \pm 10.3	0.7 \pm 2.4	\uparrow 0.9	1.075	0.305 ^{NS}

** - Significant at P <0.01; * -Significant at P<0.05; NS-Not Significant; NC- Not computed

Effect of Soy beverage on anthropometric parameters of the test group showed a significant 2.0 percent (-1.7 \pm 0.9 kg) decrease in the body weight (87.0 \pm 7.8 to 85.33 \pm 7.9 kg). A significant 2.0 percent (-0.6 \pm 0.3 kg/m²) decrease in the mean body mass index (30.4 \pm 2.4 to 30.35 \pm 2.6 kg/m²) and a significant 0.5 percent (-0.5 \pm 0.7 cm) decrease in the mean waist circumference (105.5 \pm 9.6 to 104.96 \pm 9.8 cm) at the end of the supplementation period (p<0.001) was observed.

Mean Anthropometric parameters of the control group showed a 0.4 percent (0.3 \pm 1.5 kg) increase in the body weight levels (84.2 \pm 6.5 to 84.6 \pm 6.0 kg), 0.4 percent (0.1 \pm 0.5 kg/m²) increase in the body mass index levels (28.5 \pm 3.2 to 28.7 \pm 3.1 kg/m²), a 0.9 percent (0.7 \pm 2.4 cm) increase in the waist circumference levels (98.9 \pm 11.4 to 99.6 \pm 10.3 cm) during the study period, but these changes were not statistically significant.

All the anthropometric parameters of the test group decreased during the supplementation period, while all the anthropometric parameters of the control group increased during the study period. The mean difference in body weight and BMI of the test group and control group showed a statistical significant difference (p<0.001). These results indicate that including a significant part of the daily protein intake with soya protein has a beneficial effect on body composition in hypercholesterolemic patients.

The possible mechanism of action whereby soy protein exerts weight loss benefits is suggested by several lines of evidence that soy protein may favorably affect lipid absorption, insulin resistance, fatty acid metabolism, and other hormonal, cellular, or molecular changes associated with adiposity. Soy protein may reduce adiposity by modulating the expression of sterol regulatory

element binding proteins (SREBPs), a family of transcription factors that controls multiple genes involved in fatty acid and cholesterol synthesis. Another possible mechanism of action of soy protein is via stimulation of adiponectin, a cytokine produced by fat cells that plays a key role in regulating adipocyte differentiation and secretory function, and in enhancing insulin sensitivity. The biologic actions of certain constituents of soy protein, particularly conglycinin, soyasaponins, phospholipids, and isoflavones may contribute to the overall beneficial effects of soy protein in obesity and associated lipid abnormalities (Manuel et al., 2007).

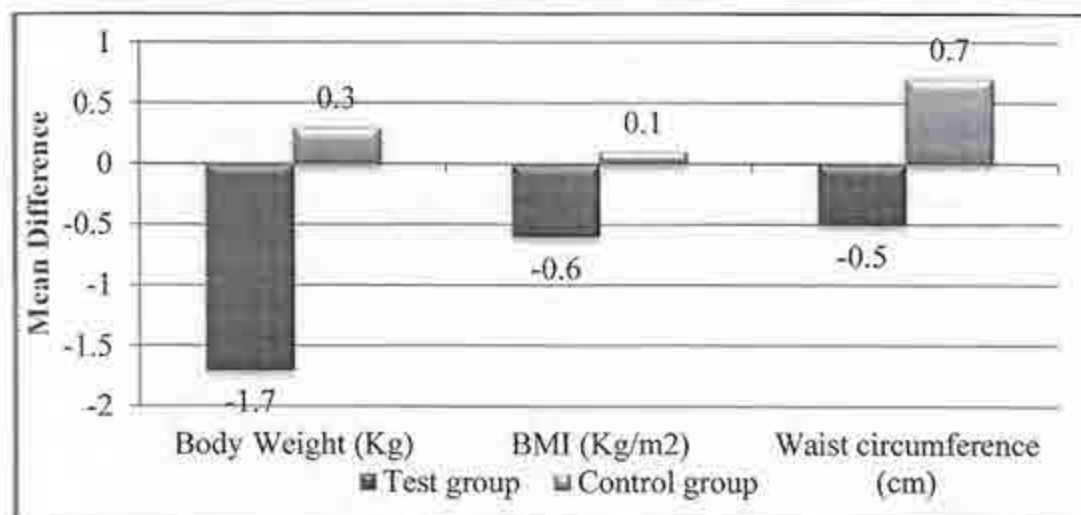


Fig 1. Comparison of the mean increment or reduction in the anthropometric parameters between test group and control group

Effect on Soy beverage on Blood pressure

The present study evaluates the antihypertensive effects of Manna Soyplus as presented in Table 3 and figure 2.

Table 3: Effect on Soy beverage supplementation on Blood pressure

Group	Variable (mm Hg)	Before Supplementation Day 1	After Supplementation Day 46	Day 1 vs Day 46		t value	p value
		Mean \pm S.D	Mean \pm S.D	Mean difference \pm S.D	Percent increment/decrement		
Test	Systolic BP	131.6 \pm 11.1	124.1 \pm 7.9	-7.5 \pm 6.2	↓5.5	4.180	0.002**
	Diastolic BP	90.0 \pm 4.2	93.3 \pm 28.0	3.3 \pm 27.7	↑3.6	0.416	0.685 ^{NS}
Control	Systolic BP	131.6 \pm 13.3	130.8 \pm 11.6	-0.8 \pm 6.2	↓0.4	0.346	0.723 ^{NS}
	Diastolic BP	90.8 \pm 6.6	88.3 \pm 8.3	-2.5 \pm 7.5	↓2.6	1.149	0.275 ^{NS}

** - Significant at $P < 0.01$; * - Significant at $P < 0.05$; NS - Not Significant

Effect of Soy beverage on blood pressure levels of the test group showed a significant 5.5 percent (-7.5 ± 6.2 mmHg) decrease in the mean systolic blood pressure levels (131.6 ± 11.1 to 124.1 ± 7.9 mmHg) at the end of the supplementation period ($p < 0.001$). The diastolic blood pressure showed a 3.6 percent (3.3 ± 27.7 mmHg) increase at the end of the supplementation period, but this was not statistically significant.

Mean blood pressure levels of the control group showed a 0.4 percent (-7.5 ± 6.5 mmHg) and 2.6 percent (-2.5 ± 7.5 mmHg) decrease in the mean systolic blood pressure levels (131.6 ± 13.1 to 130.8 ± 11.9 mmHg) and diastolic blood pressure levels (90.8 ± 6.6 to 88.3 ± 8.3 mmHg) respectively at the end of the study period, but this was not statistically significant.

The systolic blood pressure levels in the test and the control group decreased during the supplementation period or study period. The mean difference in the systolic blood pressure levels of the test group and control group showed a statistical significant difference ($p < 0.05$). The diastolic blood pressure levels in the test group increased during supplementation period, while the diastolic blood pressure levels of the control group decreased during the study period, but the mean difference between both the groups were not statistically significant.

The observed inverse association between soy intake and blood pressure is biologically plausible. Oxidative stress and inflammation have been implicated in the development of hypertension (Sagara et al., 2004). Soy isoflavones have been shown to reduce both in vitro and in vivo oxidation (Wildman et al., 2000). It has also been reported that genistein (an important isoflavone) stimulates the production of nitric oxide, a factor that is known to have potent vasodilatory and anti-inflammatory effects (Achike and Kwan, 2003).

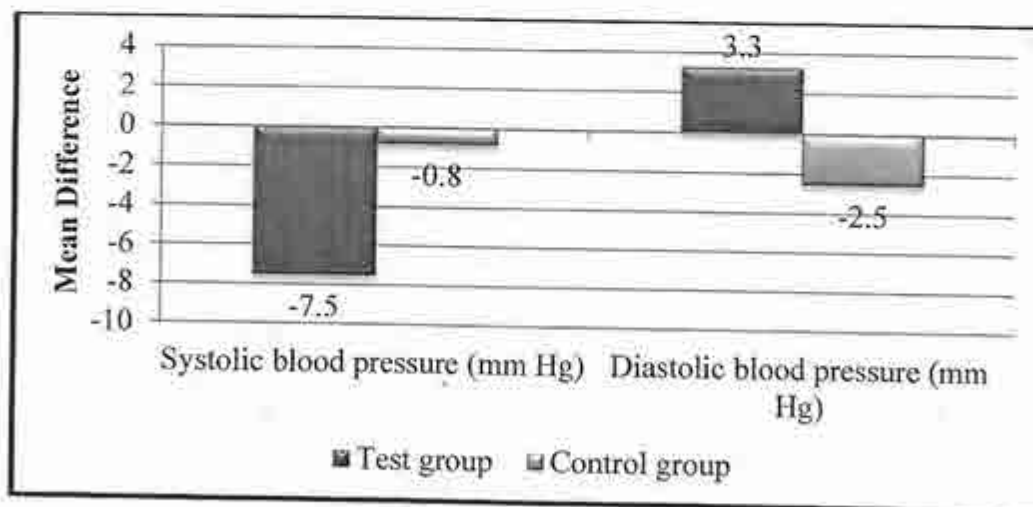


Fig 2. Comparison of the mean increment or reduction in the blood pressure levels between test group and control group

Effect of Soy beverage on Serum Lipid profile

The present study evaluates the effect of Soy beverage on Serum lipid profile as presented in table 4 and figure 3.

Table 4: Effect on Soy beverage supplementation on Serum Lipid Profile

Group	Variable (mg/dL)	Before Supplementation Day 1	After Supplementation Day 46	Day 1 vs Day 46		't' value	'p' value
		Mean \pm S.D	Mean \pm S.D	Mean difference \pm S.D	Percent increment/decrement		
Test	T cholesterol	228.9 \pm 31.8	191.6 \pm 15.9	-37.2 \pm 22.1	↓15.6	5.837	0.000**
	HDL-C	56.6 \pm 12.9	59.6 \pm 12.1	2.9 \pm 1.3	↑5.9	-7.661	0.000**
	LDL-C	116.9 \pm 41.7	98.9 \pm 31.6	-17.9 \pm 11.8	↓12.2	5.239	0.000**
	VLDL-C	74.0 \pm 25.6	68.6 \pm 23.9	-5.3 \pm 6.9	↓7.04	2.676	0.022*
	Triglycerides	322.3 \pm 113.1	265.0 \pm 96.1	-57.3 \pm 32.6	↓17.4	6.080	0.000**
Control	T cholesterol	245.2 \pm 52.3	240.1 \pm 50.1	-5.1 \pm 6.8	↓2.0	2.613	0.24 ^{NS}
	HDL-C	56.5 \pm 13.5	56.9 \pm 13.4	0.3 \pm 1.3	↑0.8	0.521	0.613 ^{NS}
	LDL-C	139.7 \pm 28.4	136.0 \pm 28.7	-3.7 \pm 6.6	↓2.7	1.954	0.077 ^{NS}
	VLDL-C	52.6 \pm 11.7	51.4 \pm 13.0	-1.1 \pm 2.0	↓2.8	1.982	0.073 ^{NS}
	Triglycerides	270.6 \pm 38.6	262.3 \pm 40.6	-8.2 \pm 8.4	↓3.2	3.393	0.006 ^{NS}

** - Significant at P < 0.01; * - Significant at P < 0.05; NS - Not Significant

Effect of Soy beverage on serum lipid profile showed a significant 15.6 percent (-37.2 ± 22.1 mg/dl) decrease in the mean total cholesterol levels (228.9 ± 31.8 to 191.6 ± 15.9 mg/dl), a significant 5.9 percent (2.9 ± 1.3 mg/dl) increase in the mean high density lipoprotein levels (56.6 ± 12.9 to 59.6 ± 12.1 mg/dl), a significant 12.2 percent (-17.9 ± 11.8 mg/dl) decrease in the mean low density lipoprotein levels (116.9 ± 41.7 to 98.9 ± 31.6 mg/dl), a significant 7.04 percent (-5.3 ± 6.9 mg/dl) decrease in the mean very low density lipoprotein (74.0 ± 25.6 to 68.6 ± 23.9 mg/dl) and a significant 17.4 (-57.3 ± 32.6 mg/dl) decrease in the mean triglycerides levels (322.3 ± 113.1 to 265.0 ± 96.7 mg/dl) at the end of the supplementation ($p < 0.01$).

Mean serum lipid profile levels of the control group showed a 2.0 percent (-5.1 ± 6.8 mg/dl) decrease in the mean total cholesterol levels (245.2 ± 52.3 to 240.1 ± 50.1 mg/dl), 0.8 percent (0.3 ± 1.3 mg/dl) increase in the mean high density lipoprotein levels (56.7 ± 13.5 to 56.9 ± 13.4 mg/dl), a 2.7 percent (-3.7 ± 6.6 mg/dl) decrease in the mean low density lipoprotein levels (139.7 ± 28.4 to 136.0 ± 28.7 mg/dl), a 2.8 percent (-1.1 ± 2.0 mg/dl) decrease in the mean very low density lipoprotein levels (52.6 ± 11.7 to 51.4 ± 13.0 mg/dl) and a 3.2 percent (-8.2 ± 8.4 mg/dl) decrease in the mean triglycerides levels (270.6 ± 38.6 to 262.3 ± 40.6 mg/dl) at the end of the study period, but these changes were not statistically significant.

Serum lipid parameters like total cholesterol, triglyceride, LDL-C and VLDL-C levels of the test and the control group decreased during the supplementation period or study period, while the HDL-C levels of the test and the control group increased during the supplementation study period. The mean difference in serum lipid parameters of the test group and control group showed a statistical significant difference ($p < 0.001$), except for VLDL-C levels.

It is well established that soy protein consumption reduces serum total cholesterol, LDL cholesterol, and triglycerides as well as hepatic cholesterol and triglycerides. Studies in animals indicate that soy protein ingestion exerts its lipid-lowering effect by reducing fecal bile acid excretion, thereby reducing hepatic cholesterol content and enhancing removal of LDL. Dietary soy protein has also been shown to directly affect hepatic cholesterol metabolism and LDL receptor activity (Gebbers, 2007).

Several components associated with soy protein have been implicated in the hypocholesterolemic benefits: trypsin inhibitors, phytic acid, saponins, isoflavones, and fiber.

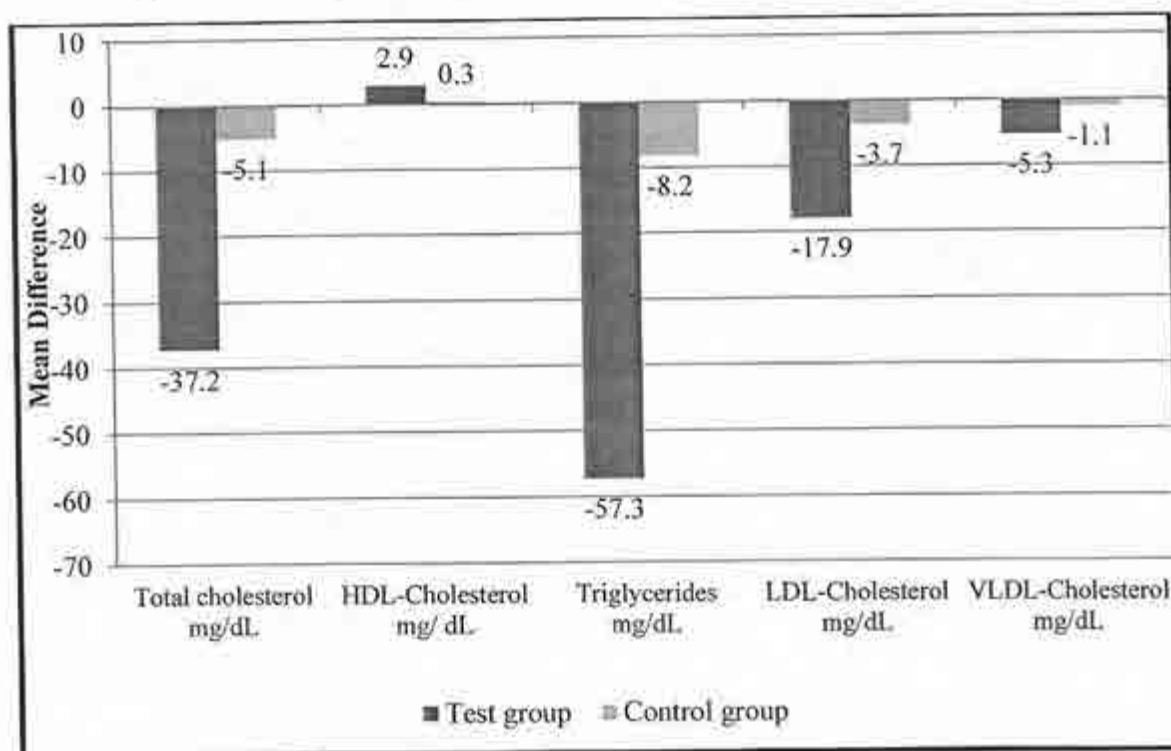


Fig. 3. Comparison of the mean increment or reduction in the serum lipid parameters between test group and control group

Nutrition Education Programme

Nutrition education program was conducted using a power point presentation on cardiovascular disease, foods to be included and foods to be avoided during hypercholesterolemia, soy benefits,

benefits of exercise, benefits of fiber, 25 tips for healthy heart, RDA for adults and general population.

Results on perceived knowledge and attitude of the subjects towards soy indicate that majority of the subjects responded "disagree somewhat" and "neither disagree or agree" to most of the questions related to perceived knowledge and attitude towards soy. Results of the test of significance reveal that there is a significant increase in nutrition knowledge and nutrition awareness among the subjects after the nutrition education program ($P < 0.001$). As seen in Fig.4. the mean score on nutrition knowledge before the education program was found to be 5.1 ± 1.5 out of a maximum score of 13 and this had increased to 12.8 ± 0.3 after the nutrition education program. The mean score on nutrition awareness before the education program was found to be 4.8 ± 1.8 out of a maximum score of 10 and this had increased to 9.9 ± 0.2 after the nutrition education program. Nutrition education program was effective and useful and improved their knowledge and awareness in nutrition.

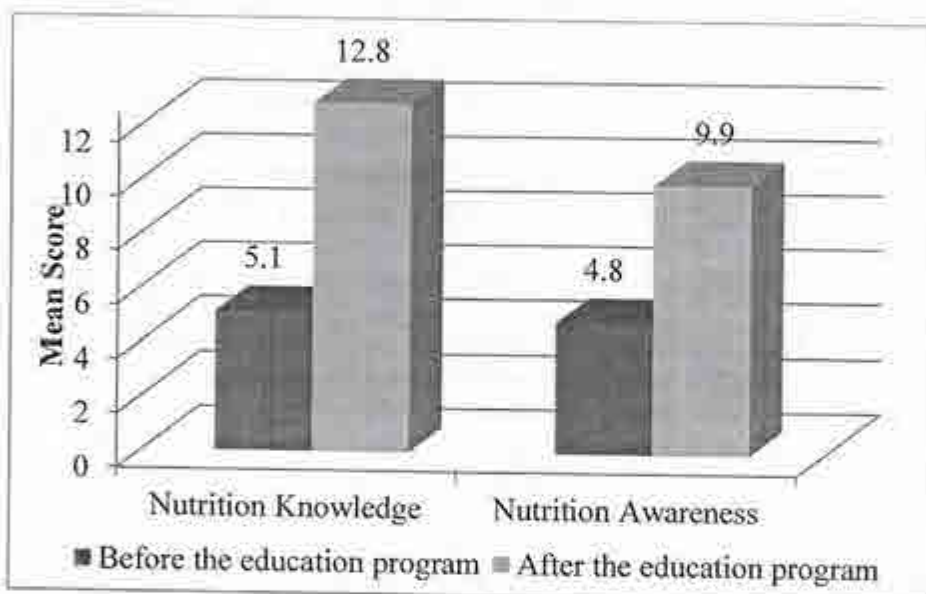


Fig. 4. Nutrition knowledge and awareness of the participants before and after the nutrition education program.

CONCLUSION

Soy beverage contains Isolated soy protein, vegetable fat powder, sugar, maltodextrin, malt extract, dipotassium phosphate, tricalcium phosphate, monoglycerides, mineral and vitamin premix. The supplement was found to be very good in its sensory attributes. Supplementation of Soy beverage for 45 days has exerted positive effects on the anthropometric parameters, blood pressure levels and serum lipid profile of hypercholesterolemic male subjects aged 40-50 years. Soy beverage reduces body weight and fat mass in addition to lowering serum lipids and triglyceride: this could be due to a wide spectrum of biochemical and molecular activities that

favorably affect fatty acid metabolism and cholesterol homeostasis. Soy protein has a greater thermogenic effect, which may be relevant for the prevention and treatment of obesity. Soy beverage exerts a positive effect on systolic blood pressure. There is strong evidence to indicate that every 10 mm Hg reduction in systolic blood pressure was associated with reductions in risk of 12% for any complication related to diabetes, 11% for myocardial infarction, and 13% for microvascular complication. The observed reduction in blood pressure can be attributed to the presence of amino acid content of soy-based products with a higher arginine, cysteine and glycine content than other proteins. In addition, the isoflavones associated with soy protein may help account for the difference observed in blood pressure. Isoflavones tend to act as phytoestrogens in mammals and, therefore, may influence endothelial function of blood vessels through biological estrogenic mechanisms.

Soy beverage exerts a positive effect on serum lipid profile, the observed reduction can be attributed to several compounds like trypsin inhibitors, phytic acid, saponins, isoflavones and fiber present in soy which reduces serum total cholesterol, LDL cholesterol, and triglycerides as well as hepatic cholesterol and triglycerides.

In line with previous scientific findings, the results of this study have indicated that active soy based supplements had a beneficial effect on cardiovascular risk markers among the hypercholesterolemic male subjects aged 40-50 years in the study. However considering the limitations of the study viz-a-viz small sample size, short duration of supplementation etc, the effect of other confounding factors such as changes in diet composition, physical activity variations etc cannot be ruled out. The study, however, highlights the recommendation of FDA. The Food and Drug Administration (FDA) suggested consumption of at least 25 g/day of soy protein as part of a diet.

The present study also indicates that majority of subjects appear to be unaware of health benefits of Soy and even if they do they avoid soy food because of its perceived unattractive taste and inconvenience. The study strongly recommends the dissemination of information about soy-related health benefits through education program.

The research conducted has led to some useful results and conclusions; however it has also uncovered many areas that need additional study. Thus the following recommendations for further research are presented:

- The study should be replicated with more subjects under more carefully controlled conditions,
- This study should be replicated, using hypercholesterolemic women in pre and post menopausal period.
- As very little information is available regarding the use of soy protein foods during pregnancy, postpartum, or infancy, future studies can evaluate the effect of soy protein among different age groups targeting both pediatric and geriatric research.
- Further studies can be carried out on the therapeutic effects of soy on various non-communicable diseases.

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ROLE OF DIETICIANS IN PUBLIC AND PRIVATE HOSPITALS OF MUMBAI.

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Dietetics is the interpretation of the science of nutrition to enable people to make informed and practical choices about food and lifestyle, in both health and disease. Dietitians work as part of a team caring for patients in the hospital. Most hospitalized patients are dependent on hospital food for their nutritional requirements. The role of a dietitian is extremely varied. The present study was conducted to examine the dietary department functions and systems and to evaluate the role of the dietitians at public and private hospitals of Mumbai. A questionnaire was administered to dietitians of 30 hospitals including public $n=4$ as well as private $n=26$. The total number of dietitians in a hospital varied from one to as many as ten and they worked either in one or two shifts. Dietitians in public hospitals met up to a maximum of 1200 patients while that of private hospitals met a maximum of 380 patients admitted in the hospital daily. Activity levels measured in the study showed task activities that included individualized diet instructions, conducting nutrition assessments, taking anthropometric measurements, screening patients for deficiencies, detailed diet recalls, participating in medical rounds, and supervising support personnel among other functions. The average amount of time spent in minutes with each patient had a mean of 17.07 ± 13.77 for inpatient admissions while the outpatient department had a mean of 29.17 ± 8.815 . Fifty percent of the Hospitals both in public sectors as well as private sectors conduct nutritional assessments only for referred patients. All hospitals had a provision for a diet counseling clinic. Hence it can be concluded that the dietitian is an important link in the hospitals' health care system, plays a key role in providing quality nutritional care to the patients, and is responsible for the nutritional wellbeing of the patients.

Key Words: Dieticians, Public, Private Hospitals, Patients, Nutrition

INTRODUCTION

Most hospitalized patients are dependent on hospital food for their nutritional requirements. All patients have the right to expect that their nutritional needs will be fulfilled during a hospitalization. Optimal supply of food is a prerequisite for an optimal effect of the specific treatment offered to patients. Hence, the responsibilities of staff categories and the hospital management with respect to procuring nutritional care and support should be clearly assigned (Beck et al, 2002).

The role of a dietitian is extremely varied and exciting. In general, dietitians work as part of a team, caring for people in hospital. They also work to promote good health and prevent disease by informing and teaching the public, health professionals and others about diet and nutrition. Dietitians help to promote healthy food choices and prevent disease by increasing awareness of the link between nutrition and health. Registered dietitians translate the science of nutrition into everyday information about food. (The British Dietetic Association, 2012)).

Dietetics is the science and art of feeding individuals based on the principles of nutrition. It can also be said to be the "science and art of nutritional care." Diet therapy and its application in

patient related settings is a major focus of dietetics. The role of dietitian has come a long way since the early 1900s. Their role is still unknown to a lot of people. Some think that dietitians, as their name implies, only give out diets to make individuals lose weight, whereas this is a small part of their role. The dietitian is the link between the patient and medical team or physician in the difficult decision making about nutrition care. A dilemma occurs when the disease state of the patient confounds the adequacy of nutritional support, resulting in the patient's malnourishment (Employment news, 2012).

In a study done by Towers et al, 1987 it was observed that although the role of the clinical dietitian has undergone dramatic change in recent years, standards for staffing patterns that were developed in 1935 are often still in use. There is a need for workload measurement systems to quantify the daily activities performed by clinical dietitians. Studies examining the role of dietitians have revealed that dietitians were perceived as not performing a role consistent with respondents' expectations. Activities related to the professional development, education, and research role of dietitians yielded higher disparity than did activities related to the provision of nutritional care. (Schwartz, 1984)

Despite sufficient food provision, most of the hospitalized patients did not cover their estimated needs. Since insufficient food intake was often attributed to causes other than disease, there should be potential to improve the hospital meal service. (Dupertuis et al, 2003)

Hence this study was done to understand the workload of the dietitians and also to quantify the daily activities performed by clinical dietitians. In view of the rising health care cost, there is a need for hospitals to improve the efficiency of quality dietetic services provided to the patients.

MATERIALS AND METHODS

RESEARCH PROTOCOL – The research protocol included administration of a questionnaire to all the chief Dietitians. All questionnaires were administered after obtaining consent of the concerned authorities.

Criteria for Sample Selection

➤ Inclusion Criteria:

1. Multi-specialty as well as specialty hospital was included in the scope of study.
2. Hospitals with/without a structured dietary department were included.
3. Food Service Management functions, Out Patients Department (OPD) functions and Continuous Medical Nutrition Education (CMNE) programs were studied.
4. All hospitals were within the geographical boundaries of Mumbai.

SAMPLE SIZE- A total of 65 hospitals in the Public and Private Sector hospitals of Mumbai were approached of which 30 hospitals gave consent to conduct the study.

SAMPLING TECHNIQUE

Purposive sampling technique

1. **RESEARCH METHODS:** Interview Method - Personal and Structural interview using a questionnaire method.
2. **TOOLS AND TECHNIQUES: Questionnaire** A detailed questionnaire was administered to all the participants to obtain information on the following:

Part I - On the Dietetic department functions and systems, roles and responsibilities, and job description/specifications of dietitians in the hospital.

Part II - On the nutritional protocols followed by dietitians and 'Dietetics Services' of the hospital.

RESULTS AND DISCUSSIONS

In the present study, the role of dietitians in public and private hospitals of Mumbai was studied. The results obtained have been discussed under the following headings.

1. The dietary department functions and systems in public and private hospitals of Mumbai
2. The existing role of the dietitians in the hospitals

Functions and Systems of dietary department in public and private hospitals of Mumbai.

The questionnaire was administered to 30 hospitals; of which 13.4% were public hospitals (n=4) and 86.6 % were private hospitals (n=26)

Hospital n = 30	Hospitals	Number of hospitals which have any kind of accreditation	Hospitals that work in either one or two shift
Public sector	4	0 (0)	4 (100)
Private sector	26	6 (23)	13 (50)
Total	30	6 (20)	17(57)

Table: 1Hospitals with accreditation or certifications and shifts of dietitians (Data is presented as number (percent))

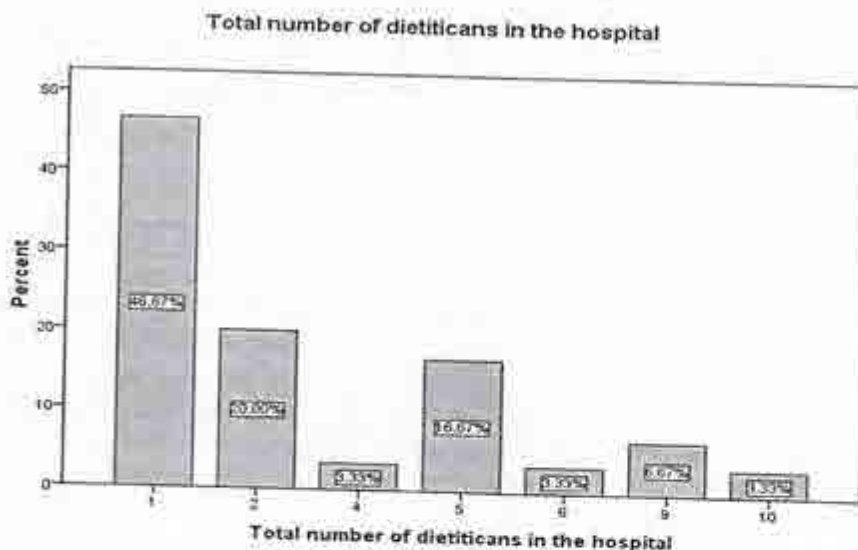
In the present study 80% of all of the Hospitals in did not have any kind of accreditation or certification, while 20 % were certified, all of which were from the private sector. This study also brought out the fact that in the hospital dietetic department, dietitians of all public hospitals worked in either one or two shifts whereas in private sector hospitals 50% of dietitians worked in shifts, while the rest were dietitian consultants.

In another study conducted by the Department of Human Nutrition, All India Institute of Medical Sciences on the Status of nutrition support services in selected hospitals in India, it was found that Nutritional support of hospitalized patients was a neglected aspect of clinical management despite the fact that hospital malnutrition leads to increased morbidity and mortality. There was a paucity of data regarding the status of nutrition support services (NSS) from India; hence, the study was conducted in 50 hospitals attached to medical colleges all over the country. A semi-structured, pre-tested questionnaire was utilized to collect data regarding the status of NSS in these hospitals. The results of the study revealed that only 64% of the hospitals had a dietetics department. About 18% did not have any dietitian. The dietitian-to-patient ratio was very low--0.28 dietitians available per 100 hospital indoor beds. The majority (82%) of the hospitals were providing hospital food to indoor patients. The average cost of 4 meals per day was Rs 22 per patient. It was seen that 46% of the hospitals were not providing hospital-based special feeds to the patients. The findings of the study indicated that the NSS are inadequate even in tertiary care hospitals and there was a need to strengthen the services for the holistic management of patients (Kapil et al, 2003).

Number of employed dietitians in the hospitals (public and private)

In the present study the number of employed dietitians in the hospitals (public and private) had a mean of 2.97 ± 2.71 dietitian staff employed.

Figure 1: Number of employed dietitians in the hospitals (public and private)



The above Figure shows that about 47% of all hospitals (public and private) in the given study employ one dietitian, 20 % employ 2 dietitians while 3 % of all hospitals employ from 4, 6 or even 10 dietitians.

A survey was conducted by the 'The American Dietetic Association' on the number of Dietitians in Nutrition Support dietetic practice group. A questionnaire was developed to evaluate changes in nutrition support services provided to hospitalized patients and was mailed to clinical nutrition managers from a nationwide random sample and two hundred and seventy one responses were received. The number of Full-time equivalent (FTE) registered dietitians (RDs)—including clinical RDs, nutrition support service RDs, and clinical nutrition managers—decreased 11% and FTE dietetic technicians decreased by 22% over a period of three years. The number of FTE nutrition support service RDs and clinical nutrition managers decreased significantly (P less than .05). The mean number of FTE clinical dietitians per 100 beds decreased from 1.4 to 1.0 from 1986 to 1989. These decreases in dietetics staffing occurred despite an overall increase in total hospital FTE staff of 2.9%. Decreased dietetics staffing was accompanied by other factors that negatively affect productivity (and therefore ability to provide adequate patient care), including inadequate delegation of technical tasks to dietetic technicians, limited availability of secretarial and computer support, and minimal provision of pocket pagers. These trends may be evidence of inadequacy of dietetics staffing for nutrition care (Compher and Colaizzo, 1992).

Anticipated Staffing Patterns

Table: 2 - Anticipated staffing pattern s expressed by the chief dieticians of the hospital

Number of more staff are required	Public hospitals n=4 f	Private hospitals n=26 f	All cases n=30 f	All cases n=30 %
0	1	15	16	53.3
1	0	5	5	16.7
2	1	5	6	20.0
4	1	1	2	6.7
9	1	0	1	3.3

As show in Table 2: Data on the anticipated additional staffing requirements as expressed by the chief dieticians of the hospital, revealed that 53.3% of the hospital's chief dietician were of the opinion that they were adequately staffed. 46.7% of the chief dieticians identified the need for additional staff requirement. Highest among the need for additional staff need was from Public sector hospital, with the need anticipated from one to as many as nine additional dieticians while five hospitals in the private sector anticipated the need of minimum one additional dietician and the other five anticipated the need of additional two dieticians

The role of dieticians in the hospitals.

Table 3 presents the job specifications/activities carried out as departmental function by the dietician in both public and private hospitals in this study.

Table 3: The role of the dieticians in the hospitals

Job specifications: various activities carried out by dieticians in hospitals	Public hospital n=4 f	Private hospital n=26 f	Total n=30 f
Assess the Nutritional status	4	16	20
Helps patient to select appropriate food items (during hospital stay)	0	11	11
Discusses the diet with the patients	0	21	21
Screening patients (nutritional deficiencies)	4	24	28
Considers biochemical parameters before planning diets	4	26	30
Develops a diet plan	1	18	19
Communicates to other team members	2	20	22
Monitoring the effect of nutrition intervention	4	19	23
Assessing the patient's food acceptance.	2	19	21
Provide diet counseling	4	26	30
Implement nutrition care plan	2	22	24
Solves Nutrition problems of individual	3	19	22
Acquires and utilized dietary supplements	4	20	24
Meet all patients daily	0	9	9
Detailed diet history	2	21	23
Provides a discharge diet to referred patients only	4	26	30

Provides a discharge diet to all patients even if not referred	0	2	2
Maintains a departmental record	4	15	19
Supervise diet assistants/clerks,	2	17	19
Accept direct supervision from senior dietitians	1	11	12
Respects the lifestyles, opinions, beliefs and values	4	26	30
Understands the need for team effort.	2	24	26
Seeks appropriate avenues for continuing education (Seminars, conferences)	4	23	27
Uses communication effectively. (to ward and kitchen)	4	26	30

As seen in table 3, the public hospital dietitians were unable to meet all patients during the patient's hospital stay, nor they are able to discuss their daily diet and also unable to provide a discharge diet to all patients. This could be because of the workload of dietitians in public hospitals where they met upto 1200 patients per day, as show in table 4 given below.

Table:4 Patients met daily by the dietitians- Inpatient

Maximum Patients met daily by the dietitians- Inpatient	
Public hospital n=4	1200
Private hospital n= 26	380

Another study of dietitian performance, based on pre-established criteria, was conducted to measure current levels of clinical services and to define productivity standards. Each dietitian were supplied a lists of job functions or duties performed and the length of time spent on each function. Results indicated a need to establish a list of prioritized duties that was mutually agreed upon, as well as analysis of existing scheduling and floor assignments. Changes were made in all areas, which improved performance but still did not reach the 75% goal. An analysis of staffing needs versus productive time necessary for patient care was then conducted. Each function of clinical care was assigned a time value with consideration of patient acuity level. After 18 months of research, it was possible to justify an additional full-time employee (FTE) on the basis of the number of productive hours needed for patient care to achieve their goal.

In Another study ,on the basis of responses to a telephone questionnaire, it was evaluated--from the viewpoint of nutrition support dietitians, general clinical dietitians (dietitians who were not members of a nutrition support team and who provided general clinical dietetic services), and other health professionals--the current job functions that nutrition support and general clinical dietitians performed in hospitals. Anticipated staffing needs and desired job functions were also assessed. For the nutrition support and general clinical dietitians, as viewed by themselves and other health professionals, there was considerable overlap in many job activities. However, a significantly larger proportion of directors of nursing thought that nutrition support dietitians were more involved than general clinical dietitians in the evaluation of nutritional status (42% vs.

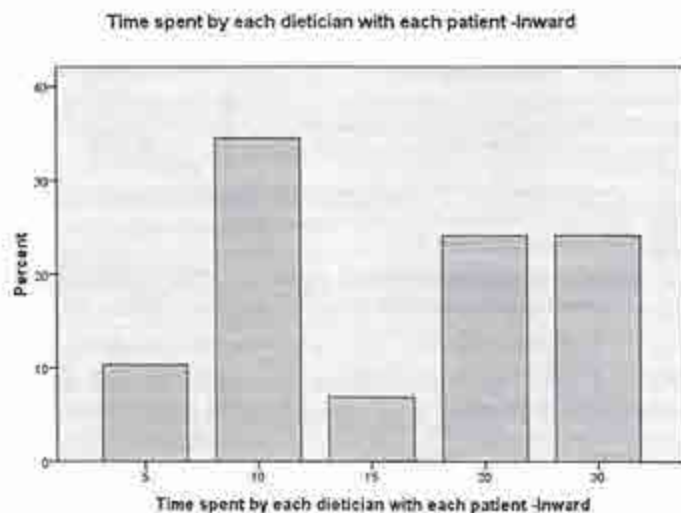
14%) and in contributing expertise to medical team discussions (48% vs. 12%). A significantly larger proportion of physicians viewed the nutrition support dietitian as more involved than the general clinical dietitian in in-service programs for medical and nursing staffs (32% vs. 6%). A large proportion of directors of nursing (62%), hospital administrators (34%), and physicians (56%) believed that dietetic involvement in the supervision of food preparation, especially by general clinical dietitians, was much greater than did the dietetic staff. The outlook for the future suggests a greater participation by both the nutrition support and the general clinical dietitian in direct patient care functions and less involvement in food preparation and clerical tasks (Ryan et al, 1988).

The current nutritional protocol followed by dietitians in the hospitals (Public and private) of Mumbai:

In the present study, the amount of time spent by the dietitian per patient for in patients and out patients of all the hospitals in the study was calculated.

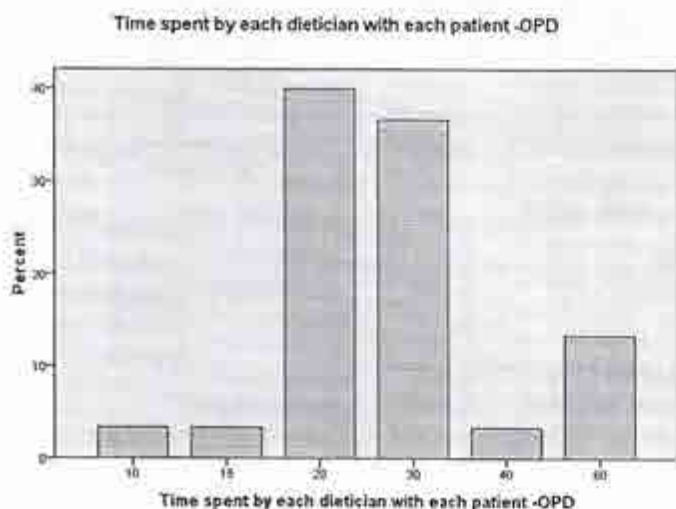
In the present study the time spent with in patients of all the hospitals in the study had a mean of 17.07 ± 8.815 minutes.

Figure 2: Time spent with inpatient (public and private) hospitals.



The time spent by each dietitian with the outpatient of all the hospitals in the study had a mean of 29.17 ± 13.77

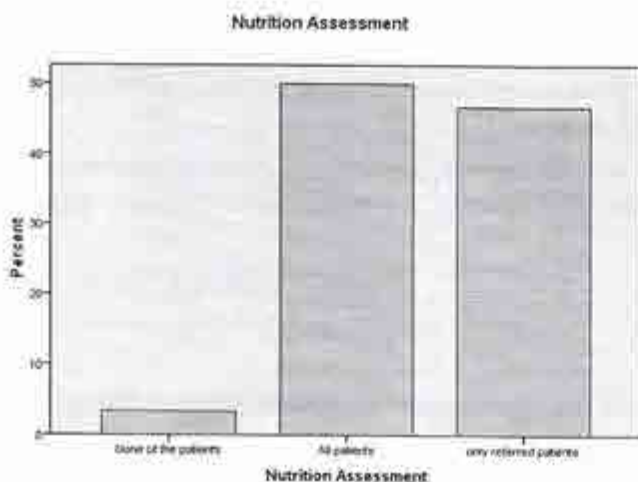
Figure 3: Time spent with outpatient (public and private) hospitals.



Nutritional Assessment

In the current study as shown 50% of the Public Hospitals and 50% of the private hospitals conduct Nutritional assessments for the patients only for referred patients, while 50% of the Public Hospitals and 46.2% of the private hospitals conduct Nutritional assessments for all the patients met by the dietitian. The mean number of Nutritional Assessments conducted by dietitians in public and private hospitals is 15.53 ± 24.288 (total N=30)

Figure 4: Nutritional Assessment (public and private) hospitals.



SUMMARY AND CONCLUSION

Many experienced health professionals, hospital administrators and the human resource departments of the hospitals have only a vague idea of the role of trained clinical dietician. This study has helped to understand the Dietician's role.

The present study also highlight the importance of Accreditation of Hospital Dietary Department for Standards as they promote safe, effective, and efficient food and nutrition services based on evidence-based practice. They provide for improved health care and food and nutrition service-related outcomes, ensure continuous quality improvement and promote dietetics research, innovation, and practice development.

The findings of the study were:

- Dietician in the hospitals work in one or two shifts.
- The Dietician to patient ratio in most hospital of Mumbai seems to be poor.
- There is inadequate dietetics staffing for nutrition care and also a high anticipation of additional staff requirements.
- Adequate time is allotted for patient counseling.
- Dieticians seem to take personal responsibility for Professional performance and also seek strategies to increase the credibility and visibility in clinical dietetics. Part time employment opportunities have emerged in hospitals and hospitals seem to be employing dieticians as consultants and not full time employees.
- The findings of this study could provide guidelines to various bodies such as hospitals, Dietetic Association, Government bodies, and Accreditation boards with regards to role of dieticians in hospitals.

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