



REFLECTIONS

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REFLECTIONS

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Perception and Knowledge regarding Menopause among Working and Non-Working women of Kolkata from different Socio-Economic backgrounds

Nidhi Ghelani and Krishnakali Bhattacharyya

ABSTRACT

Menopause is a time in a woman's life when it is recognized that biological and social changes can influence upon their quality of life. This study was planned to investigate the Perception and Knowledge regarding Menopause among Working and Non-Working women of Kolkata from different Socio-Economic backgrounds. The present study was carried out on 517 participants using Menopausal Rating Scale (MRS), Utian Quality Of Life Scale (UQOLS) and a self-prepared 12 statement questionnaire, to investigate the rating of menopausal symptoms, quality of life of menopausal women and also the attitude and knowledge level regarding menopause among menopausal women of Kolkata, West Bengal. ANOVA was used to analyse the data. The results of the study help to draw a clear conclusion that the response towards the symptoms of menopause is consistent among women irrespective of their income and employment status. Difference exists when the quality of life is considered. A difference in perception is observed which stems from their knowledge and living conditions. Overall, the natural phenomenon of menopause is an universal course of life which all women go through.

Keywords: Age, Knowledge, Menopause, Menopause rating scale, Perception, Utian quality of life scale

Introduction

“What begins... must end. The grace with which we accept the end is what makes the journey worthwhile for a woman...”

Menopause is a universal phenomenon. There is a considerable variation among women regarding the age of attaining menopause and the manifestation of menopausal signs and symptoms. Worldwide, the estimates for the mean age of menopause range from 45 to 55 years. Menopause is a permanent shutting down of the female reproductive system, a considerable length of time before the end of life span. A WHO⁽¹⁾ scientific group conducting research on menopause recommended the following stipulated definition of “menopause as a permanent cessation of menstruation resulting from loss of ovarian, follicular activity.” The term menopause simply refers to the last menstrual period which is defined by not having had a period in 12 months. Although a technical definition of menopause refers to your last period, it is not an abrupt event but a gradual process. The average age of menopause in the western world is 51 years while as in India it is 44.3 years and the normal age range for the occurrence of menopause is somewhat between the age of 45 and 55. More than 80% of women report physical and psychological symptoms that commonly accompany menopause, with varying degrees of severity and life disruption⁽⁴⁵⁾. India has a large population, which has already crossed the billion marks with million people over 60 years of age and number of menopausal women about 43 million (Indian Menopause Society [IMS] 2008).

According to scholars⁽³⁾, in terms of relationships, all of these symptoms can be detrimental to a healthy relationship. One minute they may be feeling fine and the next they might experience a bout of anger. While it is impossible to fashion a menopause-proof vest, their significant other will most likely have to deal with mood swings which can be difficult. Many women report not feeling like themselves. It has also been revealed that vasomotor symptoms may lead to social impairment and work related difficulties that significantly decrease the overall quality of life⁽⁵⁾.

An earlier study conducted on behalf of the British association for women in policing revealed that the menopause represented a major challenge for some women’s health⁽⁶⁾. Menopause is perceived as freedom from certain cultural restrictions that have been imposed on younger women and as a control from childbirth.

There are many possible signs of menopause and each woman feels them differently. Most women have no or few menopausal symptoms while some women have moderate or severe symptoms⁽⁷⁸⁾. Symptoms which constitute menopausal symptoms vary widely between populations and studies⁽⁷⁾. The clearest signs of the start of menopause are irregular periods and when blood flow becomes lighter or heavier. Other signs may include, weight gain, hot flashes, insomnia, night sweats, vaginal dryness, joint pain, fatigue, short-term memory problems, bowel upset, dry eyes, itchy skin, loss of libido, palpitations, headaches, irritability, mood swings and urinary tract infections⁽¹¹⁾.

In addition, the benefits of psycho-education, behavioural changes, and exercise in improving the experience of menopause can also be related. Menopause does not mean end of life; women have much more to do in their life rather than feeling physically, psychologically or emotionally and socially affected. Lifestyle modification can have a major impact on health. Modifying the sleep pattern, daily routine, regularly exercising, dietary habits, thinking pattern will help a great deal to cope with menopause. Women hold a major portion in today's world and if she is not fit enough, the family gets affected and in turn the society gets affected, as she becomes a burden for her own community, health care and the government⁽⁹⁾.

There are 3 stages of menopause, and what most women call "menopause" is actually peri-menopause. After peri-menopause is stage 2, menopause, followed by the final stage, post-menopause. This is attributed to the many perceived benefits of menopause such as freedom from cultural restrictions imposed on younger women and the burden of childbirth as well as the discomforts associated with menstruation. Postmenopausal women in some parts of India are said to enjoy a higher social status assigned to ageing women.

A population based crossed sectional study⁽¹²⁾ was conducted In Tamil Nadu, India on perception regarding menopause, prevalence of menopausal symptoms and association of family environment factors with menopausal symptoms among 100 post-menopausal and 100 pre-menopausal rural women. 57% of post-menopausal women perceived menopause as convenient. 69% of them complained diminishing abilities after menopause. 23% felt that sexual life ends with the onset of menopause. 16% reported that their husbands and become disinterested in them after menopause and 11% were apprehensive about the loss of femininity. 54% of post-menopausal and 32% of premenopausal women were currently not sexually active. 59% of postmenopausal and 38% of premenopausal women expressed loss of sexual desire and this difference was statistically significant.

The analysis of the relationship between stress at work and results of cognitive functions amongst women, at peri- and post-menopausal age, performing intellectual work was studied by a team of researchers. Among the post-menopausal women, negative correlations were observed between the majority of cognitive functions and

the intensity of stress at work, and the majority of factors which caused this stress. Cognitive functions of the examined women remained within the range of average evaluations, and were correlated with stress-inducing factors at the place of work.

The objectives of the present study are to find out the mean age at which women attain menopause and to investigate the level of awareness regarding the concept of menopause. Also to explore if, any substantial difference exists among working and non-working women regarding their perception of menopause and to investigate if, the socioeconomic status influences the perception of menopause among women.

Methodology

The present study has been aimed at investigating the age of menopause among women residing in Kolkata, the perception regarding the natural phenomenon of menopause and also the level of awareness and knowledge regarding menopause. The study primarily focuses on working and non-working women of Kolkata from various socioeconomic backgrounds. To do justice to the objectives of this study Descriptive Research Method has been adopted. The study procedure consisted of collecting data by way of interview questionnaire. Menopausal Rating scale (MRS) questionnaire was used along with Utian Quality of Life Scale (UQOL) was used to investigate the quality of life of women experiencing menopause. Along with these standardized scales a set of 12 statements were given to the women where the opinion was recorded on the basis of whether the statement is true or false in their opinion. The statements were prepared on the basis of previously done research^{(63) (64)}. In the current research, the sample was chosen using the Purposive Sampling Technique. However, as the study progressed snowball sampling technique was adopted. 517 women are considered for the study and belong to 3 distinct economic strata's of the society.

Inclusion criteria for the study: The inclusion criteria for the present study are that the respondent must be a middle aged woman. The respondent should have experienced no menopause for at least 6 months at a stretch. The women must be married. The women must not have had any surgery (hysterectomy) or medically induced menopause. The respondent must be a resident of Kolkata. The respondent must be willing to participate in the present study.

Results & Discussions

The results of present study denotes, the mean age of menopause was 51.5 ± 3 year's ranging from 48-55 year's. (51.14 ± 2.11 year's worldwide⁽⁸⁷⁾). Menopause is peculiar to women as it is a stage in the cycle of reproductive aging of women which is universal⁽¹³⁾. Historically menopause has been a topic of curiosity, although it was rarely discussed in social realm. The symptoms of menopause are an indicator of imbalance in estrogen; testosterone and progesterone that cause 34 common menopausal symptoms such as hot flushes, irritability, mood swings, etc. experienced by all women in varying degrees and have many associated effects that might disrupt the quality of life⁽¹⁷⁾. The results of various previously conducted studies⁽³⁾⁽¹⁷⁾ reveal the burden of menopausal symptoms on the life of midlife women in different parts of the world, although a large proportion of women go through this period

uneventfully. From the reviewed studies⁽¹⁶⁾⁽¹⁷⁾⁽¹⁸⁾, it is evident that there is great diversity in symptom frequencies across the cultures and ways of coping adopted by these women.

With reference to the above mentioned table (Table 1) it is observed that the corresponding F-value is 1.572, with a P-value of 0.3412. Hence, the values do not indicate any significant difference. Therefore, the Null Hypothesis (H_{01}) is being accepted rejecting the Alternative Hypothesis (H_1). This further indicates that there is no significant difference between high income group working and non-working women regarding their rating of psychological symptoms, somatic symptoms and urogenital symptoms as given in the Menopause Rating Scale. Similar results were obtained when the middle and low economic groups were considered.

Table 1- Total Number, Mean, Standard Deviation and F-values of High Income working and non-working women regarding Psychological, Somatic and Urogenital symptoms of The Menopause Rating Scale.

	Working Status	N	Mean	Standard Deviation	F- Value	P-Value	P-Value Summary	Hypothesis
1	high income group							
A	working women	54						
	pyschological symptoms		7.96	0.8183	1.572	0.3412		
	somatic symptoms		5.79	1.0375				
	urogenital symptoms		5.75	0.7134				
B	non-working working	49			1.572	0.3412	NO	H_{01} Accepted, H_1 Rejected
	pyschological symptoms		6.14	0.6592				
	somatic symptoms		6.67	1.0799				
	urogenital symptoms		5.38	0.6296				

With reference to the Table 2 it is observed that the corresponding F-value is 32.58, with a P-value of 0.0029. Hence, the values indicate significant difference. Therefore, the null hypothesis (H_{01})

is being rejected accepting the alternative (H_1) hypothesis. When the same test was conducted among women from middle and low economic groups similar results were obtained.

Table 2: Total Number, Mean, Standard Deviation and F-values of high income working and non-working women regarding occupational, health, emotional and sexual quality of life.

	Working Status	N	Mean	Standard Deviation	F- Value	P-Value	P-Value Summary	Hypothesis
1	high income group							
A	working women	54						
	occupational quality		16.7	0.697				
	health quality		17.14	0.894				
	emotional quality		15.35	0.843				
	sexual quality		6.75	0.716				

B	Non-working	49			32.58	0.0029	yes	H_0 Rejected, H_1 Accepted
	occupational quality		13.95	0.662				
	health quality		18.42	0.794				
	emotional quality		16.3	0.704				
	sexual quality		7.59	0.54				

Women's growing awareness causes that they treat menopause as the end of a certain stage followed by a new one. For many of them middle age is the most harmonious time of life¹⁹. The working status of women has a deep impact on their personality, lifestyle and also their outlook towards life thus, influencing their quality of life. Menopause brings with it a series of hormonal and physical changes. One important influencing factor is the fact that working women have had external exposure and even during the time of hormonal changes train their minds and body to work effectively without it influencing their work or their capacity. Hence women who do not work observe these symptoms and are impacted by them at a greater degree.

Interestingly it was also observed that when the income status is not considered as a variable and only the working status is considered a significant difference is observed as well. With the help of Two-Way Analysis of Variance (ANOVA) it was observed that there lies a significant difference among working and non-working women in their response to the quality of life scale. It can be inferred that even if the economic status of the women is not considered, the working status also affects their quality of life. A significant difference is observed in their response to the quality of life scale. It was observed that a remarkable difference is seen among the women belonging to different economic backgrounds regarding their perception however a similarity among working and non-working women was observed within the same income group. This could mean that irrespective of the working status of women of Kolkata, the income status influences their perception and idea regarding menopause. It was also observed that the basic idea of menopause meaning the end of menstruation or freedom from the possibility of pregnancy was uniform among all the respondents which reflect that they are well aware of the concept of menopause and the meaning of this phase in their life. When asked about the changes in libido among women and also regarding the interest of their husband or male partners towards them during this phase of life a variety of response was obtained. Women are seen to have a mixed attitude towards

this as many hold a positive outlook whereas some view this negatively as well.

Among women in the higher income category both working and non-working women it was observed that they feel that during this phase there is no reportable decrease in their libido or decrease in the interest of the partner towards them. This response is significantly different from that obtained from women in middle and low income category. Women both from working and non-working category feel that there is a significant decrease in their libido and also the interest of their partner towards them is seen. A plausible reason behind this can be that women from higher income levels have higher spending capacity and a more thriving social life to compensate for this change hence making this less stressful for them. However women from middle and low income levels focus more on these changes making them a reason for stress. Women across all income groups were of the opinion that life before menopause was significantly more pleasant than that after menopause. This finding is considerably different from the findings of the west. This also leads to women especially from the middle and lower income groups feeling more vulnerable and lonely during this phase compared to women from high economic backgrounds.

Another significant difference is observed when asked if menopause reduces the grace and physical appearance of women. Women from high income group both working and non-working feel no significant change whereas women from middle and low income groups view this as a serious problem and reported that a significant decrease is observed. This however points towards the fact that women from high income groups can afford expensive beauty treatments and care for themselves in a better way as compared to their lower income counterparts. The cultural background, level of education, working status and income status plays an important role in shaping the perception of women regarding this phase of their life⁽²⁰⁾.

The psychological symptoms were correlated to the emotional quality of life. However a score of

-0.065 and -0.123 was obtained for working and non-working women respectively. Hence a negative correlation is seen, which means the psychological symptoms and the emotional quality of life have no influence on each other for the given sample. Similarly the somatic symptoms and uro-genital symptoms were correlated with the health quality of life domain. In case of working women from the middle income group, a score of 0.2411 was obtained when somatic symptoms were correlated to the health domain of the quality life scale. On analysis of the score no significant correlation was seen. Similarly when the uro-genital symptoms were correlated with health a score of 0.510 was obtained showing no significant correlation between the two. For the given population the two scales showed no significant correlation between them.

Conclusion

The results of the present study are expected provide a platform and understanding of how menopause affects the life of the women opening avenues for development and research. The outcomes of the present study can be utilized in improving women's views of this transition in their lives, and ultimately enable women to face this phase of life in a more positive approach. This study identifies the need for further research to examine the views and also to explore urban and rural differences in the aspect of knowledge as well as perception and attitude of women regarding menopause.

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Body Consciousness and Self-Objectification in Female Collegiate Students of Kolkata

Shristee Rai and Geetika Sachdeva

ABSTRACT

Self-objectification refers to the state when people view themselves as objects for use instead of human beings. Self-objectification affects both men and women, but it is more widely seen in women. The present study attempts to provide information about body consciousness and self-objectification to understand how culture and society sexually objectify women. It tries to study the relation between women's self-objectification and self-esteem while considering other aspects like body shame, anxiety revolving around their body image. The study further states that girls and women have a tendency to internalize the third party view of them as the ideal image. This additionally leads to endless self-monitoring causing the girls and women to suffer from eating disorders. It was also seen that girls have heightened self-objectification in the presence of the opposite sex. This self-objectification is further amplified due to constant comparisons with thin friends or siblings. Collegiate girls (N= 212) ranging between 19-23 years completed self-report measures. The main reason for conducting this study was to find out how young women perceive themselves with respect to their physical appearance and their level of consciousness and then to identify the significant factors through Data Analysis. The findings suggest that there exists a significant negative correlation as well as interaction among the variables, self-objectification and self-esteem. Likewise, the presence of a third person had noteworthy effect on relentless self-surveillance further augmenting irrelevant weight concerns. Lastly, media has an enormous effect on idealizing beauty standards.

Keywords: Anxiety, Body Consciousness, Body Shame, Self-Esteem, Self-Objectification

Introduction

Our body is a temple, a gift from God and we must keep it pure and clean for the soul to reside in. From the moment we wake up, we are all concerned with our bodies, whether consciously or unconsciously. Every day we look at the mirror and some of us might notice even the slightest changes, having an impact on how we feel about our self. For many of us, the idea we have of our body largely affects our self-worth and confidence too. This self-image further affects our everyday experiences in daily life. Karen Horney very rightly said 6 decades ago, "it is the socially sanctioned right of all men to sexualize women, irrespective of age or status." This sexualisation can occur in a wide range of forms from sexual evaluation to sexual violence. However, the most subtle form of sexual evaluation is the constant visual inspection that people do on women irrespective of their age. This gaze is objectifying and can take place in two parts. First is when girls and women are a part of an interpersonal interaction and social situation. Second it is through social media that women are sexually objectified. It is because of this objectifying act of the men that women tend to objectify themselves too. Self-objectification can simply mean the situation wherein people view themselves as objects for use instead of as human beings. On the other hand, body consciousness can be defined as being aware of one's body and creating

a relationship with the body that is a fundamental key for change. In the psychological level, perhaps the most severe effect of objectifying treatment is that it allures girls to affiliate a particular view of the self. Several feminist theorists have argued that women often adopt an observer's perspective on their physical selves. Some researchers developed an influential theory that hypothesizes that one of the foundation experiences of women in modern society is observed and evaluated for one's appearance. It also states that self-objectification affects a girl's emotional well-being. This leads girls and women to internalize the opinion of others as the basic image of their body which further shifts focus on how they appear to be, how their body looks rather than what their bodies are capable of doing. (6) Even though it is mostly an explicit sexual view that is directed towards the women, but the objectification theory focuses more on appearance than on sexuality in broad terms. The woman who objectifies herself tends to exert oneself to be attractive, however, not with the aim of attracting sexual attention but for self-satisfaction. Scholars have developed the concept of sexualisation to better understand a more explicitly sexual form of objectification.⁽⁴⁾

Self-objectification increases in situations which exaggerates the attentiveness of an individual's physical appearance. In this context, the presence

of a third person observer is heightened. Therefore, when individuals know others are looking at them, or will be looking at them, they are more likely to care about their physical appearance. Examples are when an individual is a part of a dance audition or a fashion show etc.⁽¹²⁾

According to some researchers in their attempt to test the impact of sexual objectification on women's behavior in social interactions, saw that women had a tendency to limit their interactions with men in social situations where their bodies or appearances could be inspected or they were objectified. The participants that included both men and women gave an introduction to an interaction partner, both men and women. The participants were told whether their bodies were being inspected or not. There were three conditions under which the participants had to give their introduction through a closed circuit device in one of three conditions: body (videotaped from the neck down), or audio (no videotaping) and face (videotaped neck upwards). It was noted that the women who thought that they were being videotaped from their body and were interacting with men, spent considerably less time talking than people from other groups. Lastly, majority of the women were against being videotaped on their body as they did not feel comfortable with it.⁽¹¹⁾

Female self-objectification has many consequences, including eating disorders, which are associated with depression. According to DSM-IV-TR, eating disorders are characterized by a severe disturbance in eating behaviour.⁽²⁾

According to National Anorexia Nervosa and Associated Disorders (2013), up to 24 million people of all ages and genders suffer from an eating disorder. This site also reports that 5% of American females believe that a "petite" body type is the most ideal body type. While this might not seem like a large enough number to create concern, data show that 47% of girls in the 5th-12th grade report wanting to lose weight because they compare themselves to idealized magazine photographs, and 69% of girls in the 5th-12th grade report that such images influence their idea of a "perfect" body shape.

Self-Objectification in India- Contemporary western culture has essentially commoditised the female body and form and we now live in a society where

women's bodies tend to be valued as appearance based, sexual objects; objects that can be viewed and appraised and ultimately consumed by other individuals and society as a whole.⁽¹⁾

Increasing awareness about feminism and women's issues has not been able to change prevalent patriarchal attitudes in India. A recent study conducted in different parts of India showed that men are still hung up at women's looks even at the workplace. The results from the study showed that around 68% of Indian men admitted to judging women solely on the basis of their looks rather than their talents and capabilities.⁽⁸⁾ Even arbitrary external factors like a woman's hairstyle could have a major impact on people's perception of their overall personality as 65% of Indian women feel that they have been judged according to their hairstyles. This means that a woman's choice of hair dye could overshadow the amount of efforts she has put in her project. Pop culture and advertising have often been blamed for the objectification of women and have added undue pressure on how women see and groom themselves.⁽⁷⁾ In fact, regular experiences of objectification by others can also lead many women to self-objectification and low self-esteem, according to a study published in Psychological Science.

Methodology

The study is descriptive in nature as the topic has a lot of previous researches done on it. The sample under consideration covers 212 female collegiate students from Kolkata. They are in the age group of 19-23 years. Due to the matter of convenience middle class and upper middle class population from Ballygunge, Lower Rawdon Street and Topsia locality were studied for the purpose. The sample method used is Non-probability convenience sampling technique. The type of research method applied is survey research. Here the main instrument of data collection are two scales. Objectified Body Consciousness Scale and Rosenberg Self Esteem Scale. Along with this the Body Shape Questionnaire was administered.

The data analysis methods used in the study are Mean, Standard Deviation and Correlation Coefficient.

Results and Discussions

Table 1- Overview of the scores

Variables	Mean	Standard deviation
Self-Objectification and Body Consciousness	117.4123	23.89552
Self Esteem	13.79621	7.714623
N=212		

The mean score of the respondents in self-objectification and body consciousness was 117.4123 and the standard deviation was 23.89552 as shown in Table 1. This further indicates that the scores are closely distributed around the mean value further providing a general outlook of the scores of the respondents which is seen to be towards the higher side. The mean score of the respondents in self-esteem was 13.79621 and the standard deviation was 7.714623. This states that the self-esteem scores of the respondents are distributed around the mean. The mean self-esteem score of the respondents is towards the lower range indicating, low self-esteem on a universal scale. The correlation coefficient between self-objectification body consciousness and self-esteem is -0.86547 indicating a negative correlation between the two variables. This further indicates that with an increase in the self-objectification there is a decrease in the self-esteem of the respondents. According to a study published in Psychological Science, regular experiences of objectification by others can lead many women to self-objectification and low self-esteem.⁽¹³⁾ This might happen due to several reasons like constant body surveillance and dissatisfaction with not only their skin tone, facial features but their body as a whole. The girls who had higher self-objectification scores reported feeling more disgust and shame. Low self-esteem leads not only to low confidence levels but also makes it difficult for the girls to view themselves as capable or productive human beings. The lack in confidence also leads to failure to recognize ones strengths as well as value and worth.

Dieting Concerns

86% of the respondents said that they always worried about their shape which led them to dieting. They were very conscious about their body shape and felt that if they started dieting, it would give their body a better silhouette. Comparatively only 1% never engaged in dieting due to worry of the shape. They engaged in dieting for other reasons like health concerns.

■ Always ■ Sometimes ■ Rarely ■ Never

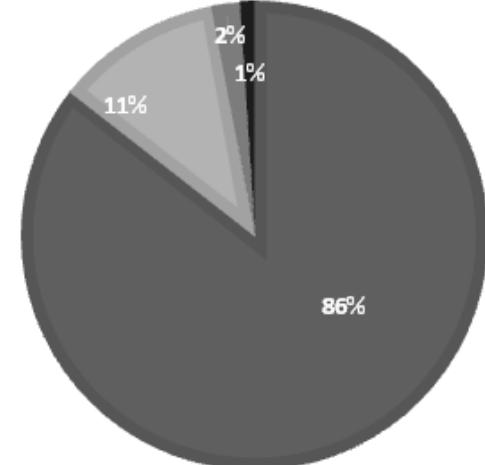


Figure 1- Worry about shape leading to diet

The yearning for slenderness and fright of turning chubby, resulting in weight loss or inhibition of weight gain are the key medical features of disorderly eating. As it has been studied by researchers the relation between fat concerns and anorexia nervosa, the major reason for starvation or restrained dieting has been due to cultural reasons for having internal feelings or actually experiencing fear of weight gain.⁽⁹⁾

■ Always ■ Sometimes ■ Rarely ■ Never

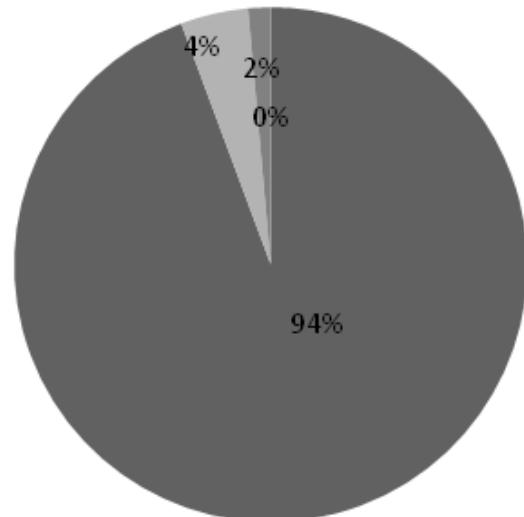


Figure 2- Body Consciousness in social situations

94% the respondents felt conscious about their body size and weight in social situations. This was heightened in the presence of someone thin. Some researchers studied the effects of social

interactions between men and women leading to self-objectification in women. It was concluded that the presence of males heightened self-objectification in women and girls. Studies also show that obese individuals with social anxiety related only to their weight may experience anxiety as severe as individuals with social anxiety disorder. Whereas on the other hand 4% of the respondents said that they sometimes felt conscious about their body size. Lastly only 2% said they felt conscious about their body size in rare situations like wedding ceremonies.⁽¹⁰⁾

Table 2- Body mass index of the respondents

BMI	Under-weight	Normal	Over-weight	Obese
	<18.5	18.5-24.9	25.0-29.9	30
Medical Notion	73%	24%	3%	NA
Individual Conception	NA	11%	72%	17%

It was seen that 72% of the respondents felt that they were overweight, 11% felt their weight was normal and 17% of them felt they were obese.

However after calculating their BMI it was found that 24% of the respondents had a normal BMI ranging from 18.5-24.9, 73% were underweight and only 3% were overweight.

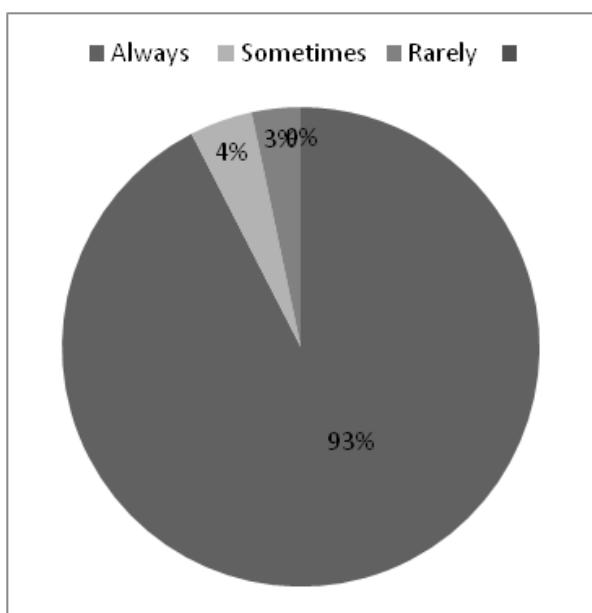


Figure 3- Food consumption and body consciousness

As it was studied by researchers that body consciousness leads to binge eating and restricted eating patterns, it was observed that 93% of

the respondents always felt they would put on weight after consuming high calorie food. It was also understood that due to body consciousness respondents were very watchful about their food consumption and tried to restrict their calorie intake. Many of them opted long hours of starvation or completely skipped a meal. On the other hand 4% of them were sometimes conscious about the food they consumed and only 3% of them were never worried about consuming any high calorie food either.⁽⁵⁾

Most of the issues faced by girls and women in today's time is making their best possible effort to look physically attractive and appealing to others. It is an endless struggle on the part of young women to accept themselves with their flaws, feel confident about their internal qualities and focus on what they are capable of doing rather than how they look. However the vicious cycle of pleasing others eyes and the resulting decline in self-worth has been a perpetual fragment of the society. For many of us, a 'good' day or a 'bad' day is determined by our weighing scales. It is always a happy moment for almost every girl if she requires 'a size smaller' while shopping for clothes. All this has caused a gradual shift from focusing on core potentials to superficial exquisiteness. Furthermore, the mean score of the respondents' self-objectification was on the higher side, avowing high self-objectification to be a mutual piece in all girls.

The respondents also displayed elevated requirement to diet to appear beautiful. The respondents believed that being thin is a very important requisite for looking gorgeous; hence they always had the tendency to follow some diet or the other to maintain their body weight. All of the respondents said that they always compared their body to others and felt negatively. It was observed that the respondents compared themselves to someone who they felt was thinner and had a negative opinion about them. This comparison might take place due to previous instances of comparison situations with thin sisters, models or friends.⁽³⁾

Conclusion

Women being unhappy about their bodies have become a gender cliché that people have now started universally adopting. Some women and girls are somewhat neurotic about their body weight.⁽¹⁴⁾ They never indulge in comforting food; neither do they live life without any tension and hassles about their body weight. Most of the women spend their life worrying endlessly about being pleasing enough to

other's eyes or if they look attractive. Good days and bad days for many women are determined by the fitting of their clothes or by their weighing scale. Fat or chubby girls have very little hope of having a so called normal dating and sexual relationship. This stems out of the constant efforts they make to fulfil the needs and demands of the society and be 'eye candy' to others. It is almost impossible for a chubby woman to be comfortable with her own skin and wear a bikini to the beach. From the present study it can be concluded that there is a negative correlation between self-objectification, body consciousness and self-esteem. This further specified that with an increase in the self-objectification of the respondents there is a decline in their self-esteem. This partly takes place due to relentless body surveillance and recognition of other's critical views. The negative correlation between the two variables is an important justification of the impact of self-objectification on the feelings of the respondents. The girls who had higher self-objectification scores reported feeling more disgust and shame. Low self-esteem leads not only to low confidence levels but also makes it difficult for the girls to view themselves as capable or productive human beings. It was also seen that dieting and starvation was a common trend in all the girls just to look good. Due to this drive to lose weight, they were putting their health at risk and developing eating disorders. It was also observed that the presence of a male counterpart heightened anxiety in the women and girls.

The notion of self-objectification has grown so enormously that it has slowly engulfed all important virtues like hard work, compassion, honesty as the basis of being' a good human being'. For today's society, external beauty reflects inner attractiveness as well. As a result of which it is not surprising to see young girls, or adolescents trying out of their capacities to look beautiful. Thus, efforts should be made to inculcate good virtues, habits and morals in young girls so that they grow up to be beautiful not only externally but internally as well. There are various aspects like intelligence, compassion, industriousness etc. that should be given prominence in the lives of all girls. The very basic understanding that people lack is that beauty fades with time, but the qualities that a person has goes with him, till his grave. Lastly, we should all remember that till we don't love ourselves, it is not conceivable for us to expect the same from others.

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A Comparative Study on Academic Stress, Reaction to Frustration and Coping Strategies among CA, MBA and Engineering Students

Sharmistha Mitra and Krishnakali Bhattacharyya

ABSTRACT

The present study aims to compare the level of academic stress, reaction to frustration and coping strategies among students in the fields of CA, MBA and Engineering. The study analysed data collected from 255 students among which 86 were MBA students, 94 CA students and 77 engineering students belonging to various colleges in the city of Kolkata. The data was collected through the method of non probability purposive sampling on basis of students' availability. From the data attained, and analyzed the following results were obtained: a) there is a significant difference obtained in the academic stress faced by MBA, CA and Engineering students. It has been observed that CA and Engineering students suffer from —High level of academic stress whereas MBA students suffer from —Moderate level of stress. There is no insignificant difference among males and females in academic stress among CA MBA and Engineering b) there is a significant difference in the modes of reaction to frustration among the three groups. It is seen that Engineering students suffer from more frustration than CA and MBA students. There is a significant difference among male and female students in terms of their reactions to frustrations c) Results from correlation between academic stress and reaction to frustration was seen to be inverse for MBA males, females, CA and Engineering females whereas positive correlation was found between CA males and Engineering males d). There was no significant difference found among CA, MBA and Engineering in coping strategies of Behavioural Approach, Cognitive Approach and Cognitive Behavioural Approach and significant difference in Cognitive and Behavioural Avoidance. Females were found to be better copers than male participants in the study. It can be concluded that appropriate coping strategies are required to cope up with stress and frustration among CA, MBA and Engineering students.

Keywords: Academic Stress, Behavioural Approach, Behavioural Avoidance, Cognitive Avoidance, Cognitive Behavioural Approach, Cognitive Approach, Coping Strategies, and Reaction to Frustration.

Introduction

Academic stress plays an important part in a student's life. When stress is perceived as negative and becomes excessive, students experience psychological as well as physiological problems. Researchers and students report that the major causes of academic stress are due to taking and studying for exams, grade competitions, too many assignments, failures and poor relationship with other students and lecturers as well as inability to master large content in a short period of time. When students are unable to meet their academic goals it may lead frustration. In psychological terms, frustration is a general emotional retort to antagonism. In a relation with anger and displeasure, it occurs from the apparent resistance to the accomplishment of individual will.⁽⁵⁾

To cope up with academic stress and frustration students may engage in using defence mechanisms. Defence Mechanism is a process which one can use to react to frustration. These defence mechanisms are professed as they try to guard individuals from the psychosomatic effects of a blocked goal. When some students get frustrated, they turn into tension and ill-tempered behaviour. Use of defence mechanism at

minimum level is good it helps individuals to cope with everyday life frustrations but too much use of this mechanism can be devastating as it takes off from reality and its acceptance.

This association between academic stress, reaction to frustration and coping strategies shows that they are interrelated with each other. When students aren't able to attain their academic goals it hampers them, causing frustration. Some amount of frustration is good as it drives the student towards his or her goals but if the frustration is high, it may lead students to suffer from maladaptive behaviour. To curb the students' academic stress certain coping mechanisms are required or otherwise it may lead the student to suffer from psychological or physiological issues.

Methodology

Aim: The present study aims to compare the level of academic stress, reaction to frustration and coping strategies among students in the fields of CA, MBA and Engineering

Nature of the study: The study is descriptive in nature.

Sample Size: A sample size of 255 was selected for the study. There were 94 respondents pursuing CA,

86 respondents pursuing MBA and 75 respondents pursuing Engineering.

Method of sample selection: The sample was selected through the method of non probability random sampling.

Tools used in the study: The data collected was primary in nature. The following standardised tests were used to collect data: Academic Stress Scale by Dr. Poorva Jain, Reaction to Frustration Scale by Dr. B.M Dixit and Coping Strategies scale by Prof. A. K. Srivastava.

Results & Discussions

From the data attained, the mean (average) and standard deviation was calculated and found for MBA, CA and Engineering. The groups were then compared by applying t-test and ANOVA. The following results were attained:

- Academic Stress-From the data obtained from Academic Stress Scale by Dr. Poorva Jain, the data was analyzed and the following results were attained:

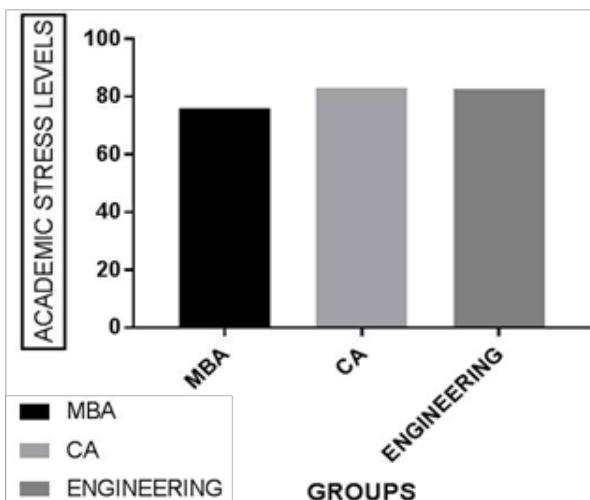


Figure 1- Mean of Academic stress among CA, MBA and Engineering students

Figure 1 shows the “Mean of Academic Stress among MBA, CA and Engineering Students”. From the data obtained and analyzed it is observed that MBA students have obtained a mean of 76.5 when interpreted shows that they suffer from “Moderate Level of Academic Stress”. On the other hand CA and Engineering students have obtained a mean of 82.94 and 82.5 respectively showing that they suffer from “High Level of Academic Stress”. It can be seen that CA students have higher level of stress than the other two groups: MBA and CAs. Hence it can be concluded that CA students suffer from high levels of stress maybe due to the following factors:

- ◆ Lack of time management due to balancing tuitions, college, article ship and studies
- ◆ Changes in curriculum causing stress
- ◆ Time bound time to complete their syllabus
- ◆ No time to engage in extracurricular activities or hardly any time to go for social outings
- ◆ Spending many hours studying
- ◆ Constant fear of failure
- ◆ Course Curriculum being tough

b. Reaction to Frustration

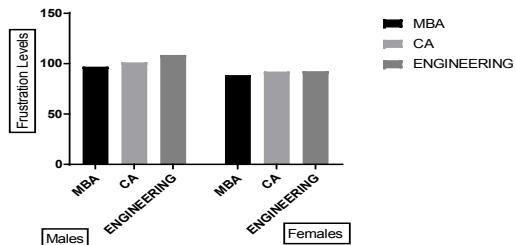


Figure 2- Frustration Levels among males and females from MBA, CA and Engineering

Figure 2 describes shows the comparison of mean of reaction to frustration among MBA, CA and Engineering students. It can be seen that MBA males have attained a mean score of 97.07 when interpreted with the help of the norm key attains a percentile of 30 which is which is “Low Frustration” whereas on the other hand MBA females have obtained a mean score of 88.7 , the percentile being 20 which is “Very Low Frustration”. In case of CA students it is observed that CA males have attained a mean score of 101.3 attaining a percentile of 40 showing that they have “Average Frustration” whereas CA females have a mean score of 92.21, the percentile being 25 which on interpretation is “Very Low Frustration”. In Engineering, males have attained a mean score of 108.7 which is a percentile of 60 referring to “Average Frustration” and females have attained a mean score of 92.5 showing a percentile of 20 which when interpreted in “Very Low Frustration”.

CA and Engineering males, they may get frustrated at time when goals are not being met or some obstacles are in their path. Instead of taking appropriate coping strategies, they may take the help of defence mechanisms to cope with the conflicting situation. MBA males may suffer from low level of frustration as they have previously may have faced or had experiences with frustrating situations and hence they are now more able to cope up with conflicting situations. They may know which coping

strategies to use from past experience to prevent frustration.

Relationship between Academic Stress and Reaction to Frustration- It was seen from the findings from the Pearson's Correlation Coefficient it may be concluded that among CA males and Engineering males the correlation between academic stress and reaction to frustration is positive. Hence with increase in academic stress, frustration increases. It maybe because of the pressure they face by society to do well academically and get good paid jobs to support their family, balance their studies and do their assignments on time and hence when they may not be able to manage they become frustrated. As a defence mechanism they may isolate themselves from individuals or may take out their anger in various ways or take up illegal substances. In case of MBA males and females, CA and Engineering females, instead of running away from the situation by taking up a defence mechanism, they may take up appropriate coping strategies to deal with the stress. Hence they have a negative correlation between academic stress and reaction to frustration. It can be said that when academic stress rises, reaction to frustration decreases.

c. Coping strategies

In coping strategies, it was observed from the mean scores that female participants were slightly more equipped with coping skills to overcome stressful situations. They plan and think about how to eliminate the stressful situation instead of running away from it or avoiding it. In the results of hypotheses testing it was seen that there were no insignificant differences in Behavioural Approach, Cognitive Approach and Cognitive Behavioural Approach among MBA, CA and Engineering students. But in terms of Cognitive Avoidance and Behavioural Avoidance a significant difference was found.

Conclusion

Overall it can be concluded that academic stress, reaction to frustration and coping strategies are interrelated together. When a stressful situation arises, when individuals are unable to attain their goals due to obstacles in their path they may feel frustrated and hence it may cause physical or psychological mal-adaptiveness. Hence to prevent the psychological or physical mal-adaptiveness coping strategies are required. Coping strategies can reduce the level of stress as well eliminate frustration and allow the individual to obtain his goals.

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Care Network for Children- The ‘Care Giving’ Context, in Institution-Reared and Family-Reared Young Children in Kolkata”

Prerna Tirkey and Punam Mehra

ABSTRACT

The present study aims to compare the care giving environments of young children being raised in institutions and in family settings, in relation to developmental characteristics of social and emotional development, in Kolkata, West Bengal. A purposive sampling technique was employed and the sample comprised of 128 participants (age range 3-7 years). Social emotional development of young children in family and institution was assessed by a self made questionnaire where some questions were taken from Social-Emotional Assessment/Evaluation Measure (SEAM). Data was analyzed by applying t-test to compare between family reared children and institute reared children. Care giving environment was assessed by an observational checklist judging for you – A Child Care Checklist by Child Care Providers Resource Network. The research findings revealed that the institute reared and family reared children differ significantly on social-emotional development. Hence taking out a relationship from the observational checklist with the t-test score, it can be stated that caregiver interaction is very inconsistent. Further it can be stated that the children in family setting were attached with their parents and shared an emotional bond with them. Thus, it appears that the social-emotional relationship environment is the key contributor to improving children’s development in the orphanage.

Keywords: Care giving, Family & institute reared young children, Social-emotional development.

Introduction

Early childhood is a stage in human development. Some age-related development periods and examples of defined intervals are: newborn (ages 0-5 weeks); infant (ages 5 weeks- 1 year); toddler (ages 1-3 years); preschooler (ages 3-5 years); school-going children (ages 5-12 years)

There are three simultaneous development stages:
1. Physical growth and development 2. Cognitive growth and development 3. Social-emotional growth and development According to the National Conference of State Legislators (NCSL), social-emotional development is influenced by three main factors including biology, relationships, and environment.⁽⁹⁾

Social- Emotional Development and its Importance in the Early Years- Children’s emotional well-being during their early years has a powerful impact on their social relationships throughout the rest of their lives. The core features of emotional development include the ability to identify and understand one’s own feelings, to accurately read and comprehend emotional states in others, to manage strong emotions and their expression in a constructive manner, to regulate one’s own behaviour, to develop empathy for others, and to establish and maintain relationships. (8) Positive social-emotional growths build the communication skills necessary for learning throughout a child’s life.

A child’s positive relationship with trusting and caring adults is the key to successful emotional and social development. Responsive care giving supports young children in beginning to regulate their emotions and to develop a sense of predictability, safety, and responsiveness in their social environments. Early relationships are so important to young children that research experts have broadly concluded that, in the early years, “nurturing, stable and consistent relationships are the key to healthy growth, development and learning”. In other words, high-quality relationships increase the likelihood of positive outcomes for young children.⁽⁸⁹⁾

The Caregiver- The word caregiver as used in the paper denotes the people who look after infants and young children. Mary Eming Young argues, “Fogel, the 1993 Nobelist in economics, states that the quality of early child development has a significant effect on the quality of populations and influences health outcomes in later life”.(16) Further, “inadequate and inappropriate social and emotional experiences in the early environment can compromise higher level neural systems that provide the information needed to bond, imitate and generally respond in socially appropriate ways”.⁽¹⁵⁾ Relationship of Social- Emotional Development to Child Functioning and Well-Being- Positive social-emotional growth builds the communication skills necessary for learning throughout a child’s life. Social

and emotional experiences with primary caregivers as well as interactions with other children and adults early in life set the stage for future academic and personal outcomes, and undergird other areas of development.(1, 2, 6, 7) In addition, children with greater self-control (an aspect of self-regulation) are more likely to grow into adults with better health. Conversely, maladjustment in the social and emotional domain may impede children's ability to function in family, school, or other contexts. Failure to develop secure attachments with caregivers may lead to later difficulties communicating or managing emotions, or developing positive relationships with peers.⁽¹²⁾ According to Tarullo (2005) article summarizes the research on socio-emotional deficits in post institutionalized children. Institutional rearing is associated with early social deprivation, including lack of individualized attention and consistent relatedness from a stable caregiver. Early socio-emotional development of joint attention, pretend play, and attachment are compromised in institutionalized children, which may contribute to persistent socio emotional deficits in maintaining social boundaries, peer competence, and social cognition. It is concluded that early social experience plays a role in the organization of neural circuits relevant to social interaction and regulation, thereby exerting a long-term influence on the underlying capacity to process social information.⁽¹³⁾

Orphaned and Vulnerable Children Worldwide: An orphan is defined as a child that has lost one or both parents. A recent study on abandonment of children in Europe found that, in more than 90% of cases, poverty and homelessness were the reasons for child abandonment (and subsequent placement in orphanages). (14) One attribute of the orphanage environment, namely very limited caregiver-child social-emotional interactions and the lack of opportunity to develop caregiver-child relationships, can be responsible for contemporary delays in most major domains of development in institutionalized children.(11)

Methodology

The target group of the present study is family reared and institutional reared young children age range from 3-7 years in Kolkata. The study tries to examine the care giving environments of young children being raised in institutions and in family settings, in relation to developmental characteristics of social and emotional development.

This study aims to compare the care giving

environments of young children being raised in institutions and in family settings, in relation to developmental characteristics of social and emotional development.

Hypothesis:

H0: There is no significant difference in the mean scores in the area of social emotional development of children residing in institutes and the one's residing with family.

H1: There is significant difference between the socio- emotional response given by the Institutional reared and Family reared young children, where Family reared children will show positive affect with higher mean scores.

Sample Characteristics: To obtain the information various families from middle and high income group were approached, who had an average income of 8-12 lakhs per annum and orphanages: Nirmala Shishu Bhavan & Calcutta Muslim Orphanage was approached. The cumulative reports of Human Development Index 2015-2016, states that below 3 lakhs p.a. is considered to be low income group, 3-10 lakhs p.a. is considered to be middle income group and 10 lakhs p.a. is considered to be high income group. Thus it can be said that the respondents of the study fall in the category of middle and high income group.⁽⁶⁾

The sample under consideration was young children and their parents & care givers of Kolkata. Young children belonged to the age group of 3-7 years. Parents belonged to the age group of 27-38years, whereas care givers (females) belonged to the age group of 26-52 years. The participants did not have any chronic or psychological disorder.

Overall the sample comprised of 128 participants. (Institute- reared children N=65 Family-reared children N=63)

Collection of Data: This study is comparative in nature. A self prepared questionnaire has been used as a tool in the survey to gather information regarding the social emotional development in family reared and institute reared young children of Kolkata. Along with it some questions from a standardized questionnaire called 'The Social-Emotional Assessment/Evaluation Measure (SEAM)'(1) was used to collect data. Secondly, an observational checklist to assess the care giving environment and screen the caregivers/parents is taken from Child

Care Providers Resource Network, Judging for Yourself – A Child Care Checklist.⁽⁴⁾

Results & Discussion

Collecting data from the respective respondents, it was seen that children living in institutions were in the custody of the Superior Sister in charge of the Institution, Sister Maria. Where there were 10 care takers who were asked question for 65 participants.

Analysis of Observational checklist:

The checklist consisted of 5 dimensions i.e. Caregiver, Health & Safety, Program, Discipline and General Atmosphere. The first dimension was Caregiver where it was seen children living in the institution, however, frequently did not have a caregiver present and available to them. Children raised in institutions have far more limited opportunities to develop selective attachments than those raised in family environments because the caregivers in these institutions perform shift-work and because they usually are responsible for the care of many young children. As the parent's marital status were married, children were lucky to have both, a mother figure as well as a father figure. Parents are expressive when engaged with children. Child responds contingently to parents and engages in reciprocal activities (games or conversations). Nurturing family relationships lay the foundation for all other relationships. It was seen in many cases that both the parents were working. The children also get extra help from the maids/ nannies hired. In contrast to the institutional setting, a child receives care and attention from many individuals. Here the child may get attached with many individuals.

The second dimension was Health and Safety, where it was seen that most of the equipment were kept clean and were well maintained. Provision of food was nutritious and if any child is not well the food is not modified. When a child does not want to eat the food provided, he/she is forced to eat the food; because the institutes want that their children should look healthy and that there are no further health problems. Hospital services are given if the child suffers from any illness. Both the orphanages provide each child with their own bed. These children sleep alone, having no elder with them in their room. In family setting most of the equipment are kept clean and rooms are well maintained. Food is nutritious and if the child is not well, immediate changes are made. The children are provided with all the non-vegetarian and vegetarian items. Food of their choice is given. All of the children, who

were surveyed, sleep with their parents unlike the orphans who sleep alone.

The third dimension was Program where it was seen that the institutes follow a clear daily routine and timings are strict. Like for instance, the food time, if the child does not want to eat, they are forced to eat so that they do not crib for it later. Play materials are well maintained but not enough so that a child can gain knowledge. As every item is donated they do not have that amount of knowledge of how to use so that the children's skills can be enhanced. Children were given specific time to study, where teachers used to come in the morning to teach. No usage of technology is there. As the caretaker who stays with them half of the time is not literate. Children here were not taken out, as it was restricted to one area. On the other hand, children in a family setting were seen to have no strict routine. Sleep timing were kept fixed and had various play materials. They were sent to play house and Montessori, where educated teachers with high qualification taught them. Parents who were surveyed had good qualifications, enough to teach their young children. Study time and play time varied among them, as young children in family setting got more time to study with usage of more new technology aids like phone, computers and television.

Fourth dimension was Discipline, it was observed that the caregiver physically and negatively grabs a child to move him or her; hits a child, yells, and talks down to children in a disrespectful manner. In the study of James Sengendo (1997), he also stated that in many cases children are punished for showing their negative emotions, thereby adding to their pain. It was seen that the caregivers were irritated at times, as it gets difficult to handle so many children at a time, so rather explaining to them they punish the child or hit. They sometimes praise the child, but there is no reward as such. The discipline method is not appropriate according to their age. Where in family setting, it was seen that the caregiver changes child behaviour in a positive and supportive way by providing "guidance" or "suggestions". Caregiver explains a rule or consequences and calmly redirects behaviour all in a positive and supportive way. Parents at times get irritated but explain the punishment first before they punish them for certain behaviour; and if they continue doing it they simply punish them which are appropriate enough instead of hitting the child. They also do not forget to reward the child for positive behaviours like praising them. Fifth dimension was General Atmosphere, here the

caregiver does not encourage children to respect and care about each other, because they are so busy with other works, and watching children in a group become difficult for them. Though they are taught at morning classes, but should be reinforced frequently; where in family setting, it was seen that

children are taught routinely at home and reinforced frequently in school and other places in community.

Another part of the present study was through a questionnaire whose result is obtained through using the statistical method of t test.

Table 1: Comparison of Institutional and family reared children on social-emotional development:

Groups	Mean	S.D	SED	t	P value
Family setting	52.16	3.9			
			0.85	5.73	Significant at 0.05 level (5.73)
Institutional setting	28.35	5.6			

Table 1 demonstrates that there is a significant difference between families reared children and institutional reared children with respect to social-emotional development. Inspection of this table reveals that the two sectors differ significantly on social-emotional development. By conventional criteria, this difference is considered to be statistically significant.

Hence, the null hypothesis that there is no significant difference in the mean scores in the area of social emotional development of children residing in institutes and the one's residing with family is rejected.

Thus, accepting the alternative hypothesis stating that there is significant difference between the socio-emotional response given by the Institutional reared and Family reared young children, where Family reared children will show positive affect with higher mean scores. Thus, it is accepted and proved.

Conclusion

It was found from the above checklist that institutions had acceptable medical care, nutrition, sanitation, toys, equipment, but were primarily deficient in the children's social-emotional experience and opportunity for adult-child relationships. Caregiver interaction found in many orphanages is minimal or inconsistent. Caregivers are mostly female, so the children lack father figure in their life, where in family reared children they have a father figure, and according to various research the role of father figure is very important to children's formative years, both in their emotional and social development. When caregivers perform their care giving duties, it is likely to be in a business-like manner, whereas in family care giving is not seen as a daily job, but shown with immense warmth and positive responsiveness to individual's emotional needs and expectations. Self made questionnaire assessed the

social emotional development by using statistical method t-test. The data was analyzed and the research findings revealed that from the table 4 and figure iii, we get to know that the institute reared and family reared children differ significantly on social-emotional development. By conventional criteria, this difference is considered to be statistically significant. Therefore, the null hypothesis is rejected and hence accepting the alternative hypothesis that, there is significant difference between the socio-emotional response given by the institutional reared and family reared young children, where family reared children will show positive affect with higher mean scores.

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Exploring the Background and Literacy Status of the Ostagar Community of Metiabruz, Kolkata

Nafisa Islam and Geetika Sachdeva

ABSTRACT

The present study aims to explore the background and literacy status of Ostagar Community of Metiabruz, Kolkata. An Ostagar is a term used for skilled tailors and independent manufacturers of garments. 160 respondents belonging to four age groups were included. The age groups were: 6-10 years, 11-14 years, 15-17 years and 18-25 years. Each age group comprised of 40 individuals, out of which 20 were males and 20 were females. A self prepared questionnaire was used to assess the background and the literacy status of the respondents. The test of correlation coefficient was used to establish the relationship between the variables of the study. It was found that the parental involvement was highest in the age group (6-10 years) and lowest in the age group (15-17 years). A positive correlation was found in ,maternal education and parental involvement, quality of education and type of school, parental involvement and attendance rate, quality of education and attendance rate. A negative correlation was found between household expenditure and members, class size and type of school, attendance rate and class size, household expenditure and dropout rate.In the age group (18-25) years a positive correlation was found between maternal education and individual's mean years of education, marital status and years of education received, years of education received and vocational training.

Keywords: Ostagar, Family Background, Parental Involvement, Quality of Education, Attendance Rate, Dropout

Introduction

Literacy and level of education are basic indicators of the level of development achieved by a society. Spread of literacy is generally associated with important traits of modern civilization such as modernization, urbanization, industrialization, communication and commerce. A Community study is that method in which a problem (or problem) in the nature, interconnections, or dynamics of behavior and attitudes is explored against or within the surround of other behavior and attitudes of the individuals making up the life of a particular community. Taking into account all evolving debates, including the major traditions, critiques and approaches to literacy, United Nations Educational, Scientific and Cultural Organization (UNESCO) presented four discrete understandings of literacy:

- ◆ Literacy as an autonomous set of skills
- ◆ Literacy as applied, practiced and situated
- ◆ Literacy as a learning process
- ◆ Literacy as text

The Human Development Index, produced by the United Nations Development Programme (UNDP), uses education as one of its three indicators; originally adult literacy represented two thirds of this education index weight. In 2010, however, the UNDP replaced the adult literacy measure with mean years of schooling. In educational and economic studies, it has been found that background variables

including family income, family type, family size and parent's education are strong determinants of the amount and quality of education children receive over their lifetime.

Metiabruz is a locality in Garden Reach neighborhood of Kolkata, the capital of the Indian state of West Bengal. It is situated on the southern fringe of Kolkata. Metiaburj is a key industrial location, with the Southern Thermal Power Station (coal) and a water pumping station that supplies water to major parts of the city. It also has a shipyard, Garden Reach Shipbuilders & Engineers, founded in 1884, that is engaged in making warships of Indian Navy and Coast Guard, and is home to one of the largest textile manufacturers in India. The area is largest producer of non branded garments in India. - (the Indian Express, 2016). My study will focus primarily on the manufacturers of ready made garments locally known as "Ostagars". The major setback faced by these tailors is the lack of knowledge of new technology in this field. Thus the government plans to start "knowledge centers" to educate them about the latest technologies as the government wants to increase the value by 2000 dollars in the coming days (Ananda Bazaar, 2017). My study will excessively focus on the co-relational factors between the quality of education and parental or societal co-operation with educational institutions. I will also be assessing the demand for higher education in the community.

Methodology

This study is explorative study on the background and literacy status of Ostagar Community in Metiabruz, Kolkata as no earlier studies have been done on this topic. The focus and aim of this study is to gain insights and familiarity into the factors contributing to the current literacy and educational levels in the community. The objectives of my study are:

- ◆ To determine the enrolment in primary, secondary, higher secondary and tertiary education of the Ostagar Community.
- ◆ To establish the correlation of background and educational variables.
- ◆ To understand the factors contributing to the current situation of the community.

Sample: In this study, the sample under consideration covers male and female participants each from the school going and non school going population aged 6-30 years of the Ostagar Community. The age range has been kept to explore the primary, secondary, higher secondary and tertiary levels of education among the Ostagar Community, Kolkata. The sampling method used here is non- probability purposive sampling. The sampling size of this study is 160 N, 80 female and 80 male participants.

Table 1- Details of Subjects

Age	Female Participants	Male Participants
6-10 years	20	20
11-14 years	20	20
15-17 years	20	20
18-25 years	20	20

Data Collection Process: In the present study, the type of research method applied is Questionnaire Method. A self prepared questionnaire has been used for this study. The scoring of the data has been done referring Socio-Economic Scales whereas the qualitative data has been scored using self-rating scales .The houses of the participants were visited to administer the questionnaire. Bengali and Urdu was used while communicating with the families .The language and vocabularies used while administering the questionnaire was kept simple, precise and comprehensible.

Respondents were assured that their personal details like expenditure, conceptions were for the sole use of research and the privacy of their identity will

be maintained. The purpose and the scope of the research were stated clearly in order to avoid any controversy.

The Method of Data Processing and Analysis: Correlation coefficient, Mean and Standard Deviation and bar graphs have been used to analyze the study.

Results and Discussion

Males (6-10, 11-14, 15-17 Years)

- I. Household Expenditure is a key indicator of the socio-economic status of a family. It also reflects the income of the family. As the data indicates, ,the majority of expenditure lies within the range of Rs.20000-30000 respectively.
- II. Household Members-According to the data, most families taking all three groups into consideration (48.3%) had 3-5 members per household.
- 3.1 Correlation between Household Expenditure and Household Members- The correlation value of -0.030933 between household expenditure and household members is slightly negative indicating that both the variables may have an inverse.
- III. Maternal Education- The average mean value of 3.28333 lies closer to the score 3 that indicates that the average mothers in the sample have studied till middle school.
- IV. Parental Involvement- The Parental Involvement was found to be highest in the age group (6-10 years) in the above data with a mean score of 3.85 In the age group a mean score of 2.95 (11-14 years) the response was neutral, In the age group (15-17 years) the parental involvement was lowest. A moderate correlation has been found between Maternal Education and Parental Involvement
- V. Type of School- According to the data, it was seen that the mean score 1.7 was the highest (age group 6-10 years) among all the three age groups indicating that most children studied in private english medium schools. In the age group (11-14 years) a mean score of 1.4 indicates that a lesser number of students attended private English Medium Schools as compared to the age group (6-11 years) as the English Medium schools available in the locality only have class till primary or upper primary level. In the age group (15-17

- years) it was seen that most students attended Bengali Medium Public schools.
- VI. Quality of Education-According to the data, it was seen that the scores of all age groups were less than 3.5 and the mean score 3.23333 indicates that the quality of education was average. A moderately positive correlation has been found in the type of school and quality of education.
- VII Class Size- The mean score -0.37369 indicates that there is a moderately negative correlation between Class Size and Type of School.
- VIII. Attendance Rate- A moderate correlation was found between Parental Involvement and Attendance Rate indicating with an increase in Parental Involvement there is an increase in attendance rate and vice versa. A slightly negative correlation has been found in attendance rates and class size indicating that there is a slight probability that with an increase in class size the attendance rates may decrease or vice versa. A moderately positive correlation has been found in the variables quality of education and attendance rate indicating that with an increase in quality of education there is an increase in attendance rates and vice versa.A slightly negative correlation has been found between household expenditure and dropout.

Females (6-10,11-14,15-17 Years)

- I. Household Expenditure-As the data indicates, in the groups (6-10 years), (11-14 yrs), (15-17yrs) ; 51.6 % was within the range of Rs. 10000 to 20000, 25% was within the range of (Rs.20000-30000) and and only 6.6 % belonged to the range of(Rs. 30000-40000). The total mean value indicates that the monthly household expenditure lies between the range (Rs. 20000-30000).
- II. Household Members-The correlation value of -0.11451 between household expenditure and household members is slightly negative indicating that both the variables may have an inverse .
- III. Maternal Education-The average mean value of 3.2 lies closer to the score 3 that indicates that the average mothers in the sample have studied till middle school..
- IV. Parental Involvement-A moderate correlation has been found between Maternal Education and Parental Involvement which suggests that there may be moderate chances of an increase

- in parental involvement with an increase in maternal education and vice versa.
- Type of School-According to the data, it was seen that the mean score 1.6 (6-10 years) was the highest among all the three age groups indicating that most children studied in Private English Medium Schools. In the age group (11-14 years)a mean score of 1.25 indicates that a lesser number of students attended private English Medium Schools as compared to the age group (6-11 years) as the English Medium schools available in the locality only have class till primary or upper primary level. In the age group (15-17 years) it was seen that most students attended Bengali Medium Public schools .The mean standard deviation value of 0.4524 indicates that the values in the data are closer to the mean.
- VII. Class Size-In the above data, in the age group (6-10yrs) the class size is 45.05 with a standard deviation 13.9608 which indicates that the data is dispersed and the values are farther from the mean, the mean value was found to be the highest (56.45) in the age group (15-17 yrs)Thus ,a mean value of 48.183 indicates that it may affect the time devoted to all students by teachers as it is higher than the ideal pupil ratio by 18 individuals.
- VIII. Attendance Rate-In the age group (6-10 yrs), the attendance rate is highest ,(4-5 days a week) as a higher percentage of individuals in this group study in private schools which places more restrictions and rules on attendance .It is the lowest in the age group(15-17 years) with a mean value of 2.05 i.e. closer to the score 2 (2-3 days). A moderate correlation was found between. A slightly negative correlation has been found in attendance rates and class size indicating that there is a slight probability that with an increase in class size the attendance rates may decrease or vice versa. A moderately positive correlation has been found in the variables quality of education and attendance rate indicating that with an increase in quality of education there is an increase in attendance rates and vice versa.
- IX. Dropout-It was seen that there were no dropouts in the age (6-10 years) , in the age group (11-14 years), there were 15% of dropouts whereas in the age group (15-17 years) 35% of girls had dropped out of school. A moderately negative correlation has been

found between household expenditure and dropout rate.

(Males And Females (18-25 Years)

I. Household Expenditure & II. Household Members-As the data indicates, the mean household expenditure of males(18-25 years) was Rs.27650 whereas it was slightly more in the female participants Rs. 29250 ,The correlation between Household Expenditure and Household Members is moderately positive.

III. Occupation-In the above data, it is seen that 31.6 % are skilled tailors, whereas 30% are shop owners.

IV. Maternal Education-The average mean value 2.75 lies closer to the score 3 that indicates that the average mothers in the sample have studied till middle school.

Mean Years of Education Received by Individual-The above data indicates that compared to males (3.3 %), (21.67%) of females have studied till high school. The reason could be the tendency of boys in this community to join business at an early age, whereas girls are allowed to study till a suitable spouse is found for her. A moderate correlation was found between maternal education and individual's mean years of education. A slightly negative correlation of .15 was found between occupation and years of education.

VII. Marital Status-More of women (85%) were married in this age group than men,(30%). The correlation between marital status and years of education is moderately negative in females, whereas in males it is slightly positive.

VIII. Vocational Training -The data indicates that compared to women 205, more men 60% received a vocational training especially in computer. A moderately positive correlation was found between the years of education received and vocational training.

Conclusion

The Ostagar Community is a community that resides in the locality of Metiabruz Kolkata. The Ostagars are mainly skilled tailors, a major ancestral profession in the locality that is being continued through generations. However, the locality still suffers from a lack of good educational institutions, transport facilities, availability of teachers. As seen in the age group (6-10 years); a higher percentage

of children went to private English Medium Schools as they were available in the nearby areas of the community. This group also as a result had a slightly higher parent involvement, as parent participation is encouraged in these schools and higher attendance rate. Maternal education was slightly higher (high school) and showed a positive relation with parental involvement. The class size in this age group was around 45, slightly lower than the other age groups. The quality of education reported was also slightly better than the other age groups. There were no dropouts in this age group. It can be said that the status of primary education was satisfactory and better than the other two age groups studied. In the age group (11-14 years); a lower percentage went to private school and a higher percentage attended public schools where problems like average –poor quality of education was received with absence of teachers and dirty toilets were faced. The quality of education showed a positive correlation with attendance rates. Maternal education was till middle school that did show a positive correlation with parental involvement. The class size was above 50 that showed a negative correlation with attendance rates. It was also seen that type of schools affect the quality of education provided. However there were incidences of a few dropouts in this age group. In the age group (15-17 years); majority of students studied in public Bengali medium schools where the problems faced were same, i.e poor toilet facilities and availability of teachers. Maternal education was almost same i.e middle school in this group, though there were more mothers who had studied only till primary levels in this group. Parental involvement was poor, parents disagreed to have visited any school meetings throughout the year or helping child with their educational activities. The class size was highest some even above 60 in this age group that is known to affect student performance. The dropout rate was also highest in this age group as most of girls are married at this age and most of boys tend to get involved in business and loose interest in academics.

In the age group (18-25 years) it was seen that more of women were married than men. An interesting finding was more women tended to complete high school than men. However, more men pursued higher studies in the area than women as colleges were far and women were not allowed to travel or stay alone. The mean household expenditure lied between the ranges of Rs. 20000-30000 sharing a slightly negative correlation with household members indicating that household expenditure does

not increase with an increase in household members. To conclude, it can be said that there is a lack of government interventions in this area, also a very low awareness on educational benefits and returns. Thus this study has found that lesser availability of registered English Medium Schools, colleges, poor availability of teachers, poor transport, negligibility, low parental involvement, early marital age among girls, are the factors that have contributed to the lower levels of literacy in this community.

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A Comparative Study on Perceptions and Practices regarding Menstruation among Adolescents from various Socio-economic Groups

Palak Ruia and Punam Mehra

ABSTRACT

This study was conducted with the aim to compare the perception and practices regarding menstruation among adolescents from different socio-economic backgrounds. Among 177 adolescents, 40 belonged to High Socio-economic background, 98 belonged to Middle Socio-economic background and 39 belonged to Low Socio-economic background. The Upadhyay-Saxena Socio-Economic Scale (USSESS) by Sunil Kumar Upadhyay and Alka Saxena, was used to ascertain the socio-economic background of the respondents and Adolescent Menstrual Attitude Questionnaire(Post-Menarcheal version) by Morse, Kieren and Bottorff was used, to assess the attitude of the respondents. Through this questionnaire, their perception towards menstruation was also understood. By understanding how adolescents feel about menstruation, the way they interpret this significant event would also be known, hence the Adolescent Menstrual Attitude Questionnaire (Post-Menarcheal) was used. The self-prepared questionnaire consisted questions relating to practices regarding menstruation. Independent t-tests were used for calculating attitude and percentage for practices. It was found there is no significant difference in the mean scores of attitude regarding menstruation among adolescents from high-middle, middle-low and high-low socio-economic group. A significant difference under the subscales of Positive feelings, living with menstruation, menstrual symptoms, acceptance of menarche was observed among socio-economic groups. The subscales Acceptance and Living with Menstruation assessed perception, thus there was a significant difference in how adolescents from different socio-economic groups perceived menstruation.

Among practices, it was found that middle socio-economic group were not imposed with a lot of restrictions, in comparison with High and Low Socio-Economic Group. It was observed respondents from Middle Socio-Economic Group had slightly better attitude and practices towards menstruation followed by High and Low Socio-Economic Group.

Keywords: Adolescence, Attitude, Perception, Practices, Socio-economic group

Introduction

According to Ministry of Statistics and Programme Implementation (2016), women and girls make more than half of India's population⁽⁶⁾. Menstruation is an important event in a woman's life. Despite India being a developing country, million women face problems in managing menstruation.⁽³⁾ There is an increased need to address menstrual health in India. The current status of menstrual health is worrisome. Girls do not receive adequate education about menstruation from before. Mothers of adolescent girls often do not have enough information. They perceive periods to be a dirty affair, giving way to formation of negative perception and practices by their daughters.⁽²⁾

Perception may be defined as "a process of interpretation of a present stimulus on the basis of past experience." Perception includes different physiological and psychological processes.⁽⁹⁾ We perceive people and situations on the basis of past experiences, habits, motivations, cognitive styles, learning etc.

The term 'adolescence' is derived from the Latin word 'adolescere', which means to grow.⁽¹⁰⁾ The World Health Organization (WHO, 2014) identifies adolescence as the 'period in human growth and development that occurs after childhood and before adulthood, from ages 10 to 19.'⁽¹⁵⁾

The process of adolescence, according to World Health Organization, 'is a period of preparation for adulthood during which time several key developmental experiences occur.'⁽¹⁴⁾

A key development is puberty. Menarche is one of the later signs of puberty in girls and occurs after complete sexual maturation in girls. It is also an event which is seen as transition to a woman from a girl. The onset of menses may direct the adolescent girl to define herself now, as a woman.⁽¹¹⁾ Menarche, the onset of menses or the first menstrual period which occurs in girls in between ages of 10-16 years. Menstruation or the menstrual flow is a social, psychological and is a cultural representation of "being female".⁽⁵⁾

The menstrual cycle is around 28 days. Women often experience abdominal cramps, nausea, fatigued, frequent headaches, back pain etc. Along with physical discomfort, they also undergo emotional and psychological changes such as increased irritability or anger due to a change in hormonal levels.⁽⁵⁾

Psychological impact of menarche: Adolescent girls form a view of herself and her competence of being able to practice good menstrual hygiene. It is not only a physiological event but also a social one, marking between childhood and adulthood. The society expects them to play the role of a mature woman. Unprepared girls are frightened and confused by menarche and are more likely to develop negative attitude towards menstruation in general.⁽¹⁾

The manner in which adolescents maintain menstrual hygiene determines the health status of the individual. Practices practiced during this period carry on to adulthood.⁽¹³⁾ Practices such as using unclean rags coming in contact with the vagina, or rolling up sanitary pads, wearing the pad for a long period of time or infrequent changing of pads, douching causes health risk. Cultures have a number of beliefs or myths related to menstruation and expect the girls and the women to follow the 'secret codes' and practices to manage menstruation. Some of them like, they should not bathe (or they will become infertile), touch a cow (the cow might become infertile), etc., make the lives of women all the more difficult as it limits their freedom and restricts their participation in society. Unhygienic practices lead to disturbances in menstrual cycles as well as in health. However, certain actions- both self-care and medications, can help a woman and a girl be better. Self-care practices such as changing pads within 3-4 hours or within 6 hours, washing external genitalia, bathing daily, including fruits and vegetables in one's diet, moderate exercises to relieve from irritation and fatigue, changing pads before going to sleep, cleaning cloth with soap and water, etc are some of the self-care practices to be taken by girls and women.⁽⁵⁾

Socio-Economic Status, too plays a very important role in practicing good menstrual hygiene.

Socio-economic status refers to an individual's position within a hierarchical social structure, which is one of the most important determinant of health status.⁽⁴⁾ Safe and hygienic practices depend on cultural standards, parental involvement, socio-economic pressures. Problems in managing menstruation often lead to disturbance in relationships, school activities and affects academic performance.⁽¹³⁾ Poor menstrual health is associated with lack of confidence and restricted movement due to periods, absenteeism in schools, poor nutrition, dysmenorrhea, depression, occurrence of reproductive tract infections (RTIs), environmental problems due to incorrect disposal.⁽²⁾

In the present study, the researcher aims to understand the perception and practices of adolescents regarding menstruation from different socio-economic background, as perceptions and practices affect one's lifestyle.

Methodology

The present paper tries to examine the differences in perceptions and practices regarding menstruation among adolescents from various socio-economic backgrounds. For a better understanding, the differences were analyzed by studying two groups at a time, namely

- ◆ High and middle socio-economic group
- ◆ Middle and low socio-economic group
- ◆ High and low socio-economic group

In order to examine and study the topic, Descriptive Research of study has been opted to understand the same. Descriptive research intends to portray the characteristics of an individual, situation or a group, accurately. This kind of study includes surveys and fact-finding enquiries of different kinds. This study is also comparative in nature as it aims to compare perceptions and various practices regarding menstruation among adolescents from high, middle and low socio-economic background.

A total number of 177 respondents agreed to fill in three of the questionnaires. Sample size can be better understood with the help of a table:

Table 1- Sample Size

High Socio-economic Status	Middle/Average Socio-economic status	Low socio-economic Status	Age of respondents	Mean age of respondents	Mean age of Menarche
40	98	39	10-18 years	13.49 years	11.77 years

Three schools and one non-governmental organization were approached for data collection. The present study has been conducted by using primary data which was collected through a questionnaire. The standardized test used in this study was:

- ◆ The Adolescent Menstrual Attitude Questionnaire, by Morse, Kierre and Bottorff (1993). The questionnaire is divided into two versions-pre-menarcheal and post-menarcheal girls. The questionnaire for Pre-menarcheal girls assesses the attitude of adolescents who have not yet attained menarche whereas; the questionnaire for post-menarcheal girls assesses the attitudes of adolescents who have started menstruating. The Post-menarcheal version of this scale was only used. This questionnaire is based on a 5-point Likert scale, with six subscales- Positive feelings, Negative feelings, Acceptance of Menarche, Openness towards Menarche, Living with Menstruation and Menstrual Symptoms. This scale was used to understand the perception towards menstruation, by knowing their attitude towards menstruation. However, the scale

through its subscale of Acceptance and Living with Menstruation, assessed perception.^(7,8)

- ◆ The Upadhyay-Saxena Socio-economic Scale (USSESS), by Sunil Kumar Upadhyay and Alka Saxena was used to assess the socio-economic status of the respondents. For the convenience of the researcher, the average socio-economic group was replaced by 'Middle socio-economic group'. Also the acronym for socio-economic group or SEG was used for convenience.⁽¹²⁾
- ◆ A self-prepared questionnaire with 23 close ended and 1 open ended question to know the practices during menstruation by adolescents.

Statistics- The data collected was entered into the computer and analyzed through SPSS 17.0. Descriptive statistics was used to calculate mean and standard deviation. Independent T-tests were used for testing statistical significance between perceptions among respondents from High, Middle and Low SEG. However, for analyzing practices regarding menstruation among different socio-economic groups, data was expressed as percentage.

Results & Discussion

Table 1- T-testing (95% confidence level, alpha taken in the t-test- 0.05)

Subscales of Adolescent Menstrual Attitude Questionnaire ↓	Socio-Economic Group and t-testing					
	High and Middle	Null hypothesis	Middle and Low	Null hypothesis	High and Low	Null hypothesis
Positive feelings	0.0470	Rejected	0.3003	Accepted	0.0199	Rejected
Negative feelings	0.9908	Accepted	0.9026	Accepted	0.9233	Accepted
Acceptance of Menarche	0.3157	Accepted	0.0008	Rejected	0.0472	Rejected
Openness	0.0758	Accepted	0.5598	Accepted	0.0401	Rejected
Living with Menstruation	0.0308	Rejected	0.8125	Accepted	0.0767	Accepted
Menstrual symptoms	0.0422	Rejected	0.0162	Rejected	0.7388	Accepted
Overall attitude	0.5329	Accepted	0.1000	Accepted	0.3482	Accepted

From Table 1, it can be observed that significant difference was observed in various subscales of the Adolescent Menstrual Attitude Questionnaire, leading to rejection of Null Hypothesis. This difference was observed in the following subscales under high-middle, middle-low and High-low socio-economic group.

- High and Middle SEG: Positive Feelings, Living with Menstruation and Menstrual Symptoms.

- Middle and Low SEG: Acceptance of Menarche, Menstrual Symptoms
- High and Low SEG: Positive feelings, Acceptance of Menarche and Openness.

However, respondents from High, Middle and Low SEG had a negative attitude towards menstruation. No significant difference was observed in the mean scores as well as in t-testing, leading to acceptance

of the Null hypothesis.[(Table 1) and (Figure 1)]. Although, through Figure 1, it can be observed that respondents from Middle SEG had a little higher mean score(160.42) than respondents in the High and Low SEG. Attitudes and Perceptions towards menstruation seem to be better in respondents of middle SEG, followed by respondents in high SEG and low SEG. This might be because they have the ability to adapt, know more with the resources available. A number of factors such as socialization, actual experiences and cultural beliefs seem to have played an important factor in formation of their attitudes towards menstruation. Respondents from Middle SEG might have more time from their family especially their mothers who do not shy away from talking about menstruation, interest to know more about one's body, good peer relations etc.

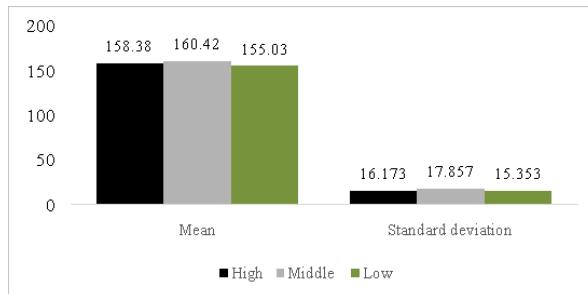


Figure 1: Mean scores of High, Middle and Low SEG in attitudes regarding menstruation

Table 2 indicates the practices practiced during menstruation. It can be observed that:

- ◆ In General Awareness: In this category of General Awareness, after analyzing the data, adolescents from Middle SEG seem to have better practices followed by respondents belonging to High and Low SEGs. The reason behind these practices might be because of supportive relationship with mother, and friends. These adolescents apart from sharing a supportive relationship, are provided with an environment of exposure, where they can learn more about themselves. Respondents in the High SEG and Low SEG might not have received sufficient guidance and are hence, not very aware. Respondents in the Low SEG, might not have received sufficient guidance and, also may not have enough facilities to increase their knowledge about Menstruation.
- ◆ In the category of Socialization, it was seen that majorly all the adolescents from low, middle and high SEG did not miss going to school during menses. Though majority of them too did socialize irrespective they were menstruating or not, it was seen the adolescents were more comfortable spending time with their friends

more than with the family members. The reason might be the time spent with peers in school as well as better understanding with them, as their peers are also going through pubertal changes as them. Family functions or gatherings are often a grand affair for girls, as they are expected to be dressed and be perfect. This can get uncomfortable for them as they may suffer from cramps and body aches. Another reason might be the time factor. Family gatherings are usually held for a long duration which might make them prefer meeting friends for a short period of time and be comfortable. However, it could be observed that respondents especially from the Low SEG were not comfortable in sharing their concerns.

- ◆ In the category of Self-Care, It can be said that adolescents try to take care of themselves but due to inadequate awareness as well as the restrictions (such as not exercising, not going to the kitchen) placed on them, they view menstruation as a negative event and are often embarrassed (if they have a stain). However in the sample, adolescents were seen to be engaged in some form of exercise, carrying extra pads when going out, having fruits whether menstruating or not. Some of them even reported becoming extra active when they have their periods. It can be said that both adolescents in the middle and high SEG had better self-care rituals in comparison to adolescents in low SEG, probably because of a difference in resources, availability of fruits, medicines and knowledge.
- ◆ Maintenance and Hygiene- Respondents in the high and low SEG have better practices related to maintenance and hygiene, in comparison to middle SEG who reported to flush the absorbent material in the toilet, skipping bathing. Regardless of better practices in the high and low SEG, it can be said that majority of the respondents from various SEGs make a note of the date of their period through their medium of convenience, dispose the absorbent material properly, take bath either once or twice a day. Majority of the respondents reported to having using soap and water to clean external genitalia. It is not wrong but generally, warm water is preferred to clean external genitalia or else water and mild soap should be used to clean external genitalia. The respondents, though a minority were seen to change absorbent material after 6 hours, which is not a very healthy practice and might lead to infections and other diseases. Respondents from High SEG were observed to

- have better practices in this category. It may be due to better availability of products and services.
- ◆ Restrictions: It was observed that majority of the respondents from high (45%), middle (53.06%) and low SEG(43.5%) were restricted from going to temple. They were also not allowed to go to kitchen, touch males or shampoo their hair. It was surprising to observe that adolescents from High SEG who might have been more educated had to practice a number of restrictions like not being alone in a room or attending functions. About 5(12.5%) respondents from High SEG, 8(8.16%) respondents from Middle SEG and 3(7.69%) respondents from Low SEG did not have any imposed restrictions on them. It can be observed that though less in number, respondents from the Middle SEG did not have restrictions imposed on them, followed by respondents of high SEG and Low SEG. Mothers and sisters played a role in encouraging them to practice these restrictions. This implies the lack of awareness, the power of cultural myths and taboos on the quality of life of menstruating girls. So many restrictions do impact how they perceive menstruation.

Conclusion

In the present study, it was seen that there is no significant difference in the mean scores of attitude regarding menstruation among adolescents from

high-middle, middle-low and high-low socio-economic background, thus implying that they were similar in their attitudes towards menstruation. As perceptions can be known by understanding the attitudes, from the results it is evident that respondent from three socio-economic backgrounds have a negative attitude and perception towards menstruation. Though there is no significant difference, in the results it was observed that attitude of middle SEG was slightly better than High SEG and Low SEG.

This study also compared the practices by adolescents from different socio-economic backgrounds during menstruation.

By comparing the practices of different socio-economic backgrounds, it was observed that:

- ◆ Respondents from Middle SEG had been more aware regarding their menstrual cycles, in comparison with High and Low SEG.
- ◆ Respondents from Middle and High SEG had better self-care practices, i.e., they engaged in some form of exercise.

Thus, respondents from Middle SEG were observed to have a better attitude (and perception) as well as practices towards menstruation, followed by High SEG and Low SEG

Table 2: Practices during menstruation

Category	Options	Socio-economic group & percentage of responses		
I. General Awareness:		High	Middle	Low
1(a) Awareness about pantyliners	Yes	15%	16.30%	0%
	No	85%	83.60%	100%
(b) Aware adolescents wearing pantyliners during menstruation	Yes	16.66%	68.75%	-
	No	83.33%	31.25%	-
II. Socialization				
1. Being absent in school during menstruation	1 day	27.50%	21.40%	20.50%
	2 days	12.50%	3.06%	2.50%
	3 days	2.50%	4.08%	2.50%
	>3 days	2.50%	0%	2.50%
	I don't miss school	55%	72%	72%
2. Adolescents meeting friends or family during periods	I only skip meeting:			
	My friends	2.50%	9%	10.20%
	Family functions	20%	17.30%	12.80%
	No, I socialize regularly	77.50%	73.40%	77%
III. Self-Care				
1. Applying antiseptics to rashes	Yes	27.50%	25.50%	23%
	No	45%	38.70%	58.90%
	Sometimes	27.50%	32.60%	17.90%
	Don't have rashes	0%	3%	0%
2. Engaging in exercise during menstruation	Yes	60%	53%	53.80%
	No	38%	41.80%	33.33%
	Other exercise	2.50%	5.10%	12.50%

	Yes	60%	51%	41%
3. Including fruits and vegetables during period	No	10%	18.30%	38.40%
	Have fruits daily	30%	30.60%	20.50%
4. Going for a medical checkup	Once in 6 months	15%	10.20%	12.80%
	Once in a year	20%	22.40%	10.20%
	Never	65%	67.3%	76.90%
IV. Maintenance and Hygiene				
1. Making a note of the date of period	Yes	37.50%	43.80%	25.60%
	No	32.50%	22.40%	64.10%
	Sometimes	30%	33.60%	10.20%
2. Medium preferred for keeping a record	Online apps	0%	1%	2.50%
	Paper/copy	10%	5.10%	5.10%
	Personal Calendar	30%	37.70%	12.80%
	Phone	5%	3%	0%
	I remember it	55%	44.80%	61.50%
	No record	0%	8.10%	17.90%
3. Type of absorbent preferred by adolescents	Sanitary napkins	92.50%	89.70%	94.80%
	Cloth	2.50%	3%	5.12%
	Tampons	5%	7.14%	0%
	Menstrual cups	0%	0%	0%
4. Frequency of taking bath in a day	Once a day	67.50%	57.10%	56.40%
	Twice a day	30%	37.70%	43.50%
	I skip bathing sometimes	2.50%	5.10%	0%
5. Cleaning external genitalia	Soap and water	55%	60.20%	48.70%
	Water	25%	19.30%	46.10%
	V-wash and water	20%	19.30%	5.10%
	Other	0%	1%	0%
6. Changing absorbent material within hours	In every 2 hours	12.50%	11.22%	5.10%
	4 hours	40%	30.60%	15.30%
	6 hours	42.50%	46.90%	53.80%
	>6 hours	5%	12.24%	25.64%

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Women Accession and Incorporation in Higher Studies: Analyzing the Gender Gap and Socio-Cultural Barriers

Anindita Halder and Punam Mehra

ABSTRACT

A survey was conducted on young adult males and females of the age group 22yrs-30yrs and on middle adult males and females of the age group 40yrs-50yrs. They were asked to fill up a self-prepared questionnaire. This questionnaire would check the women's and men's attitudes towards women's higher studies, gender based disparities, principle barriers in women's higher studies, influencing factors and suggestions that promote higher education. Another part of the survey is based on the secondary data which consists of 3 specific years data i.e. 2004-20058 of Ministry of Human Resource Development, 2011-20121 and 2015-20162 of All India Survey on Higher Education to see the improvement and cultural differences all over India in the rates of women participation in higher studies. As per all the respondent answers, young adult males and females are more concerned about women education whereas middle adult males and females are less concerned about women education because they feel that higher education is not as necessary for women as well as men. As per the survey of Ministry of Human Resource Department and also All India Survey on Higher education, the male enrolment is more than the female enrolment in the educational stages all over India but the female enrolment have increased within this 12 years which is a very good sign for women development but yet a lot to be done regarding women education through awareness and new policies and schemes should be introduced by Government.

Keywords: Accession, Gender differences, Higher studies, Socio-cultural barriers

Introduction

According to Dr James Emmanuel Kwegyir Aggrey “If you educate a man, you educate an individual but if you educate a woman you educate a family (nation)”.⁽¹⁰⁾

The Human Development Index (HDI) is a composite statistic of life expectancy, education, and per capita income indicators, which are used to rank countries into four tiers of human development. A country scores higher HDI when the lifespan is higher, the education level is higher, the GDP per capita is higher, the fertility rate is lower, and the inflation rate is lower. The HDI was developed by the Pakistani economist Mahbub ul Haq working alongside Indian economist Amartya Sen, often framed in terms of whether people are able to “be” and “do” desirable things in their life, and was published by the United Nations Development Programme.⁽⁶⁾

As a step towards enabling more female students to obtain the benefits of higher education, a number of countries have encouraged the establishment of all women's colleges and universities. India has several women's universities and colleges while Pakistan

has established its first women's university. The focus and curriculum of these universities provide high-quality professional and academic education to women, comparable to that available in the co-educational universities and colleges. These universities introduce areas of special interest to women, offer courses which meet challenges of modern times and make women self-reliant. In a gender segregated society like India, separate women's universities play a significant role in promoting women's education. Opportunities also exist for more women to be appointed to positions of leadership.⁽⁹⁾ According to Egunyomi (2009)⁽⁴⁾, higher continuing education seeks to build highly individualized and flexible programmes of learning and makes use of largely untapped resources for teaching and learning.

Methodology

This study tries to examine the differences in perceptions regarding women accession and incorporation in higher studies and also the rates of males and females in educational levels through All India Survey of India and Ministry of Human Resource Development.

Sample Selection:

Table 1- Sample Characteristics

Young adulthood (Age group -22 to 30)			Middle adulthood (Age group- 40 to 50)		
Male	Female	Qualification	Male	Female	Qualification
40	40	Minimum graduation	46	48	Minimum graduation

The total number of respondents was 174. Annual family income of the respondents was ranging from 3 lakhs to 10 lakhs. The cumulative reports of Human Development Index 2015-2016⁽⁷⁾, states that families with income below 3 lakhs p.a is considered to be low income group, 3-10 lakhs p.a. is considered to be middle income group and 10 lakhs is considered to be high income group. Thus it can be said that the respondents of this study falls under the middle income group. In this study, the type of sampling is Non-probability purposive sampling. In the present study the type of research method applied is descriptive research. There are two methods of data collection- primary data and secondary data. Here the primary data consists of a self prepared questionnaire. The secondary data is based on the comparison between the three different years (2007)⁽⁸⁾, (2013)(1) and (2016)⁽²⁾ of All India Survey on Higher Education on specific degrees i.e. Graduation, Post Graduation, PhD and M.Phil.

Results and Discussion

It was found from the present study that the respondents were of the opinion that the gender gap is reducing and has reduced than before in terms of women higher education. Same age group of males and females had more or less similar response towards women higher studies but there was difference like females were more against gender disparities as compared to males. But there was a lot of difference among different age groups of males and females because there is a difference in thought process among young adulthood females and middle adulthood females as more of young adulthood females that the perception has changed, dominance of men has reduced, distance of college now a day's matter less for the women as there is no field or stream in which women are not excelling. But middle adulthood men also feel the same but the percentage is less as because they feel that somewhere down the line, family attitudes, cultural stereotyping, and the stresses of dual roles of women, career interruption, and men dominance are still affecting women participation in higher studies.

According to the study of Ministry of Human Resource Development (2007)⁽⁸⁾, it has been noticed that there was a difference among boys and girls in all the kinds of enrolment of educational stages in the year 2004-2005. The Rates of enrolment among boys (60%) were very high as compared to girls (40%) in all the educational degree stages. It was evident that the enrolment rates of girls were very minimum in engineering (24%), medical (35%) and

also in M.Com (34%) as compared to boys whereas the maximum enrolment among girls were in M.A (47%) and M.Sc. (46%). From this we may say that in the year 2004-2005, there were less provisions and awareness by the government towards women's education. Another reason could be the trend of the society was different, less importance was given to women education and also women were considered for taking care of the house and not working out necessarily. At that point of time, women were less aware of their rights and society also paid more attention to family oriented life and not career oriented family. Most importantly, Government took fewer steps towards women's education like less educational schemes, scholarships, job prospects and policies which would have been a reason for more rates of enrolment among women in all the educational degree stages. It is seen that less female enrolment in Engineering, Medical and M.Com as because it is the societal thought that it is not their area of interest rather their area of interest is BA, MA and MSc and the reason could be that the females who gets into Graduation and more higher education then the drop-out rates among them are very less as because they get to know the importance of higher education. But the ones who get do not get into higher education; they drop-out more frequently as because they have less idea about the prospects and benefits of higher education. According to The Composite Education Development Index for assessing the status of elementary education computed by the National University of Educational Planning and Administration (NEUPA) and the Government of India (Ministry of Human Resource and Development, Department of Education and Literacy)⁽¹²⁾ females who gets into Graduation and more higher education then the drop-out rates among them are very less as because they get to know the importance of higher education.

All India Survey of India 2012⁽¹⁾ and 2016⁽²⁾ - The survey indicates that overall in India there is a difference in the enrolment of male and female which indicates that the male enrolment is higher than the female enrolment in Graduation, Post Graduation and also in PhD but except in MPhil in 2012 and also in 2016. From this it may be said that still now women are considered to be less engaged in higher education that is why today also women's education is given less priority as compared to men's education. In specific states there are major differences among males and females enrolment such as Bihar, Rajasthan, Haryana, Punjab (male enrolment is higher) but there are also

some states where female literacy rates are more such as Goa, Tamil Nadu, Kerala and Karnataka. According to S. Gunasekaran⁽⁵⁾ (Determinants of Infant and Child Mortality in Rural India), women are more advantaged in Tamil Nadu, Goa, because now women are getting aware of their rights, Government has introduced several policies and schemes on scholarships and educational loans to empower women. It could also be that the society is giving emphasis on dual-income family that is why women are being encouraged to study and also job prospects are increasing which is also motivating women to study more. According to The Composite Education Development Index for assessing the status of elementary education computed by the National University of Educational Planning and Administration (NEUPA) and the Government of India (Ministry of Human Resource and Development, Department of Education and Literacy)(12) females who gets into Graduation and more higher education then the drop-out rates among them are very less as because they get to know the importance of higher education. But the ones who get do not get into higher education, they drop-out more frequently as because they have less idea about the prospects and benefits of higher education and it is also noticed that more number of females in MPhil, as because it is always said that women are always good teachers and the reason is that the women are always encouraged to become a teacher then it will be easier for them to look after the family as well. According to the study by Shanjendu Nath on Higher Education⁽³⁾ and Women Participation in India and Higher Education for Women in India- Choices and Challenges by Nandita Singh⁽¹¹⁾, there are cultural differences among males and females enrolment in rural and urban area. Most importantly, female enrolment has increased from 2012 to 2016, which is a good sign for our nation but a lot more to be done so that more and more women participate in higher studies through spreading awareness, Government should take major steps to increase the participation of women in higher education.

Conclusion

A survey conducted on “Women accession and incorporation in higher studies: analyzing the gender gap and socio-cultural barriers”. The survey is based on the primary data and the secondary data. The primary data consists of 2 age groups and 4 comparisons, (i) 22yrs-30yrs of males with 22yrs-30yrs of females (ii) 40yrs-50yrs of males with

40yrs-50yrs of females (iii) 22yrs-30yrs of females with 40yrs-50yrs females (iv) 22yrs-30yrs of males with 40yrs-50yrs of males From the present study we can conclude that the Women accession and incorporation is increasing day by day as women also desire to be independent and have a settled career in their life. This will make them confident, self sufficient and if required they can support the family and improve the living conditions of the family. They are getting exposure into higher education as family attitudes have changed, discrimination has reduced against women, less of early marriages as because world is changing and everything is improving like technology, education, lifestyle etc. With the advancement, industrialization, urbanization and globalization, women are getting more chances to study ,scenario has changed .Today women are aware of their rights and society is giving importance in dual-income family that is why women are encouraged to study.

According to the Ministry of Human Resource development (2007) and All India survey of higher education of 2013 and 2016, the female enrolments have increased within 10 years which is because women have understood the importance of higher education and also they want to become independent and self-sufficient.

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Working & Living Conditions of Domestic Workers: Indispensable yet Unprotected

Stuti Arora and Geetika Sachdeva

ABSTRACT

This study investigates the working & living conditions of the domestic workers in Kolkata district. A purposive and convenient sampling technique was employed for the study. The sample comprised of total 220 respondents, covering total 48 full time workers (24 male workers and 24 female workers) and 172 part time domestic workers (76 male workers and 96 female workers). The data from the respondents were gathered by using two sets of questionnaire: a) a survey questionnaire by Indian Labour Organization (ILO) and b) a self prepared questionnaire. To delve in a deeper idea of the study there were 4 case studies conducted. The study is descriptive in nature. The main objective of the study was to study the demographic profile of the domestic workers and also to investigate the problems in living and working conditions of the male and female domestic workers. The study concluded that female workers were economically underprivileged as compared to male workers. The living and working conditions of male workers were better than the female workers. The work done by female workers were undervalued and unrecognized.

Keywords: Domestic Workers, Living Conditions, Working Conditions.

Introduction

The ILO (International Labour Organization) Convention on Domestic Workers (No. 189), defines domestic worker in its Article 1, 5 Article 1 For the purpose of this Convention: a) The term “domestic work” means work performed in or for a household or households; b)The term “domestic worker” means any person engaged in domestic work within an employment relationship; c)A person who performs domestic work only occasionally or sporadically and not on an occupational basis is not a domestic worker.

Provision (a) is meant to cover both domestic workers who are members of the household and live with the household (live-in domestic workers) and domestic workers who are not members of the household and do not live with the household but work as domestic worker for that household (live-out domestic workers). Provision (b) is meant to exclude persons performing domestic work in or for the household who do not have an employment relationship such as members of the family who are taking care of the house without an employment relationship. Finally, provision (c) is meant to exclude persons performing domestic work on a casual basis such as the babysitter or the handyman bringing the purchases made at the supermarket.^(1,9)

Working & Living Conditions- A domestic worker is directly under the authority of a householder & follows the straight instructions of the house owner for the work. The work done by domestic workers

may include- cooking or cleaning, taking care of the children, elderly or disabled, tasks that are usually performed by women in the vast majority of societies. However, domestic work may also include- gardening, chauffeuring or providing security services, driving, tasks which are often performed by men. It is found that among all categories in the informal sector, domestic servant's income is the lowest & the problems are many.^(2,10,12) Most urban poor live in different types of slum settlements and work in the informal sector. The relocation of the poor to resettlement colonies takes them far away from areas of economic activity in the city, thus making it impossible for them to even earn sustainable livelihood.^(3,26)

In this context, it has been well documented that the process of relocation and displacement has led to problems of sustained access to livelihood, education, basic services and healthcare where women suffer the most. In the resettlement areas (and in the slums), women spend a large part of their time accessing essential services such as water and toilets. The double burden that they face is compounded due to harsh living conditions.^(4,11) Besides this, they have no access to any form of childcare services. They often leave their own children alone while they go to take care of others' children.^(5,7)

A study conducted by the researcher focussed on the working and living conditions of women domestic workers. It was seen that there was lack

of core entitlements which was required to enjoy freedom guaranteed by the democratic society. The findings of the study showed why it was important to create a comprehensive social security system for domestic workers in India. The study even covered themes such as basic demographic features, nature of services, work profile of the domestic workers, access of social security, consumption of edible items, union awareness, attitude of domestic workers towards gender & domestic violence.⁽⁸⁾

The ILO Convention protects the Fundamental Principles and Rights at Work of the ILO (Article 3). It recognizes that domestic work is undervalued and invisible and is mainly carried out by women and girls (Preamble). Thus it states clearly that Members shall take measures to ensure that domestic workers, like workers generally, enjoy fair terms of employment as well as decent working conditions (Article 6), enjoy minimum wage coverage (Article 11) and be paid directly in cash (Article 12). Requirement is made that Members set a minimum age for domestic workers (Article 4), ensure that domestic workers enjoy effective protection against all forms of abuse, harassment and violence (Article 5), has the right to a safe and healthy work environment (Article 13), and of social security protection, especially in respect to maternity (Article 14). The Convention also recognizes that domestic workers are often migrants (Preamble), and contains provisions that are specifically addressed to their migration status. ^(1,13)

Methodology

Sample Selection- The total number of sample respondents was 220 out of which 172 were part time workers (76 male workers and 96 female workers)

Table 1- Demographic Profile of Domestic Workers

Demographic characteristics of respondents	Highest responses by full time female workers	Highest responses by full time male workers	Highest responses by part time female workers	Highest responses by part time male workers
Age Group	41-50 years	41-50 years	30-40 years	41-50 years
Native place	West Bengal	Bihar	West Bengal	West Bengal
Educational Qualification	Between standard 1-5	Between standard 6-10	No qualification	Between standard 6-10
Marital Status	Widow	Married	Married	Married
Duration of employment	More than 8 years	More than 8 years	More than 8 years	More than 8 years

Almost majority of the respondents belonged to West Bengal while among full time male workers comparatively a larger group was from Bihar. The remaining group of respondents belonged to different

while 48 were full time workers (24 male workers and 24 female workers) from Kolkata district. Out of these 220 samples, 88 domestic workers including both part time & full time were approached from 6 centres of Kolkata District. There were centres for maids & servants while other 3 were driver centres. The age group of the respondents covered young adults (20-40 years) and middle adults (40-60 years). The sample method used was Purposive Sampling & Convenient Sampling Technique.

Tools for Data Collection- In the present study, the type of research method applied is Descriptive Research. There were two questionnaires used for the study which included both open & close ended questions. a) A Survey Questionnaire was used from the study- "Study on Living and Working Conditions of Domestic Workers in Cambodia by International Labour Organization (ILO)"⁽¹⁴⁾. b) A self prepared Questionnaire was made as well., c) To delve into the depth of the study, 4 case studies were also conducted; one of male worker & the other of a female domestic worker respectively.

Results and Discussion

Table-1 demonstrates the demographic characteristics of the domestic workers. The highest age group of the respondents was between 30-50 years. All the respondents had work experiences between 20-25 years which validates with the age group. The young adults were less in number as now days with the change in time the choices of people have also changed. Previously as we used to see more number of domestic helpers but the young adults in present are now trying to find different career opportunities and providing themselves with proper education for the same.

states of India like Jharkhand; Orissa, Chennai and even few countries like Nepal and Bangladesh. The number of migrants was less in the present study. The educational background of women was more

deprived as compared to men workers because women workers were of the opinion that their education was not of much importance according to their parents. Among male workers, the parents tried to make them educated so that they can do a better work for improving the living conditions of the family. Full time female workers had highest number of widows and as they did not have any support system for income they had to work as full time workers for their and family's living needs. The rest of the respondents were married.

The working and living conditions of the workers were unrecognized. There are many different categories of work done by a domestic worker which includes: cleaning, cooking, dish washing, gardeners, watchman, caretakers, etc. Among these categories the household chores were seen to be done by women in majority, while work such as driving, gardening and security services were given to men. In the present study, the results show that the percentage of male household workers was comparatively low as compared to drivers, gardeners and watchman. The majority of household services among male workers were found in full time category. Almost all the workers were provided with meals on a regular basis except part time male workers as majority were drivers so they were not given any meals. Among full time workers both male and female workers were given an accommodation. While the percentage of full time male workers were more as compared to female workers who were not given any separate space but were told to sleep inside the kitchen itself.

The salary received by male workers was more as compared to female workers. The majority

percentage of female workers earned a salary between the ranges 5,000 to 10,000 respectively. While among male workers the maximum salary distribution was from 8,000 to 16,000 respectively. The salary distribution for women workers was even lesser than 5,000 per month. The female part time workers working hours were less as compared to male workers. But the amount of work done by female was more. It has been noticed that the female workers are given more work to do that they receive the salary. They have to do all the household chores and still their salary is less. It is told that household work is no that difficult that someone should be given a high pay while the same work if done by a male increases the value as male workers are not much seen doing the household chores. So the residences who acquire male workers as domestic helpers have to pay more salary to them as they will give to a female worker. The working hours for most workers were included between 10-14 hours each day while among part time females the working hours were between 5-9 hours per day. Even though the working hours of female part time workers were less, they worked in more than 1 household each day. They try to give 1 hour at each household where they do various different works. Almost half percentage of the part time female worked in one household for 8-9 hours. Among the rest of the workers the majority of respondents said that they worked in one household. The domestic workers had a mixture of responses for their resting periods. In general, if the percentage was calculated for all the responses it will be found that most of the workers got time to rest in between their working hours. Even though the resting hours varied in hours but the worker did get some time to rest starting from less than an hour to more than 2 hours per day.

Table 2- Number of leaves taken in monthly basis by the Domestic Workers

Division of the leaves taken	Full time Female workers	Part time Female workers	Full time Male workers	Part time Male workers	Total Percentage
No leaves	21	39	19	21	45%
Once a week		21	2	44	30%
Once a month	1	14	1	5	10%
Twice a month	2	14	2	4	10%
More		8		2	5%

In table-2 and table-3 the leave taken by the domestic workers in monthly and yearly basis have been shown. From the above tables, it can be said that the female part time workers do not take much leaves as they feel their living and working conditions are poor and that is the reason they only prefer to take leave at the time of emergencies. Among the migrant

workers including male and female, the leaves are not taken in weekly or monthly basis but on a yearly basis. Every once a year they visit their native place. Among rest of the remaining workers the leaves were taken in a weekly basis which automatically increased the total number of leaves in a year.

Table 3: Number of leaves taken in yearly basis by the Domestic Workers

Division of the leaves taken	Full time Female workers	Part time Female workers	Full time Male workers	Part time Male workers	Total Percentage
No leaves	2	28		10	18%
Less than 15 days	7	36	8	12	29%
More than 15 days	15	32	16	54	53%

Almost all the workers responded that they were not mistreated in the workplace. While a small section of respondents said that they face verbal abuse, reduction and late payments in salary or no grant for leaves. The majority of the respondents said that they do not have any paid leaves which they are informed by the employers while they start working. Some of the workers were not facing any mistreatment in current household but had faced sexual and verbal abuse in their previous household but they never filed any complaint against the employer. A majority of respondents were the only earning member in their family. The domestic workers had difficulty in managing their living conditions with the amount of salary received. But among the workers who received a good amount of salary it was manageable but for others, especially female workers it was a difficult work to handle their household as they were the highest earning member of the family and their earning was very less to fulfil the needs and requirements of the household. Male workers were the highest earning member of their families and most of their spouse was housewives. Among female workers even though their husbands were working but their salary was either less or equal to the female workers. The relationship of the workers with their spouse and children were quite good. Only a small section of workers said that they did not have a good bond with their spouse. The workers were of the opinion that the communities where they stay help them a lot at the time of any crisis which is not given much from their own relatives. The workers were of the opinion that the government does not provide any help to them in any terms. Some of them said that they have BPL cards, which help them in getting discount in ration and medical help but it is not enough for them. They still have to take loans from other higher authorities, most of the time from their employers and by the end of the month they do not have any savings.

Conclusion

In the light of above data analysis, interpretation and case studies, it can be concluded that despite of efforts been put by the society and government in helping the domestic workers, there is still a lot

of changes to be made. The domestic workers are a very important and necessary part of everyone's life. If for one day a worker does not come the entire work has to be done by us that make us realize the value of a domestic helper in our lives. But despite of the importance of having a domestic worker it can be said that women workers are economically disadvantaged and undervalued with the work they perform as domestic helpers as compared to men.

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Knowledge and Practices of Menstrual Hygiene among Adolescent Girls in Special Schools of Kolkata

Sanghita Chatterjee and Krishnakali Bhattacharyya

ABSTRACT

The present study aimed to find out the knowledge and practices of menstrual hygiene among adolescent girls in Special Schools of Kolkata. Although the target group was the adolescents studying in the special schools but the data could not be collected from adolescent girls directly as they are suffering from Specific Neuro-developmental Disorders, they are unable to respond to the questions of the questionnaire themselves. So, the mothers were interviewed whose daughters belonged to the age group of 13-19 years. The sample size comprised of the mothers and the teachers of the special schools, (Mothers N=64 & Teachers N=36). The noteworthy aspect is that mothers' effort to deal effectively with their daughters' physical change and maintaining a proper menstrual hygiene. The main findings from teachers report is that the teachers are given training to handle the adolescents during this time. Overall, majority of the teachers reflected a caring attitude towards the adolescents regarding the issue.

Keywords: Adolescent, Knowledge, Menstrual Hygiene, Practices, Specific Neuro-developmental Disorders.

Introduction

Adolescence is a transitional period in the human life span, linking childhood and adulthood. During adolescence there is a large degree of psychological growth as children make adjustments in their personality due to the rapid physical and sexual development which is characteristic of this period of life. Biological and cognitive changes are the essence of adolescent development. They encompass a sequence of events that transforms a child into an adolescent. Girls typically start to menstruate ('the time of menarche') during puberty or adolescence. Puberty refers to the physiological changes that the adolescent undergoes in order to reach sexual maturity. The three distinct stages can be identified in the psychological development of the adolescent.

During early adolescence (ages 11-13), developing a new self-image due to their physiological changes. Adolescents need to make use of their newly acquired skills of logical thinking and ability to make judgments rationally. When they reach the ages of fourteen and fifteen (the period known as mid-adolescence), adolescents strive to loosen their ties to their parents and their emotions and intellectual capacities increase. During late adolescence (ages range from sixteen on), adolescents have a more stable sense of their identity and place in society. Adolescent should, by this time, have established a balance between their aspirations, fantasies, and reality.

The Menstrual Cycle- Menstruation is also sometimes known as 'menses' or described as a 'menstrual period'. The menstrual cycle is usually around 28 days but can vary from 21 to 35 days. Each cycle involves the release of an egg (ovulation) which moves into the uterus through the fallopian tubes. Tissue and blood start to line the walls of the uterus for fertilisation. If the egg is not fertilised, the lining of the uterus is shed through the vagina along with blood. The bleeding generally lasts between two and seven days, with some lighter flow and some heavier flow days. The cycle is often irregular for the first year or two after menstruation begins. The reaction to menstruation depends upon awareness and knowledge about the subject. The manner in which a girl learns about menstruation and its associated changes may have an impact on her response to the event of menarche. In line with the present study a cross sectional survey in which 200 females were interviewed through questionnaire method at villages of Krishnu Block of Pauri, Garhwal. The study revealed that 32.5% girls had the prior information and knowledge regarding menstruation before attaining the menarche. Researchers observed that in the method of disposal of sanitary materials mostly threw on road side and few burned the clothes. The study revealed low level of knowledge and various misconceptions among adolescent girls regarding menstruation which is closely interrelated with poor menstrual hygiene.⁽⁴⁾

Many myths and social norms restrict women and girls' levels of participation in society. This can make their daily lives difficult and limit their freedom. Women having better knowledge regarding menstrual hygiene and safe practices are less vulnerable to RTI (Reproductive Tract Infections) and its consequences. Therefore, increased knowledge about menstruation right from childhood may escalate safe practices and may help in mitigating the suffering of millions of women.⁽⁷⁾

Once menarche occurs, girls with intellectual disabilities may have physical challenges that may make menstrual hygiene difficult, or they may be unable to deal with menstrual pads. The teen may remove the pads in inappropriate places, some cannot physically change their own pads, which may interfere with their ability to be independent.

A study conducted by researchers on menstrual hygiene among blind school children was observed that there was no difference in the problem of using pad or cloth during menstruation. But the study revealed that when the menstrual hygienic practice is less the problem will be more. Therefore blind children need adequate education and suitable assistance to use sanitary materials to prevent problems among blind school children. Problems may arise if caregivers at school or at home are unable or unwilling to help with hygiene. Mentally challenged children face many discrimination in family, however family also face the problem of humiliation in society. It is important to focus on the health and sexual issues of the mentally challenged children.⁽⁹⁾ Among children with cerebral palsy, puberty tends to begin earlier and end later than in typically developing children⁽³⁾. Precocious puberty, which is defined as the development of sexual characteristics before the age of eight years⁽⁵⁾ occurs in approximately 1 in 1000 girls. People with developmental disabilities may have problems with major life activities such as language, mobility, learning, self-help, and independent living. Examples of conditions in the developmental disabilities population include intellectual disability, deafness, blindness, cerebral palsy, Down syndrome, and autism.⁽¹⁰⁾ Females with DD tend to have difficulty following and implementing standard menstrual hygiene routines because of their lack of self-help skills, but do vary with cognitive, sensory, and/or motor abilities. The behaviour seen in females with DD may include aggression, restlessness, hyperactivity, increased agitation.⁽¹⁾

Menstruation and menstrual practices are still clouded by taboos and socio-cultural restrictions resulting in adolescent girls remaining ignorant of the scientific facts and hygienic health practices, which sometimes result into adverse health outcomes.⁽⁶⁾ The issue of menstrual hygiene can be of more concern if the child is suffering from some specific neuro-developmental disorder

Methodology

The target group of the present study is specially abled adolescent girls studying in special schools of Kolkata. The present study tries to explore the knowledge and practices of menstrual hygiene among adolescent girls in special schools of Kolkata. The present study aims to assess the knowledge regarding menstrual hygiene among adolescent girls studying in special schools. It also tries to find out the practices associated with menstrual hygiene among these girls.

To realize the above objectives different special schools were approached. However, permission could be obtained from only four schools.

The sample under consideration was mother(s) and teacher(s) of adolescent girls from special schools of South Kolkata.

The mothers who were interviewed have daughters belonging to the age group of 13-19 years. Some data were also collected from the teachers of the special schools. Overall the sample comprised of (Mothers N=64 & Teachers N=36).

Collection of Data- The study is primarily descriptive in nature. A self prepared questionnaire has been used as a tool in the survey to gather information regarding the knowledge and practices about menstrual hygiene among adolescent girls in special schools of Kolkata. Along with it some questions from a standardized questionnaire called 'WASH in Schools Empowers Girls' Education Tools for Assessing Menstrual Hygiene Management in Schools'(UNICEF 2013) (2)was used to collect data of teachers.

Results & Discussion

Collecting data on adolescents from four special schools by interviewing 64 mothers (administering the questionnaire) it was found that the adolescents are suffering from the following disorders.

Table 1: The number of adolescent girls suffering from various disorders

Sl No	Disorders	N (Total Number)
1	Intellectual Disorders(Mild)	25
	Intellectual Disorders(Severe)	1
2	Communication Disorders	17
3	Autism Spectrum Disorder	5
4	Down Syndrome	15
5	Cerebral Palsy	1
		N= 64

The mean age of the menarche was 14.09 years as reported by the mothers. Thus the obtained result shows that although the adolescents are suffering from Specific Neuro-developmental Disorders, Down Syndrome and Cerebral Palsy, they have started their menarche in the right time. The standard deviation (1.74) reflects homogeneity regarding the issue. A research on impact of menstruation in adolescents with disabilities related to Cerebral Palsy found the standard mean menarchal age is 12.3 years for their sample.⁽⁸⁾

Table 2: The range, mean and standard deviation of the age of menarche of adolescent girls as reported by the mothers

Range	Mean	Standard Deviation (S.D)
13-19 years	14.9 years	1.74

Proceeding further for the collection of data the mothers were asked how did they come to know that their daughters are having periods a few answered that their children are able to communicate?

The results in details are as follows-six (6) mothers reported that their daughters were able to communicate and they can express it on their own during the time of menstruation. While it was found that 58 of the mothers reported that their daughters suffering from Mild Intellectual disability and other associated problems like Speech Problems, Autism Spectrum Disorder and so on .Therefore, their daughters are unable to express that they have started their periods during the time of menstruation.

Moving further for in-depth query the mother's knowledge & notion regarding menstruation was questioned. They were asked about the causes according to you that can lead to menstruation. Fifty two (52) of the mothers said that menstruation is a normal process that takes place in the body. It is

good for our body that makes us healthy. Therefore, it shows the knowledge they have and their scientific outlook towards menstruation. However, 12 said that it is a curse of God. These responses of mothers reflect the frustration and self blaming attitude along with a prejudiced notion related to menstruation. Mothers reported that their daughters bleed for more than 5 days bleeding. Sometimes it continues for 8-9 days during that time it is difficult for them to change their sanitary napkins regularly as females with developmental disabilities have difficulty in dealing with menstrual problems. So at times they think of eliminating their menstrual cycle through surgery.

Moving towards the hygiene part of the investigation 50 of the mothers said that they bathe their daughters daily to keep them clean. Whereas 14 of the mothers felt that bathing can increase the flow of menses and it is difficult during the menstrual period to bathe their daughters as they feel uncomfortable, irritable, at times they scream. During that time it is difficult to bathe them so they prefer sponging them. Inquiry related to washing hands, which is a major part of hygiene practice majority (58) of the mothers reported that as their daughters needs assistance so they do not allow their daughters to wash their hands on their own. Mothers said if they allow their daughters to wash their hands on their own mostly they play with it or spread the water everywhere. It was further reported by fifty nine (59) mothers that they dispose of the sanitary napkins in the early morning. Only 5 of the mothers said they dispose at night to prevent others from seeing and also few of them believe that at night evil souls can cause harm so they don't dispose sanitary napkins at night. Majority of the mothers said they do not reuse the sanitary cloth as it is very unhygienic and may be very harmful causing infection in their genital area. Fifty two (52) of the mothers reported that they do not allow their daughters to go to temple for the first three days, don't allow them to go to kitchen, have oily food. They are not allowed to participate in special sports, marriage ceremony, not allowed to go out mix with other people. Parents believe that as their daughters are having developmental disabilities during the time of menstrual period they are sexually very active and they cannot express themselves so if they mix with boys they can become pregnant, they can be sexually abused by others. Therefore they are not allowed to mix with boys during this time. Only 12 of the parents do not follow any restrictions as they feel that it is difficult to restrict their daughter and they should not do it to make them feel more untouchable, uncomfortable.

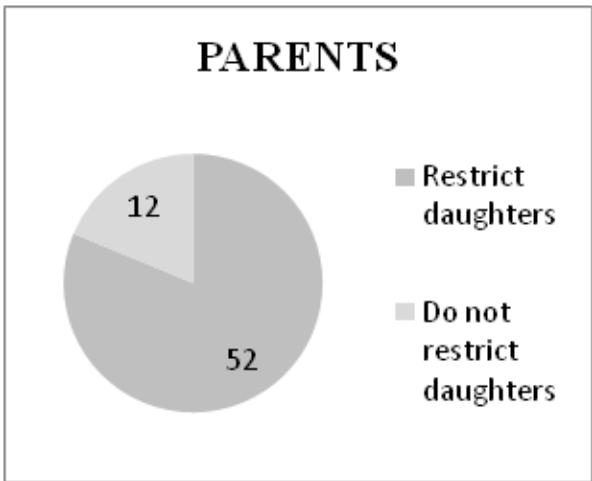


Figure 1- Number of parents who restrict and do not restrict their daughters during menstruation

Overall, the teachers think that training should be provided to girls. They believe that more information to students on menstruation can also be given through charts and posters. Now a day there is a machine which is called Sanitary napkin machine. Teachers said every school should install that machine to make it easier for girls. Keep enough supply of sanitary napkins for emergency, provide medicines for pain, have provision for sick bed in case of extreme cases of pain they felt that the time has come to conduct special classes for girls to avoid superstition concept followed on menstruation by others , as well as spread awareness of menstrual hygiene. Schools can also arrange girl counseling programmes. Menstrual hygiene should be discussed with students in positive way. Girls should feel free to discuss their problem with their teachers and other staffs who can help them in this matter. For adolescent girls it is necessary to train them in school through sex education about menstruation cycle.

Conclusion

The survey found that although the mothers have a knowledge regarding menstruation but communicating the change to their daughters is not an easy task .But the mothers never gave up. The mothers have been found quite vigilant about the changes their daughters go through this period taking notice of the change of mood and other physical problems and pain their children suffer. They try their best to help their daughters regarding menstrual hygiene.

In sum ,the efforts of the mothers and caring attitude of the teachers found from the study indicates that although managing the periods all by themselves for girls suffering from Specific Neuro-developmental

Disorders is difficult but it is not an unworkable issue with the help of their mothers and support from the teachers.

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A Study on Perception, Prevalence and Consequences of Substance Abuse among North-Eastern Students living in Kolkata

Laltanpuii and Krishnakali Bhattacharyya

ABSTRACT

The study aims to highlight the type, nature and pattern of substance abuse among North-east students. A self prepared questionnaire was distributed among 78 students, 31 men and 47 female from states of Mizoram, Manipur and Nagaland. The respondents who admitted taking drugs among was 14 male and 21 female, were taken for further study and data was analyzed accordingly. It was found that all the respondents know what drug abuse is and also it affects health adversely. Some admitted of taking drugs as early as school years. They mostly consume liquor and weed because of easy availability. However not all accepted that their parents know of this addiction and their relationship with their parents are not hampered also. However, some admitted they fall into trouble even been arrested for possessing illicit drugs and feel that their bad habit of drug and alcohol abuse give rise to negative feelings towards them and hampers their reputation.

Keywords: substance abuse, withdrawal symptoms, North-Eastern students.

Introduction

North-Eastern states is set apart from the rest of India by geographically difficult terrains, socio cultural patterns, population density, high proportion of tribal population, high prevalence of tobacco use was reported to be much higher in the North-eastern states compared to other parts of India. According to Times of India which was published on 26 June 2015 at least 1,321 people including females have died due to drug abuse in Mizoram since 1984 when the first drug related death due to heroin was detected in the state, said state excise and narcotics department records released on the occasion of International Day Against Drug Abuse and Illicit Trafficking. Overall the main killer drug in the state was spasmo proxyvon, which killed 1162 people during the same period and 59 people due to other clinical drugs. The word ‘Adolescence’ is certainly a period of change, and adolescents do have various pressures on them. However, adolescents are especially stressed and they are at no greater risk of being in crises than adults of all ages. According to Jean Piaget “Adolescence is the age of ideals and the beginning of theories as well as the time of simple adaptation to reality”. The four stages of Piaget’s theory of cognitive development correspond with the age of the child; they include the sensorimotor, preoperational, concrete operational and formal operational stages

- ◆ The sensorimotor stage occurs from birth to age 2 and is characterised by the idea that infants ‘think’ by manipulating the world around them
- ◆ The preoperational stage occurs from age 2 to age 7 and is characterised by the idea that children use symbols to represent their discoveries

- ◆ The concrete operational stage occurs from age 7 to age 11 and is characterised by the idea that children’s reasoning becomes focused and logical
- ◆ The formal operational stage occurs from age 11 to adulthood and is characterised by the idea that children develop the ability to think in abstract ways.

Substance abuse, also known as drug abuse, is a patterned use of a drug in which the user consumes the substance in amounts or with methods which are harmful to themselves or others, and is a form of substance-related disorder. According to World Health Organisation (WHO) 2016 “It is a residual category, with dependence taking precedence when applicable. The term abuse is sometimes used disapprovingly to refer to any use at all, particularly of illicit drugs”. Mc Connell (1977) explained that a “A drug is any chemical which, when taken in relatively small amounts, significantly increases or decreases cellular activities somewhere in the body” O’Toole (1989) described a drug as any substance (usually a chemical) which influences our bodies or emotions. Wilson and Wilson (1961) said “Drugs are substances used to influence the activities of the cells and organs of the human body”. Overall, substance abuse commonly referred to as addiction. A study on ‘On the frontline of Northeast India-Transnational Institute’ mentioned about the Northeast India has a long tradition of opium smoking until allowed in the 1960’s opium dens were commonplace in Manipur. In the 1970’s many of the opium users switched to morphine, produced in central India for medicinal use and legally sold over the counter in pharmacies. At the time the use of drugs was

considered a status was considered a status symbol. Another study on substance abuse and practices and their consequences among adolescents and young adults in Mangalore mentioned that the abuse of alcohol and illicit and prescription drugs continues to be a major health problem internationally. Existing studies have found a high correlation between adolescent abuses and becoming a problem drug user in adulthood, therefore it can be inferred that many problem drug users start abusing drug at an early age. Alcohol and other drug use in the adolescent population carries a high risk for school underachievement, delinquency teenage pregnancy and depression. In one study on Licit and illicit substance use by adolescent students in eastern India addresses Use of tobacco, alcohol, and other substances is a worldwide problem and affects many adolescents. The main outcome measures were substance use, namely, tobacco, alcohol, and cannabinoids. From the schools, all the students in the classes VIII, IX, and X were taken as the study population and were administered a pretested close-ended anonymous self-administered questionnaire relating to pattern, frequency, and correlates of substance use. The obtained results found that the overall prevalence rates among rural and urban students were 6.14% and 0.6% for illicit drug use, 8.60% and 11.04% for tobacco, and 7.37% and 5.23% for alcohol consumption, respectively.

Methodology

The type of sample selected for the study was non-probability convenience sampling. The study was conducted on North-Eastern students who have come to the city of Kolkata, West Bengal to pursue further study, taking admission to different colleges of the city. Most of them are from Mizoram (N=66 students) followed by Manipur (N=9 students) and finally Nagaland (N=3 students). All the 78 respondents were approached individually and were given the questionnaire individually. They were also requested to fill up the questionnaire in front of the surveyor so that any difficulty they face can be sorted out immediately. As 12 male and 23 female students were not addicts, so they were excluded from the study.

Results and discussion

The final analyses of present study found that the respondents know that taking illicit drugs or consuming excessive alcohol regularly is bad. They know it well that taking drug is harmful and injurious to health. Regarding alcohol they also hold the same notion. The present study found that 3 girls & 3 boys=6 reported they had medical problems, 4 girls

&5 boys= 9 reported sometimes they had memory loss and convulsions as a result of their drug use. However, 12 girls & 6 boys denied having any problem. It was found 3 girls and 3 boys do suffer health problem 4 girls and 5 boys acknowledge that sometimes these health problems are result of their of their drug use. However, 4 girls and 5 boys reported not to have problems any problem. As the respondents mostly are into drugs for years it was asked when you did start taking drugs?. It was found that they have started taking drugs from their school years. one boy & one girl said they started taking drugs from school years-class IX-X; 12 girls & 10 boys said from high school years XI-XII; 7 girls & 3 boys=10 said from college. So most of them started from when they are in high school years whereas few of them started from college. However, in this regard it may be mentioned that what the present study found is not new. It was also observed that a number of respondents (10 girls & 5 boys) abused more than one drug at a time, although they denied doing it regularly.

Further it was surprising to find out that 11 girls & 5 boys = 16 of the respondents are capable of staying without using drugs. Although the authenticity of the answer may be questioned, however, 3 girls & 5 boys admitted that they are unable to stay without drugs, also some of the respondents, 3 girls & 5 boys reported that they have formed the habit of taking drugs because the drug affects the entire human bodies, likewise their body also feels the need of these drugs. This gives an indication that the drugs are now the masters and they have to obey them. Eleven respondents frankly admitted that they are not able to stop taking drugs whenever they want to. Most of the drugs have withdrawal symptoms. The study found the respondents do suffer from withdrawal symptoms also.

Number of respondents

Experiencing Withdrawal symptoms	Girls (N)	Boys (N)	Total N
Always	1	2	3
Often	3	2	5
Sometimes	9	7	16
Rarely	8	3	11
			35

Associated with their drug intake is their feeling of guilty, which most of them are reportedly not being able to overcome. It was also found that most of them (14 girls & 8 boys =22) are taking drugs without parents approvals whereas some (7 girls &

6 boys) of them said that the parents already know that their children are taking drugs. In this context it may be mentioned that as the parents were not interviewed their perspective regarding the issue remains in mystery.

Most of the time intake of drugs and alcohol creates a major problem in relationship. The relationship with family, parents and friends are hampered. As some respondents (7 girls & 6 boys=13) said yes, while (14 girls & 8 boys=22) said no. It can be said that most of them are taking drugs without parents knowledge, whereas some of the parents already know that their children are taking drugs. Knowledge and acceptance are two different things and this leads to further query whether drug abuse creates problems between them and their parents. The results obtained are as follows-Those who said that their parents know of their abuse also admitted that it often brings them in conflict with their parents also. All except eleven respondents (5 girls & 6 boys=11) reported that they do not neglect their family because of their drug or alcohol addiction.

Not only relationship with parents is affected but they also lose out on their friends. On being asked. ‘Have you lost friends because of use of drugs?’, 6 girls & 6 boys=12 of the respondents said they do lost friends because of use of drugs, while 14 girls & 8 boys=22 of the respondents said that they have not lost friends because of having drugs as their bond with the friends are very strong.

Even when asked about their relationship with their girlfriends or boyfriends. The results were as follows 5 girls & 8 boys=13 reported sometimes it matters a lot and hence creates a problem in a relationship with their partners. However, 16 girls & 5 boys=21 said and reported that they never had any problem with their partners regarding the issue.

Conclusion

The present study found that the students of North Eastern regions who are in Kolkata for further studies are in a habit of consuming liquor, weed and gutkha mostly along with other illicit drugs which are available easily available here. It was found that their habit is not new, as many started taking drugs from class XI and XII, and at present some reported to take drugs even thrice a week. This substance abuse creates conflict with parents at times and with friends also. Substance abuse comes with a price ranging from suffering from withdrawal symptoms, hampered reputation, trouble in college

and even landing up in police custody. The study found that respondents know what drug abuse is, but surprisingly only one has opted for treatment.

Thus the overall perception, prevalence and consequences of substance abuse of the North-Eastern students was studied with the help of the survey

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Exploring Gender Preference for Children among Two Communities of Kolkata

Niharika Dave and Geetika Sachdeva

ABSTRACT

The aim of the present study was to study gender preferences among two communities of Kolkata. Gender preference is “the state of being male or female (typically used with reference to social and cultural differences and biological ones) The preference one has for a male or female child in the family can be termed as gender preference.

Among 200 respondents, 100 belonged to the Marwari community and 100 belonged to the Bengali Community in Kolkata. The age of respondents varied from 27 years-45 years. Self-prepared questionnaires with 20 questions, out of which 18 were close-ended and 2 of them were open-ended, were administered on the respondents from the two communities. The responses were collected and analysed using paired t-testing. It was found that there is a significant difference in gender preferences among the Marwari and Bengali community in Kolkata. The Marwari respondents had a preference for sons as they thought of a son as a medium to take care of their needs, perform their final rites, education was prioritised for boys till a later age in comparison to girls. In the Bengali community, the respondents were open to proper upbringing of both the genders. For them, even girls could do what boys could.

Keywords: Bengali communities, Gender preferences, Marwari communities.

Introduction

“The state of being male or female (typically used with reference to social and cultural differences and biological ones). The preference one has, for a male or female child in the family can be termed as gender preference. The term gender preference or sexual preference is used to describe the desire of biological parents for either a male or female child and—in the extreme—use a range of odious methods (e.g., infanticide and sex-selective abortions) to achieve that result.

Sex ratio is an important social indicator measuring extent of prevailing equity between genders. This reflects underlying socioeconomic and cultural patterns and a strong preference for sons still prevails in many societies.⁽¹⁾ Sex ratio in census 2011 in India is 940 female per 1000 males showed an improvement over 2001 census.⁽²⁾

This paper deals with the changing trend of preference in our country for male and female children, and how many families have started preferring female child to their family, welcoming them considering them equal to a male child. This study also deals with studying two communities in Bengal (Kolkata) to portray the present scenario of gender preference in families now but still it can be evident that in many families now male child is preferred and considered superior to females.

In a study the researcher states that the southern Indian state of Tamil Nadu has experienced a dramatic decline in fertility, accompanied by a trend

of increased son preference. This paper reports on findings from qualitative interviews with women in rural villages about their fertility decision-making. Specifically addressed are the reasons behind increasing son preference and the consequences of this change. Findings suggest that daughter aversion, fuelled primarily by the perceived economic burden of daughters due to the proliferation of dowry, is playing a larger role in fertility decision-making than son preference. The desire for a son is often trumped by the worry over having many daughters. Women use various means of controlling the sex of their children, which in this study appear to be primarily female infanticide, it further states that it is important to distinguish between son preference and daughter aversion and to examine repercussions of low fertility within this setting.

Methodology

A questionnaire was rotated to 100 families, which consisted 20 questions. These 20 questions helps in knowing a person’s take on sex preference. These 20 questions cover different aspects like there child preference, do they think about the sex of the child, how have you brought up your child, do you treat both the kids daughter and sons equally etc. The study is descriptive in nature as a lot of previous researches have been on this topic however I have tried to study some aspects which were not covered in the previous researches. The study type was cross sectional descriptive community study. For the present study primary data was collected using the survey technique. The tool used for data collection for the current study was a self-prepared questionnaire.

A questionnaire consists of a list of questions in a definite order. These questions are administered to the respondents, then the feedback is carefully scrutinized and recorded for analysis and interpretation. The questionnaire circulated consisted of 20 questions both open and closed ended. The pattern of questions and their order was carefully designed so as to minimize flaws and get good responses. The medium of the questions was English. There were 2 groups to which the questionnaire was distributed to Marwaris and Bengalis respectively 50 of each group to get the required data. The type of sampling was non probability purposive sampling, non-probability sampling techniques is that samples are selected based on the subjective judgment of the researcher, rather than random selection. Sample size: 100. For each community. The type of sampling done by me is purposive sampling since the research has been done before and it has been done for a purpose. I have tried to basically study two communities in Bengal, namely Marwari and Bengalis. Both had quite a different approach towards upbringing of their children which was more evident after my study.

Analyzing the Characteristics of Data-

The data was analyzed was done taking out the mean, SD and carrying T test. These are explained below:

Results discussions

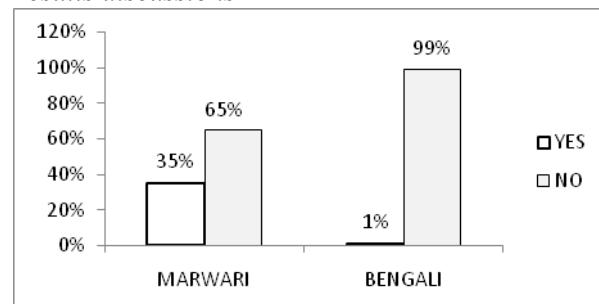


Figure 1- Viewpoint of both communities regarding gender preference during birth of their child

The Figure 1 demonstrates that about 99% of the Bengali community and about 65% of Marwari community said that they do not believe in gender preference, whereas remaining 35% of Marwaris and 1% of Bengalis said that they do have a preference towards gender of the children.

As it can be seen from the above responses that majority of the respondents among both the communities do not prefer any gender for their children it can be said that as times have changed the mindset of people regarding preference of gender have also improved, but on the other hand

less respondents said that yes the preference of child matters to them, even though the mindset of people have improved still there are a few amongst the communities who are gender biased.

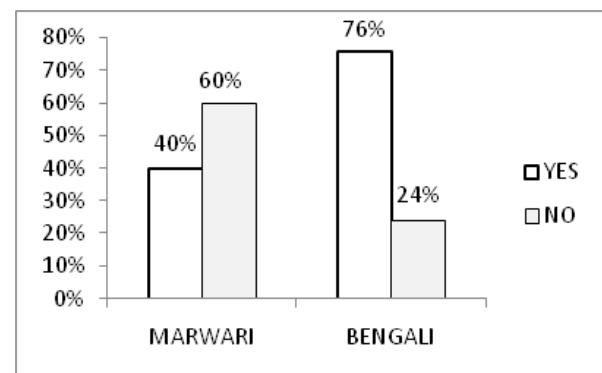


Figure 2- Preference concerning the gender of the child.

The Figure 2 demonstrates that about 76% of the Bengali community and about 60% of Marwari community said that yes gender preference still exists in the society even today, whereas remaining 40% of Marwaris and 24% of Bengalis said that there is no gender preference in the society and that times are changing.

People are becoming more broad minded, any gender the child is born in is welcomed to the family. As it can be seen from the above responses majority of the respondents from both the communities said yes to gender preference prevalent in the society and they think it to be present still whereas very few amongst both the communities believed that no nothing has changed as such people still are gender biased and prefer male child to female in the society.

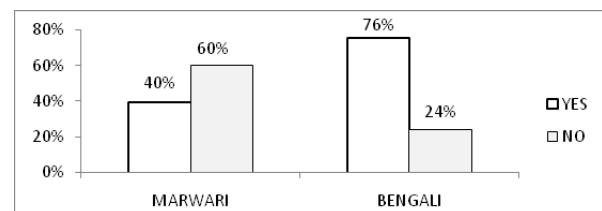


Figure 3: Viewpoint of respondents on existence of gender preference in society

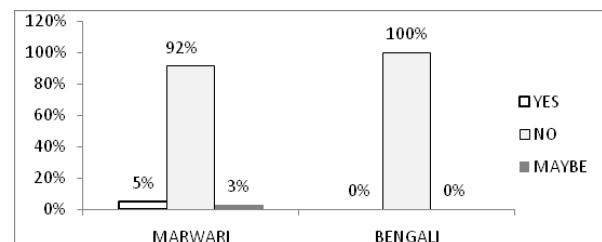


Figure 4- Pressure from laws during pregnancy on gender preference

Figure 4 demonstrates that both the Bengali and Marwari community wrote of the same opinion, about 100% that is the entire sample population of the Bengali community said that no giving birth to a 3rd child in such a populated country as ours was not the right strategy, 92% of the respondents from the Marwari community also said that no it was not a right strategy to give birth to more than 2 children in such a populated country as ours.

From the above discussion it can be said that both the communities agreed to giving birth to a 3rd child in a country like ours is not a good idea which is evident by the response given and in the Bengali community everybody agreed to this and there were no other response from their side, whereas a few from the other community did agree with 5% and 3% saying yes and maybe respectively showing that a few do not mind of having a 3rd child in the family.

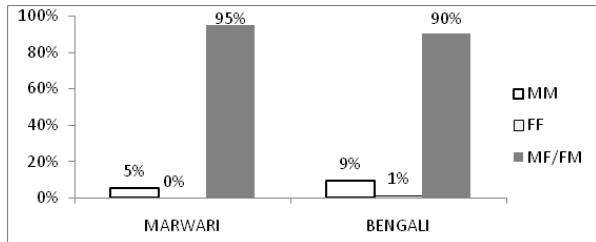


Figure 5- Idea of an ideal family

The idea of an ideal family can vary from family to family and individual to individual, gender preference exhibits a variety of patterns, most common are a preference for son and son and a preference for a balance of a son and a daughter (often expressed a desire to have at least one child of each gender.)

Figure 5 demonstrates that about 95% of the Marwari and 90% of Bengali community said that the family structure should be male and female though amongst these 90% respondents there were many who also said that whatever be the gender it is okay with them not as specific in gender, 5% and 9% agreed to male respectively and hardly to no one agreed to a structure of female structure in the Marwari and Bengali community respectively. From the above discussion it can be said that the maximum number of respondents from both the population preferred male /female family structure for an ideal family though the percentage of respondents saying this was more in the Marwari community with 95% and lesser in comparison to the former with 90%. The other 0% and 1% was for the option female/female where the least

percentage of response was seen showing that both the communities do not prefer this combination much as their idea of an ideal family structure though 1% of Bengalis agreed to it whereas no one from the Marwari community said yes to F/F option.

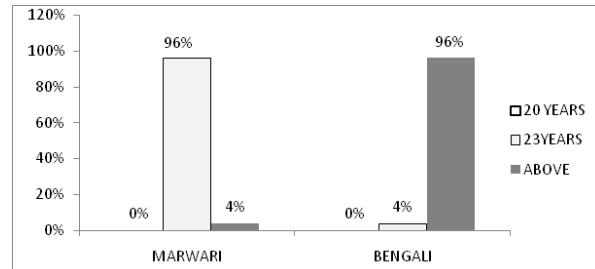


Figure 6- Educational qualification for female child

Education is a very important and essential criteria in the society today educational qualification are the degree diploma certificates professional titles and so forth that an individual achieves Figure 6 demonstrates the educational qualification that should be given to a girl child 96% of the respondents from the Marwari community said that it should be till the age of 23, other 4% denied the fact and said should be given above that age bracket and there were no respondents agreed the fact that it should be till the age of 20 which was another option. The respondents of the Bengali community on the other where 96% of the respondents said that educational qualification should be at least above 23 years not less and other 4% denied the fact that were very less in comparison again the difference could be drawn by varying attitudes of individuals regarding education criteria amongst two communities.

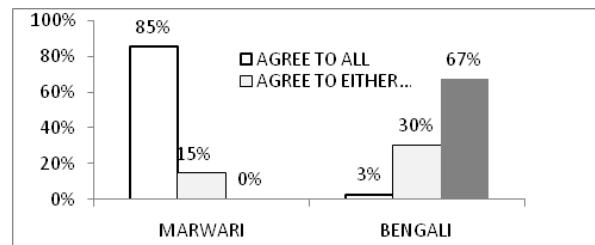


Figure 7- Reasons for son preference

In India almost all classes prefer male children to female. Family lineage and the family name are carried on by male children in the societies, leading parents concerned about their family future generations to hope for a son and possibly murder or abort girl children in order to get an heir.

Figure 7 demonstrates 85% of the respondents of the Marwari community agreed to all the reasons motioned in the survey like boy to look after the parents in old age, financial support, carrying rituals

after death etc whereas maximum percentage of respondents from Bengali community said no they did not agree to the reasons mentioned and that they did not agree to it, whereas 15% and 30% from both the communities respectively agreed either of the one reasons mentioned and remaining 0% and 3% said no from the respective communities.

From the above graph it can be said that maximum percentage of respondents of the Marwari community agreed to the reasons and the presence of son in the family is an important whereas in the Bengali community the respondents did not agree to this or less people agreed in their community with the reasons mentioned for preferring sons in our country still for them there was not much difference in males and female child.

Table 1– Mean, Standard deviation and t test of two groups of subject being studied

	x1	x2	t test	H0
MEAN	67.7	44.8	1.953	Accepted
Standard deviation	27.25	37.94		
N	20 (n1)	20(n2)		

Conclusion

In the social sphere, sons may be seen as useful for enhancing the power and prestige of the family and for carrying on the family line and the family name, and daughters may be wanted to “balance the family.” Both daughters and sons may provide companionship and psychological satisfaction for parents, but women often express a particular desire for a daughter for companionship. Although both daughters and sons may be called on for the performance of religious rituals, many religions favour sons for performing religious functions at the time of a parent’s death (e.g., burial rites or lighting of the funeral pyre).

This study dealt with preference of gender amongst two communities of Kolkata and two communities chosen were Bengali community and Marwari community. A questionnaire was distributed and the responses was calculated with the help of T test in which the mean was 67.7 and 44.8 for marwari and Bengali community respectively, and standard deviation 27.25 n was 20 since. I had 20 questions and the study is qualitative and paired hence the n was taken as 20, responses were calculated accordingly. The graphical analysis for the same was in most of the questions it was seen that the responses from the Marwari community

had more percentage of responses for answers like whether they would like their child to join their family. Business or whether they had a talk with their partner regarding the gender of their child during pregnancy daughter to be given preference over sons, pressure from in-laws the respondents response was yes in most of them whereas for other questions like government initiatives for girl child, female feticide , Cultural belief playing an important role in preference of a child for all such questions both the communities had a similar take showing that though the society has changed and the mindset of the people has improved but still in certain section within the society like the Marwari community, which is still biased towards male children.

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Microencapsulation of Lactobacillus acidophilus NCDC 291 using emulsion technique and sensory and physico-chemical analysis of the incorporated microcapsules in dairy and non-dairy food product

Divya K Mehta and Sweata Rani Rai

Abstract

Microencapsulation of probiotics have gained importance in order to improve the survival rate and viability of the microorganisms through adverse environmental and human gastro-intestinal conditions. Emulsion technique was used in the study to form microcapsules using sodium alginate and Aloe vera at different proportions and encapsulation yield was calculated. The capsules formed were then added to a dairy and non-dairy food product and sensory evaluation and physico-chemical analysis was done on the same day and third day of capsule addition. The maximum encapsulation yield was obtained using 1.5% sodium alginate and 2% Aloe vera. Sensory evaluation results showed product acceptability by the panelists and physico-chemical analysis done showed improved viability of the probiotics in gastrointestinal enzymes. Thus, it was concluded that a combination of sodium alginate and Aloe vera can be used for microencapsulating probiotics.

Keywords: Microencapsulation, Probiotics, Emulsion technique, Sodium alginate, Aloe vera

Introduction

The concept of probiotics evolved at the turn of the 20th century from a hypothesis first proposed by Nobel Prize winning Russian scientist Elie Metchnikoff, who suggested that the long, healthy life of Bulgarian peasants resulted from their consumption of fermented milk products. He believed that when consumed, the fermenting bacillus (*Lactobacillus*) positively influenced the microflora of the colon, decreasing toxic microbial activities. The historical association of probiotics with fermented dairy products, still true today, stems from these early observations.⁽²²⁾ Probiotics confer several health benefits. Probiotic supplementation of infant formulas have aimed both at the prevention of rotaviral infections and the treatment of established disease.⁽²⁶⁾ Probiotics also possess anti-carcinogenic properties.⁽³⁾ Apart from these, several other reports have also concluded their health benefits on gastrointestinal infections, antimicrobial activity, improvement in lactose metabolism, reduction in serum cholesterol, immune system stimulation, antimutagenic properties, anti-carcinogenic properties, antidiarrheal properties, improvement in inflammatory bowel disease and suppression of *Helicobacter pylori* infection by addition of selected strains to food products.^(1,5,12,19,23)

Owing to their numerous health benefits, probiotics have been added to various dairy and non-dairy products. The minimum number of probiotic cells (CFU/g) in the product at the moment of consumption that is necessary for the fruition of beneficial pharmaceutical (preventive or therapeutic) effects of probiotics has been suggested

to be represented by the minimum of bio-value (MBV) index. According to the International Dairy Federation (IDF) recommendation, this index should be ≥ 107 CFU/g up to the date of minimum durability.⁽⁴⁾

Of the various probiotics identified, the most commonly suggested organism for dietary use is *Lactobacillus acidophilus*. *Lactobacillus acidophilus* is a part of the body's natural flora and occurs naturally in the human and animal gastrointestinal tract and mouth. The beneficial effects of any Probiotic microorganism appears when they arrive in the intestinal medium, viable and in high enough number, after surviving the harsh environmental conditions. Probiotic survival in products is affected by a range of factors including pH, post acidification during products fermentation, hydrogen peroxide production and storage temperatures.⁽¹³⁾ Encapsulation technologies have been developed to protect the bacteria from damage caused by the above mentioned conditions. Microencapsulation, a form of encapsulation technique is widely used since recent times and is defined as a process in which tiny particles or droplets are surrounded by a coating or embedded in a homogeneous or heterogeneous matrix, to give small capsules with many useful properties. Most microcapsules are small spheres with diameters ranging between a few micrometers to a few millimeters. Several types of wall materials can be used for microencapsulation process. Of them, sodium alginate is widely used due to its non-toxic effect.

In the present study, emulsion technique was used for microencapsulation of *Lactobacillus acidophilus* with sodium alginate and Aloe vera as the wall material. Aloe vera was used for its gelling and prebiotic properties. The formed capsules were then added to dairy (strawberry milkshake) and a non-dairy (coconut ice-cream) food product to analyse its sensory attributes and certain physico-chemical properties in the product.

Methodology

The study was entirely conducted at the Chemistry laboratory and Food and Nutrition laboratory of the J. D. Birla Institute, Kolkata.

Procurement of raw materials- *Lactobacillus acidophilus* culture used in the study was purchased from National Collection of Dairy Cultures, ICAR-National Dairy Research Institute, Karnal, India. Sodium alginate was purchased from Laboratory Chemicals, Kolkata. Aloe vera juice and vegetable oil were bought from a nearby grocery store. Simulated Pepsin (EC 3.4.23.1) and Pancreatin (EC 232-468-9) enzymes were purchased from Scientific House and Bhupendra Shah and Company, Kolkata respectively. Other chemicals required were procured from the chemistry laboratory of the Institute.

Raw materials for preparing non-dairy (ice-cream) and dairy (milkshake) was purchased from local market of the city.

Preparation of cell suspension- Freeze-dried pure culture of *Lactobacillus acidophilus* (NCDC 291) was first sub-cultured in 10 ml of de Man, Rogosa and Sharpe (MRS) broth at 37°C for 24-48 hours in an incubator. 1 ml of the resulting culture was transferred twice in 100ml of the MRS broth till 10⁹ Colony Forming Unit (CFU)/ml was obtained, before it was used in experiment.(27) The probiotic culture obtained after subsequent subculturing were harvested by centrifugation at 3000 rpm at 4°C for 15 minutes and the pellet obtained was washed twice and re-suspended in 0.85% (w/v) saline solution. The suspension was used for encapsulation process.²⁴⁾

Preparation for Microencapsulation of probiotic culture- All the glasswares used in the procedure was sterilized before use. The materials or reagents required for the microencapsulation of probiotic includes: *Lactobacillus acidophilus* NCDC 291

culture suspension, sodium alginate, Aloe vera juice, 0.05M calcium chloride solution, vegetable oil, sterilized water, Tween 80 (emulsifier) and magnetic stirrer. The capsules were prepared using different concentrations of sodium alginate (0.5%, 1%, 1.5% and 2%) with 2% Aloevera. 2% aloe vera was used from reference to a previous study where it gave the highest encapsulation yield.(25) The desired concentrations of sodium alginate (% weight/ volume) was prepared, cotton plugged and sterilized in an autoclave at 121°C, 15 psi for 15 minutes before use. For emulsion technique, cell suspension and sodium alginate were mixed in a ratio of 1:5 and 2% Aloe vera was added to it. 20 ml of this final solution was added to 5 parts (100 ml) of vegetable oil containing 0.2% Tween 80 emulsifier. The solution was mixed well using magnetic stirrer. Once the emulsion was formed, calcium chloride solution (0.05M) was added dropwise to the turbid emulsion until the water-in-oil emulsion was broken. The calcium alginate beads formed were allowed to harden for 30 minutes and then filtered using sterilized Whatman No. 1 filter paper and washed twice with 0.85% saline solution.⁽²⁴⁾

Analysis of the encapsulation yield- Encapsulation yield was determined by releasing of the entrapped probiotic from the matrix. The releasing activity was done by dissolving the beads using phosphate buffer (0.1M, pH 7.4). One gram of capsules was transferred to 9ml buffer. The phosphate ions chelate to calcium ions thereby weakening the alginate beads for effective release of the cells. The homogenised sample was then used for performing serial dilution till 10⁻⁹ dilution and poured in petri plates with MRS agar. The sample plates were then incubated at 37 °C for 48 hours in anaerobic condition. Plating was done in triplicates. After that the encapsulation yield (EY) was calculated according to the formula:

$$EY = \left(\frac{N}{N_0} \right) \times 100$$

where N is the number of viable entrapped cells released from the beads and N_0 is the number of free cells added to the biopolymer mix during the encapsulation process.⁽²⁹⁾

The number of colonies was calculated by the formula:

Calculation:

Number of cells	=	Number of Colonies × Dilution factor
		Amount plated

The results were expressed as Colony Forming Units (CFU)/ml.

Preparation of Probiotic dairy and non-dairy food product

Strawberry milkshake was prepared by blending 60gm fresh strawberries, 200ml milk and 10gm sugar in a mixer till a smooth consistency was obtained.⁽¹¹⁾

Non-dairy coconut ice-cream was prepared by blending 50ml of coconut cream and coconut milk each, 10gm powdered sugar, 1.25ml vanilla extract and a pinch of salt. The mixture was then placed in an aluminium container in freezer. After every 30 minutes the mixture was blended to incorporate air. It was then allowed to set for 10-12 hours, blended again to remove ice crystals and kept in freezer to set.

The capsule variation that provided the highest encapsulation efficiency was incorporated into the dairy and non-diary food product. Free cells were also introduced into another set of the product and the viability of the cells were analysed at an interval of three days.

Sensory Evaluation- 9 point hedonic scale was used to assess the sensory properties of the free and microencapsulated probiotic ice cream and milkshake samples.⁽²⁸⁾ The samples were analysed by 25 panelists belonging to age groups (19-23 years old) and the attributes to be scored was colour, appearance, flavour, texture and taste. A sensory evaluation sheet was placed before them and the panel members were explained about the process of evaluation. Acceptability of the products was evaluated from the scores obtained from different attributes and the overall rating.

Analysis of physico-chemical properties

Analysis of pH and acidity- For measuring pH of the product containing the probiotic, digital pH meter was used. The acidity was estimated by titration method using 0.1N sodium hydroxide solution.⁽⁹⁾

$$\% \text{ Titratable Acidity} = \frac{\text{ml} \times \text{N} \times 90 \times 100}{\text{V} \times 1000}$$

where,

ml= the volume of 0.1 N NaOH used

N= Normality of 0.1 N NaOH

V= ml sample solution used

Titratable acidity is expressed as % lactic acid ($\text{CH}_3\text{CHOH-COOH}$, MW=90)

Analysis of bacterial viability during refrigerated storage condition-

The viability of the probiotics during refrigerated storage was analyzed on the same day and 3rd day of addition into food products. 10gm of the sample was diluted in 100ml sterile peptone water (0.1%) and 1ml of aliquot dilutions were poured onto petriplates of MRS agar in triplicates. The plates were incubated at 37°C for 24-48 hours and all the results were expressed as colony-forming units per gram of sample.⁽¹⁴⁾

Statistical Analysis- Data relating to the sensory characteristics were organized in the form of graphs and the percentage encapsulation efficiency, viability of probiotics in gastro-intestinal juices and storage conditions were expressed in form of table, and interpretation was done. The data from sensory evaluation were reported as mean \pm standard deviation (S.D.). Differences among groups were examined for statistical significance by one way analysis of variance (ANOVA) using an online Statistical calculator. The criterion for significance was $p < 0.05$.⁽¹⁰⁾

Results and Discussion

Estimation of Encapsulation Yield (%) - The highest encapsulation yield of 90.73% was obtained with a combination of 1.5% sodium alginate and 2% Aloe vera. 0.5% sodium alginate with 2% Aloe vera, 1% sodium alginate with 2% Aloe vera and 2% sodium alginate with 2% Aloe vera gave a yield of 43.33%, 60.18% and 76.67% respectively. The encapsulation efficiency increased with increase in concentration of sodium alginate till 1.5%. However, it decreased when 2% sodium alginate was mixed with 2% Aloe vera. This could be due to the high viscosity of the resulting mixture of the two wall materials. It has been seen that when the viscosity of the solution increases beyond required, a film or a gel results instead of bead formation. Sodium alginate and Aloe vera both show gelling properties due to presence of polysaccharides like mannuronate and guluronate in sodium alginate and acetylated glucomannan, galactan, galactogalacturan, glucogalactomannan, galactoglucoarabinomannan and glucuronic-acid in Aloe vera.^(7,18)

Results of Sensory Evaluation of Strawberry Milkshake and Coconut Ice-cream

Sensory evaluation was conducted two days, on the day the capsules were added to the product and after 2 days of addition. The graphical representation of sensory evaluation for all the three products

showed no significant difference in the appearance, colour and texture of strawberry milkshake on both days of evaluation, but difference was seen in taste, odour and overall acceptability of the product on 3rd day for all the three products with mean and standard deviation values. The scores for taste, odour and overall acceptability decreased as the

milkshake had turned sour and coagulation of milk proteins had also taken place. This could be due to the presence of high vitamin C content(52mg/100 gram of the fruit) in strawberry added to the shake⁽⁶⁾ as vitamin C rich foods causes reduction in the pH of milk which leads to coagulation of milk proteins.⁽⁸⁾

◆ Strawberry Milkshake

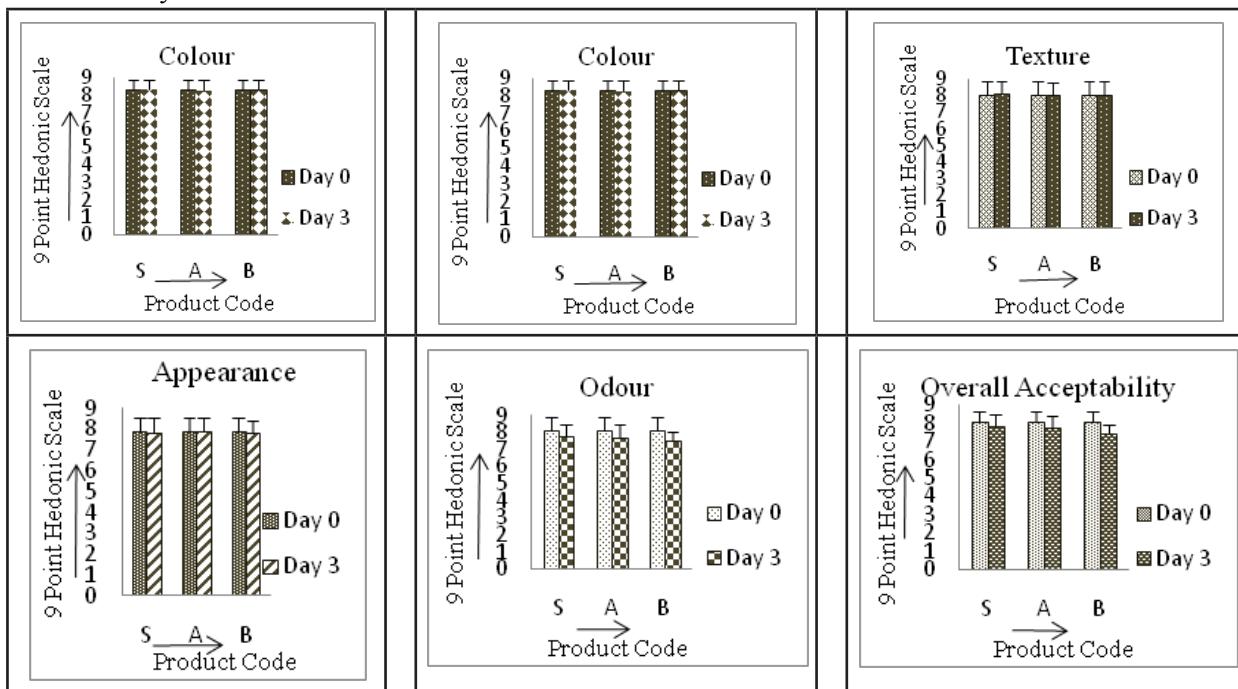


Figure 1- Comparison of Sensory evaluation of Products S, A and B (Strawberry Milkshake)

S- Standard Product/ Control, A-Product containing the microcapsules, B-Product containing free microbial cells. (*) p-score < 0.05 represents statistically significant results. The p-score of the attributes were calculated by ANOVA which revealed that there was statistically significant difference in taste and no statistically significant difference in other attributes like appearance, colour, texture, odour and overall acceptability of milkshake

Sensory evaluation for the ice-creams was conducted on the first day and 3rd day of microcapsule incorporation. There was no significant difference in the appearance, colour, taste, texture, odour and overall acceptability of the ice-cream on the first day of evaluation. However, on the 3rd day of sensory evaluation, an increase was seen in the texture value of the ice-cream containing the probiotic microcapsules (Product A). There was also a slight increase in the taste, odour and overall acceptability of Product A whereas, the scores of other attributes for Product S and B remained same as on day 0 of evaluation. These results were obtained by calculating the mean and standard deviation. The

texture of Product A was improved probably due to the presence of Aloe vera which has also been found to improve the taste and colour of products to which they are added. Aloe vera contains products of the isoprenoid pathway, including carotenoids, steroids, terpenes, and phytosterols which are regarded as sensory molecules which contribute to the color and fragrance of the products in which they exist.⁽²¹⁾ Another study conducted in 2014 where beverage was prepared using papaya and Aloe vera gel also showed an improvement in the quality and shelf-life of the food product, indicating that functional fruit beverages can be prepared successfully using Aloe vera gel.⁽²⁰⁾

◆ Coconut Ice cream

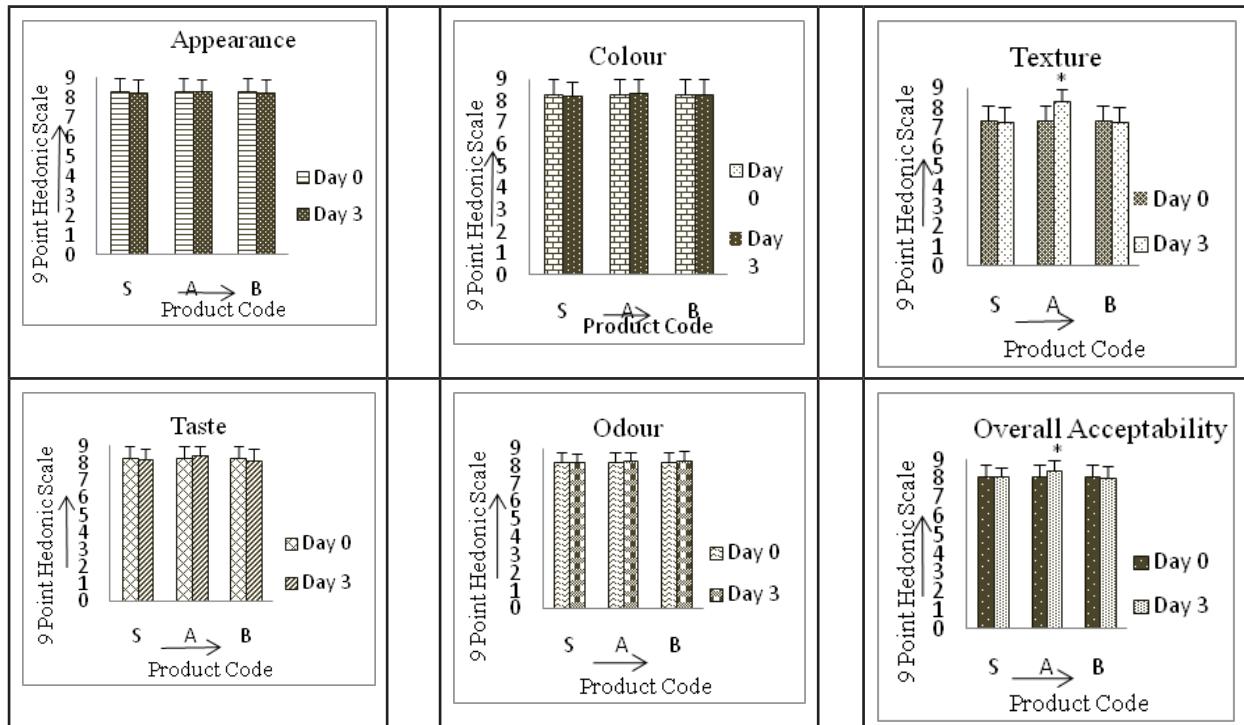


Figure 2- Comparison of the Sensory evaluation of Products S, A and B (Coconut Ice-cream).

S- Standard Product/Control, A-Product containing the microcapsules, B-Product containing free microbial cells.

(*) p-score < 0.05 represents statistically significant results. The p-score of the attributes were calculated by ANOVA which revealed that there was statistically significant difference in texture and overall acceptability and no statistically significant difference in other attributes like appearance, colour, texture and odour.

Estimation of pH and Titratable Acidity:

◆ Coconut Icecream

◆ Strawberry Milkshake

Table 1: pH and Titratable acidity value of Strawberry Milkshake

Product Code	pH		Titratable Acidity (%)	
	Day 0	Day 3	Day 0	Day 3
S	5.66	5.16	0.261	0.306
A	5.66	5.17	0.261	0.315
B	5.66	4.96	0.261	0.506

The pH of the milkshake decreased and the titratable acidity increased in all the three variations when analysed on 3rd day as compared to the first day due to the presence of high vitamin C containing strawberries which result in the decrease of the pH value, as mentioned earlier. The decrease in pH and increase in titratable acidity was considerably high in Product B which had free microorganisms added to it. This was due to the production of lactic acid by Lactobacillus acidophilus used in the study which utilises the lactose present in the milk to produce fermentable products that cause decrease in pH value.⁽²⁾

Table 2: pH value of Coconut Ice-cream

Product Code	pH	
	Day 0	Day 3
S	5.64	5.64
A	5.64	5.64
B	5.64	5.64

There was no significant change in the pH of coconut icecream. This could be due to the low temperature of storage at which the bacteria cannot act and also due to absence of lactose in coconut milk due to which the fermentation by lactic acid bacteria cannot take place. Lactobacillus acidophilus has optimum growth temperature range of 37-42°C and its growth rate decreases as the temperature decreases.⁽²⁾

The titratable acidity of the icecream cannot be calculated as coconut milk is free from lactose, due to which there is no production of lactic acid.⁽¹⁷⁾ Titratable acidity is employed to ascertain if milk is of high acidity so as to reduce its keeping quality.

Survival of free and microencapsulated probiotic bacteria during refrigerated storage conditions:

◆ Strawberry Milkshake

Table 3: Viability of bacteria during refrigerated storage in Milkshake

Product Code	Time (Day)	Plate Count (log 10 CFU/g)	
		Before storage	Refrigerated storage
A	0	8.94×10^{11}	8.58×10^{11}
B		9.60×10^{11}	8.88×10^{11}
A	3	8.40×10^{11}	8.32×10^{11}
B		8.84×10^{11}	8.76×10^{11}

◆ Coconut Ice-cream

Table 4: Viability of bacteria during refrigerated storage in Ice-cream

Product Code	Time (Day)	Plate Count (log 10 CFU/g)	
		Before storage	Freezer storage
A	0	8.94×10^{11}	8.20×10^{11}
B		9.60×10^{11}	7.84×10^{11}
A	3	7.32×10^{11}	7.20×10^{11}
B		6.96×10^{11}	6.80×10^{11}

Probiotic milkshake and ice-cream were analysed for obtaining the viability of probiotic cells during refrigerated storage conditions.

The viability of the bacterial cells decreased during refrigerated or freezer storage conditions. Freezing and refrigeration affect the probiotics survival, as the integrity of the cell membrane is damaged during the freezing process so that metabolic life can be stopped. Studies have shown that the survival of these microorganisms is enhanced over an extended period of shelf-life. The effect of refrigerated storage temperature (at 2, 5, and 8°C) on the viability of probiotics (*Lactobacillus acidophilus*, *Bifidobacterium animalis* subsp. *lactis* BB-12) in yogurt had been studied. Within the study, after 20 days storage at 2°C resulted in the highest viability of *L. acidophilus*, whereas for *B. lactis*, the highest viability was obtained when yogurt was stored at 8 °C. Although tolerance to frozen stress is strain-dependent, most lactobacilli survive well in frozen storage.⁽¹⁶⁾

A higher decrease in the number of free and microencapsulated cells was seen in coconut ice-cream than in strawberry milkshake. This could be due to a higher affinity of probiotics for dairy products.

A study was conducted in 2015 to investigate the contribution of milk in improving health benefits with combination of probiotic *Lactobacillus casei* BL23. The results showed that *Lactobacillus casei* 25 BL23 protected against the development of colitis when ingested in milk but not in a nutrient-free buffer simulating consumption as a nutritional supplement. Consuming (acidified) milk alone also provided some protection against weight loss and intestinal inflammation but was not as effective as *L. casei* and milk in combination. These findings strongly indicate that probiotic strain efficacy can be influenced by the food or supplement delivery matrix.⁽¹⁵⁾

Conclusion

The technology of micro-encapsulation has developed from a simple immobilisation or entrapment to sophisticated and precise microcapsule formation. The advances in this field have been tremendous with nutraceuticals and food ingredients; however, as to the micro-encapsulation of live probiotic bacterial cells, the technology is developing. Many wall materials are being used for the encapsulation process including polysaccharides, lipids and proteins. Sodium alginate has been used in various studies in combination with other ingredients like whey proteins or prebiotics like inulin and fructo-oligosaccharide. Use of Aloe vera as a prebiotic for encapsulation has recently been proposed. Not many studies have been done in the food industry using Aloe vera as the wall material. Also, emulsion technique can be used in small laboratories unlike other processes like freeze-drying and fluidised bed coating which can be done only at industrial level. Dairy and non-dairy food products can be effectively used for the delivery of probiotics when processed taking appropriate measures.

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Development and analysis of multi-nut spread for children aged between 7-9 years.

Aniqah Maruf and Damandeep Kaur

ABSTRACT

Nuts are a good source of energy, protein, omega fatty acids, calcium and phosphorus. These nutrients are crucial for growing children and aids normal growth and development. A survey was conducted for 80 children aged 7-9 years using a close-ended KAP questionnaire and 3-day diet recall. It revealed that the subjects were not consuming enough protein, calcium and energy and 62% of the subjects were underweight. Children preferred ready to eat sweet products like jams and chocolate spreads rather than home cooked meals. A market survey was carried out for ready to eat sweet spreads which revealed that the available products were high in sugars and fats; therefore a multi-nut spread was developed for the subjects. On the basis of 9-point Hedonic Scale Product C containing 15g flaxseeds and 30g sesame seeds was selected as the most acceptable product (7.6). Incorporation of flaxseeds balanced the ratio of omega 6 and omega 3 fatty acids in the Product C to 4.25:1 which is close to correct ratio of 2-4:1. Incorporation of sesame seeds increased the calcium content of the Product C (78.89 589.4 mg/100g of product) as compared to Product S(78.89 589.4 mg/100g of product). The product did not show any changes in the sensory attributes on storage for 3 months in the refrigerator and in room temperature. Flavoured variations of the approved product were developed. It was seen that the cost of the approved product (INR50/100g) was less than that of the standard recipe (INR78/100g).

Key Words: Calcium, Flaxseeds, Multi nut spread, Omega 6 and omega 3 fatty acid ratio, Sesame seeds.

Introduction

Children are generally restless and do not like spending time on eating. Menus should provide dishes that are quick to eat and satisfying. Nutritional supplements like health drinks aid in this case. Moreover children have varying appetites and they prefer light snacks rather than a heavy meal.⁽²⁰⁾ Most of the children have a liking for sweeter food items, therefore sweet spreads like jams, marmalades and cocoa spreads which are unhealthy because of their high content of carbohydrates (mainly sugars) and fats and low content of proteins and micronutrients. Products like peanut butter are available in the market, which come under the category of sweet spreads, but people are not aware of the health benefits it has compared to other sweet spreads.⁽¹⁵⁾ Peanut spread contains more proteins and healthy unsaturated fatty acids compared to the other ready to eat sweet snacks.⁽⁵⁾ School children excessively consume food rich in fat and sugar, consume less of fruits and vegetables and skip breakfast often. Stress appears to be consistently harmful to children in terms of steering their food choices away from the healthy towards the unhealthy. With the right guidance and nutrition education children can learn to prefer healthy foods. Psychological factors which contribute to depression or poor motivation to eat should be identified. The child's likes and dislikes needs to be considered while feeding otherwise the child might abstain from eating at all.⁽²¹⁾

Nuts and seeds are the storehouse of health benefiting poly-phenolic flavonoid antioxidants such as carotenes, resveratrol, lutein, cryptoxanthin, etc. These compounds have been found to offer protection against cancers, heart disease, degenerative nerve disease, Attention Deficit Hyperactivity Disorder (ADHD), and viral/fungal infections.^(4,17) Like pulses, oil seeds nuts are rich in protein and in addition they contain a high level of fat. Hence they are not only good sources of protein but are a concentrated source of energy. They do not contain an appreciable amount of carbohydrate but contains a high level of B-vitamins. They are a rich source of all the important omega-3 essential fatty acids like linoleic acid, α-linolenic acid (ALA), eicosapentaenoic acid and docosahexaenoic acid.⁽¹⁰⁾

Methodology

The nutritional status, eating habits and preferences of children aged 7-9 years were assessed through a close ended KAP questionnaire and a 3 day diet recall. A market survey of the preferred food items of the sample population was conducted, in order to analyze the type of products available and their nutrient content, so as to develop a product customized to the preferences and requirements of the subjects. The product was then developed after which the acceptability was checked through sensory evaluation using the 9-point hedonic scale and Just About Right scale (JAR).⁽¹²⁾ The shelf-life and nutrient content of the products were analyzed.

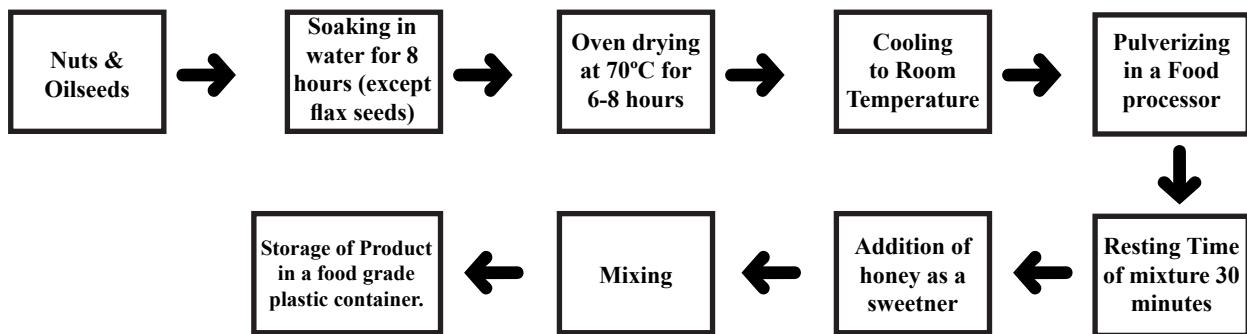


Figure 1- Flow chart of the procedure followed to prepare the multi-nut spread

Table 1- Proportion of ingredients used to develop the multi-nut spread⁽²⁴⁾

Product Code	Ingredients					
Product S	Peanuts (50g)	Sunflower seeds (30g)	Walnuts (20g)	Flaxseeds (0g)	Oil (5ml)	Honey (10g)
Product A	Peanuts (50g)	Sesame seeds (30g)	Walnuts (15g)	Flaxseeds (5g)	Oil (5ml)	Honey (10g)
Product B	Peanuts (50g)	Sesame seeds (30g)	Walnuts (10g)	Flaxseeds (10g)	Oil (5ml)	Honey (10g)
Product C	Peanuts (50g)	Sesame seeds (30g)	Walnuts (5g)	Flaxseeds (15g)	Oil (5ml)	Honey (10g)
Product D	Peanuts (50g)	Sesame seeds (30g)	Walnuts (0g)	Flaxseeds (20g)	Oil (5ml)	Honey (10g)

The table above represents the ratio of different nuts and oilseeds used to develop the multi-nut spread for the standard recipe and the variations. Sensory evaluation of the developed products and the basic product was done using the 9-point hedonic scale. The attributes on which the products were scored are appearance, colour, taste, texture, odour and overall acceptability. The most accepted variation and the basic product were statistically analysed using students t-score. When the approved variation was found out, it was compared to two popular commercially available nut spreads from the market in terms of sensory attributes like Spreadability, overall flavour and aroma and texture using the JAR [Just about right] scale.⁽¹²⁾ After the sensory evaluation was done, the most acceptable product was selected, and flavour variations were made with it. The two flavours prepared were, Chocolate Delight and Caramel Crunch.

Chemical analysis was done on the basic product and the most approved variation. The protein content was measured using the Kjeldahl method.⁽¹⁸⁾ The fat and the carbohydrate content of the two products were measured using the Rose-Gottlieb method for the former and the Anthrone method for the latter.^(13,14)

The micronutrients for the products were also tested. Each of the two products was converted to ash in a muffle furnace for micronutrient estimation. The calcium content was measured by the End OCPC method while the phosphorous content was measured using the molybdate U.V. method.⁽¹⁹⁾ Tannins were estimated by Folin-Denis method.⁽²⁰⁾

The shelf life of the two products was tested by placing the products in Food grade plastic containers and placing each of the two at room temperature and at a refrigeration temperature. The cost calculations were done for each variation of the multi-nut spread.

Results and Discussion

Results of the 3-day dietary recall

It was observed that majority of the subjects did not consume enough food, throughout the day, which lead to a few of them being underweight according to the growth chart. The subjects met their carbohydrate requirement (but mostly through sweets and candies, and not through whole grains). The subjects basically lacked proteins, energy and calcium in their diet.

Table 2- Comparison of nutrient intake of subjects with the RDA.

Serial Number	Nutrient	RDA	Average Consumption	Difference between RDA and Average consumption	Percentage Difference
1	Proteins	29.5g	21.34g	8.16g	27.6%
2	Energy	1610 kcal	1401.89 kcal	208.11 kcal	12.92%
3	Calcium	600mg	392mg	118mg	19.67%
4	Iron	16mg	15.63mg	0.37mg	2.3%

70% of the subjects did not meet their requirement for proteins. The average protein consumption of the subjects was 21.34g which was 27.6% less than the requirement given by RDA (Recommended Dietary Allowance) which is 29.5g of proteins per day. The RDA for energy is 1690 kcal/day, the average consumption of the subjects was 1422.89 kcal/day, which meant on an average they could not meet the requirements by 12.92%. Around 45% of the subjects did not meet there energy requirements according to RDA where is 55% of them met the energy requirements. From the 3 day diet recall it was seen that mostly the children consumed carbohydrate rich foods therefore the energy requirement met however it was less by 12.92%. Some children surpassed the energy requirement since they consumed ready to eat foods which were high in sugar, fats and refined carbohydrates. Children of 7-9 years require 600mg of Calcium per day, the average intake of the subjects was 392mg, and the subjects did not meet their calcium requirements by 19.67% as compared to RDA. As seen from the dietary record of the subject the subjects were not consuming milk regularly also calcium rich food was not consumed on a regular basis therefore their diet was poor in calcium. Calcium is very important for the age group of 7-9 years old since during this time the skeletal growth and tooth formation take place.⁽⁶⁾

Results of Survey

65% of the sample population were non vegetarians but the subjects did not consume non vegetarian foods on a regular basis this could be the reason that they did not meet the nutritional requirement as per the RDA. 85% of parents preferred ready-to-eat snacks and so did 92% of the children. Since a majority of the parents did not provide the children with healthy home-cooked snacks, the children developed a habit of consuming and developed a liking towards ready-to-eat foods. 40% parents continued providing their children with ready to eat foods despite having knowledge about their high sodium, sugar, salt and fat content, whereas a 60% were not aware of the harmful effects of the food additives used in ready to eat foods.



Figure 2-Weight for age percentiles of the subjects.
The subjects did not show any clinical signs and symptoms of severe micronutrient deficiencies. But as seen from the above figure 2. 10% of them were severely undernourished since their weight for age was below the 3rd percentile, 17% of them were between the 3rd and 10th percentile, which meant they suffered from moderate undernourishment, 35% of them were in the category of underweight, whereas 25% of the subjects were in the category of Normal (25th-50th percentile) with persistent thinness, but it was seen that none of the subjects were under the 50th-75th percentile (Normal with slight higher weight) 10% of them were found to be overweight (75th-90th percentile) whereas only 2% of the subjects were obese.

Picky eating is a common disorder during childhood often causing considerable parental anxiety. Picky eating is a common disorder during childhood often causing considerable parental anxiety. 65% of the subjects were picky eaters. The eating habits of the subjects can be correlated to their nutritional status. 62% of the subjects were undernourished whereas only 25% of the subjects were falling under the category of normal. The reason for this could be that these subjects refused to consume proper nutritious meals and were very choosy. Since the subjects were picky eaters, they refused to consume most of the things that were served to them, which lead to lower nutrient intake, which in turn lead to undernourishment. (23)80% of the subjects did not finish their meals often. The probable reason could be that they were picky eaters, they were served too much food or that they had low appetites.

Studies have shown that mostly children like sweet taste, because their taste buds are very active at this stage, so other tastes might seem too strong to them. They show more acceptances towards sweet products rather than savoury items.⁽¹⁶⁾

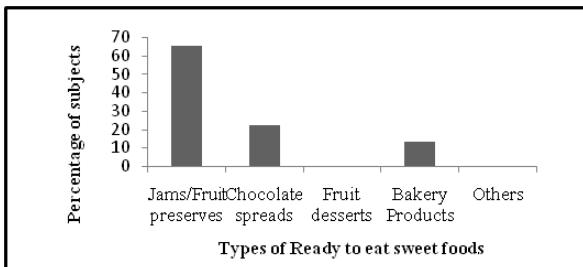


Figure 3-Preferred sweet ready-to-eat products of the subjects

The subjects preferred bread and jam the most (55%) as seen in figure 3. Roti and Vegetable Curry became too heavy for them to consume during lunch break and other products like extruded and baked products were too dry to consume. Most of the parents agreed to this and it was also stated by the parents that bread and jam, was the most convenient, safe and inexpensive product out of all the other options for packed lunches.

The results of the survey using the KAP Questionnaire indicated that the preferred food item of the subjects was Ready To Eat sweet spreads. Therefore a market survey was carried out in order to find out the types of products available, their nutritional content and to note down the popular flavours and variations available, so as to incorporate new flavours in the developed product in future. It was observed that cocoa spreads and fruits preserves were high in calories and contained a high amount of saturated fatty acids and sugars. Peanut spread is also one of the items that fell under the category of ready to eat sweet spreads. The protein and unsaturated fat content of peanut spreads was high making it one of the healthiest sweet spreads available in the market. Chocolate peanut spread was gaining popularity in the market. It was decided that after the variations would be evaluated, chocolate and caramel flavours would be incorporated to the multi-nut spread, since chocolate was a popular flavour and caramel was not available.

Results of Sensory Evaluation

Comparison of Sensory Evaluation of the variations with the standard recipe (Product S)

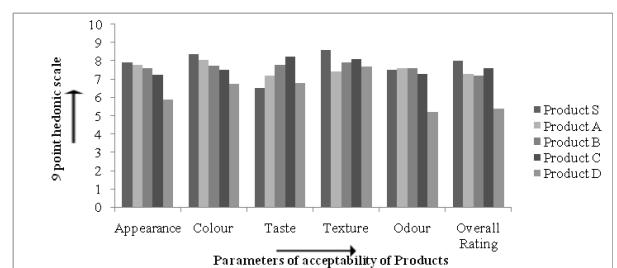


Figure 4- Comparison of the sensory attributes of the variations with the standard recipe

- ◆ Appearance- After the incorporation of flax seeds the appearance of the spread had reduced considerably. The incorporation of sesame seeds did not affect the appearance much since the colour of sesame seeds is off-white, whereas flax seeds are brown.
- ◆ Colour- Since flax seeds are brown in colour, incorporation led to darkening of the hue of the spread, therefore the score of the variations reduced as compared to the standard product. Product D received the lowest score in colour (6.75). Secoisolariciresinol diglucoside is the compound responsible for parting the brown colour to the Product C, due to its high concentration in flax seeds.(26)The scores of the productsshow that the panel members preferred lighter colour.
- ◆ Taste- The standard recipe which is Product S, contained sunflower seeds which imparted a metallic aftertaste, therefore the taste was not appreciated by the panel members. The variations contained flax seeds, which also leaves a pungent after taste but it was counteracted by the taste of the sesame seeds. The taste of the variations was received better by the panel members as compared to the standard product and the Product C scored the highest (8.25) when it comes to taste.
- ◆ Texture- There was a lot of difference observed in the texture. Due to the hydro colloidal properties of the flax seeds, the spread became stickier in nature.(26) Product C received the highest score in texture (8.1) among all the variations. Product D was reported to be too sticky, whereas Product A and B, did not have the desirable sticky consistency.
- ◆ Odour- there was a slight nutty aroma in the products, due to roasting of the nuts. It was a desirable characteristic. Product A (7.6) and Product B (7.6) scored better than the Product S (7.5), since sesame seeds were added to the

- variations and it gave a better aroma to the product.
- ◆ Overall Rating- The overall rating of the variations reduced as compared to the standard product. It was mainly due to the color and odor changes which had occurred after the addition of flax seeds.

Table 3- Average score and standard deviation of all the products

Product Code	Appearance	Colour	Taste	Texture	Odour	Overall Rating
Product S	7.9 ±0.44	8.35±0.45	6.5±0.51	8.6±0.48	7.5±0.51	8.0±0.92
Product A	7.8±0.41	8.05±0.22	7.2±0.41	7.4±0.51	7.6±0.81	7.3±0.49
Product B	7.6±0.50	7.75±0.44	7.8±0.42	7.9±0.83	7.6±0.51	7.2±0.43
Product C	7.25±0.44	7.5±0.51	8.25±0.55	8.1±0.87	7.3±0.67	7.6±0.48
Product D	5.9±0.45	6.75±0.44	6.8±0.69	7.7±0.62	5.2±0.90	5.4±0.90

The 9 point hedonic score for ‘appearance attribute’ of product S and C are 7.9 and 7.25 respectively as seen in the above figure 5. Since ground flaxseeds have a dark brown colour, the product C showed dark coloured minute specks, due to which the score reduced slightly as compared to the Standard recipe.

From the above figure it is evident that product S and C scored 8.35 and 7.5 respectively on the 9 point hedonic scale for the ‘colour attribute’. Secoisolariciresinol diglucoside is the compound responsible for imparting the brown colour to the Product C, due to its high concentration in flax seeds. A lighter colour was preferred by the panel members which is evident from the score achieved.⁽¹⁵⁾

Comparison of Product S and C

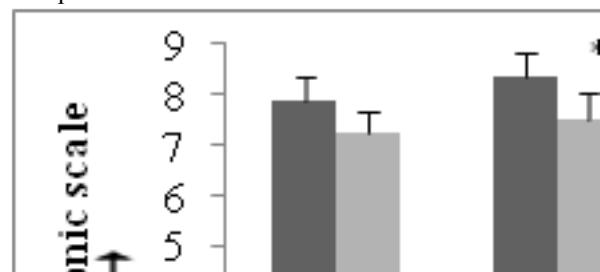


Figure 5- Comparison of Sensory evaluation of the Product S and Product C. (*)P-score <0.05 represents statistically significant results. The p-score of the attributes were calculated by student's t-score which revealed that incorporation of flaxseeds and sesame seeds caused statistically significant differences in attributes like appearance, colour and taste, and not statistically significant differences in attributes like texture, odour and overall rating.

The 9 point hedonic score for the ‘taste attribute’ of product S and C are 6.5 and 8.25 respectively as seen in the above figure. It is interesting to know

Product C received the most appreciation as compared to the other variations. It had high scoring of taste, texture as well as odour. Peanuts and sesame seeds synergistically masked the pungent odour of flaxseeds very well.

that sesame seeds improved the taste of the multi-nut spread. The sweet taste of the multi nut spread was sweet mainly due to honey which has a high calorific value. The specific “nutty aroma” and unique taste was because of the peanuts and sesame seeds.

Product S and C scored 8.6 and 8.1 respectively for ‘texture attribute’ as is evident from the above figure. Nuts were ground to a fine paste in both the recipes. The mouth feel was similar to the basic product as the panel members could not feel much difference in the particular variation (Product C).

Product S and C has 7.5 and 7.3 sensory rating respectively on the score for ‘odour attribute’. The addition of sesame seeds gave an enhanced aroma to the product making it acceptable by the panel members. The main aroma components in sesame seeds are due to sesamin and sesamolin.⁽¹¹⁾

The score for the ‘overall attribute’ of product S and C are 8.0 and 7.6 respectively as seen in the above figure. Peanuts and sesame seeds synergistically masked the pungent odour of flaxseeds very well in the approved product.

The total acceptability of a food product is not only dependant on the sensory evaluation solely. The chemical analysis and the shelf-life study of the product also affect the acceptability of the product. The most appreciated variation, Product C was compared to two commercial products. These products are nut spreads from popular brands available in Kolkata. The products are tested on the attributes like spreadability, Overall flavour and aroma and texture. The test was done using the JAR [Just about right] scale.(44)Products see when

compared to Commercial product 1 and commercial product 2 received acceptable scores in the attributes of spreadability over all flavour and Aroma and texture. It received a score of 5.65 in spreadability, which shows that products is “very slightly more spreadable”, it received an overall score of 6.3 in overall flavour and Aroma, it received a highest score in this category due to addition of sesame seeds in sesame seeds have strong nutty flavour and Aroma. It received a score of 4.15 for texture which shows that the product was “very slightly smoother.” As Product C was the most acceptable, two flavours of the approved variations were made. The attributes of the developed flavours were tested by using the 9-point hedonic scale. The Flavour Chocolate Delight was Product C1 and the flavour Caramel Crunch was Product C2. Product C1 (Chocolate Delight) was preferred in terms of all attributes except odour as compared to the Product C and Product C2 (Caramel Crunch). The odour of Product C2 was the highest (8.85). Both the developed flavours were appreciated more than the plain Product C, but chocolate was found to be more popular since it one of the most appreciated flavours in sweet products universally.

Results of Chemical Analysis

The total moisture content of product S and product C are 0.12% and 0.09% respectively per 100 grams of multi-nut spread.(25)The values of the moisture content are extremely low since no water added to the product and the ingredients which had been soaked earlier were oven-dried. Honey which is used as a sweetener had some moisture. Incorporation of both Flax seed and Sesame seeds increased the ash content in product.. The standard recipe contains 16% of ash where as the variation Product C contains 19% of ash.⁽²⁶⁾

Product S contained 14.45g of proteins per 100 g and Product C contained 14.25g of proteins per 100 g. Incorporation of flax seeds and sesame seeds were not done to increase the protein content of the product, so both the product showed almost equal concentration of proteins.

The carbohydrates content of product S is 14.6g per 100g of the product whereas product C contains 12.3g of carbohydrates per 100g of the product. The fat content of the Product S was 48g per 100g and of Product C was 42g per 100g of the product. The fat content reduced by 6g due to the incorporation of flax seeds with the husk. Product S provides 548.2

kcal per 100g of the product, whereas Product C provides 484.2 kcal per 100g of the product. The husk of the flax seeds contributed to the high fibre content, reducing the fat, carbohydrate and energy content.

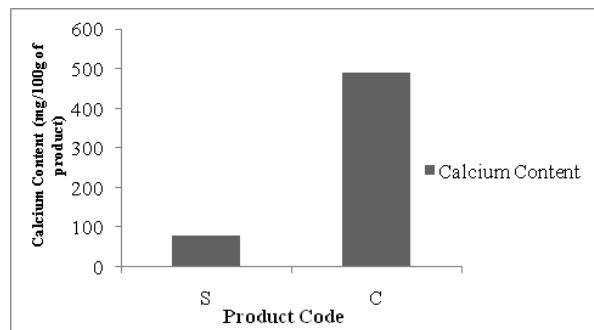


Figure 6- Comparison of the calcium content of the approved variation with the standard recipe

Incorporation of sesame seeds in the variations increase the calcium content drastically when compared to the standard recipe. The calcium content of product S is 78.89 mg/100g of the product, whereas Product C contains 589.4 mg of calcium /100g of the product.⁽¹¹⁾

The phosphorous content of the standard recipe product S is 180mg/100g of the product and the acceptable variation product C is 170mg/100g of the product.

It can be seen from the above graph that the tannin content of Product S is 4.6mg per 100g of the product whereas the approved product C contains a higher amount of Tannins which is 7.8 mg per 100g of the product. The basic recipe does not contain flax seeds, therefore the concentration is lower.

Nuts are a rich in Omega-3 and Omega-6 fatty acids. The balance between these two fatty acids is very crucial in normal growth and development for children. The ratio between omega-6 and omega-3 should be 2:1 to 4:1, a ratio different than this causes imbalance in the metabolism and affects the normal functioning of the fatty acids. The omega 3 fatty acid content of Product S is 1.81g/100g of product and of Product C is 4.12g/100g of product. The omega 6 fatty acid content of Product S is 21.95g/100g of product and of Product C is 17.33g/100g of product. Therefore the ratio of omega 6 and omega 3 fatty acids in Product S is 21:1 and 4.25:1 in Product C. The ratio of omega 6 and omega 3 fatty acids in Product C is closer to the correct ratio which is 2-4:1.^(7, 11)

The shelf life of the two products was tested by placing the products in Food grade plastic containers and placing each of the two at room temperature and at a refrigeration temperature. It was found that the product did not show any prominent microbial or fungal growth throughout the period of storage of 3 months in the refrigerator as well as in room temperature. Since the both the products contained less than 0.2% of moisture, it was concluded that the shelf-life of the product was high due to the low moisture content.⁽²⁵⁾

Cost of the products were calculated and it was observed that Product S (INR 78) was the most expensive product, mainly due to the cost of the sunflower seeds, whereas Chocolate Delight (INR 53) and Caramel Crunch (INR 52) showed increased prices as compared to Product C (INR 50) mainly due to extra charges for incorporation of flavours like chocolate and caramel, since extra ingredients were required.

Conclusion

Nuts and oilseeds are a power house of essential nutrients which can aid in providing the quintessential nutrients to children which aids in their normal growth and development. They also provide a wide range of health benefits for growing children, which includes lowered serum lipid levels, prevention of diseases like coronary heart disease and attention deficit hyperactivity disorder (ADHD), juvenile diabetes and maintenance of lean body. It also provides micronutrients essential for growth.⁽¹⁰⁾

The results of sensory evaluation using 9 point Hedonic Scale, indicated that the Product C containing 15g of flaxseed powder and 30g sesame seeds was most acceptable as it was scored highest on most parameters including taste (8.8), texture (8.3), and overall score (8.6). The Products B and C were not approved since they had a very strong flavour of sesame seeds, which was toned down by a higher amount of ground flaxseeds in Product C. The product D received a low overall score (5.4) since it had a much higher amount of ground flaxseed, which not only deteriorated the flavour of sesame seeds, but masked the flavour of all the nuts, giving the product a pungent and astringent after-taste. The P score of the sensory attributes were calculated using Student's t-test, which showed that incorporation of flax seeds and sesame seeds led to statistical significant differences in sensory attributes like appearance, colour and texture. Dark colour of the flaxseeds made the approved

variation, Product C was darker, and therefore it received lower score in the colour aspect (7.9). The acceptable variation, Product C had better taste. Incorporation of flax seeds and sesame seeds not cause statistical significant differences in sensory attributes like overall rating and odour.

The multi-nut spread developed was rich in proteins, omega fats, calcium and phosphorus. The ratio of omega 6 and omega 3 fatty acids was very close to the appropriate ratio.⁽⁸⁾ The developed product could be healthier alternative as compared to the ready to eat sweet spreads like jams, marmalades and chocolate spreads which are rich in sugar and fat.

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A Study to Check the Acceptance of Sprouted and Un-sprouted Amaranth seeds Incorporated Rusk among Post Menopausal Women

Zaira Azhar and Adrija Sarkar

Abstract

The aim of the present study is to check the acceptance of sprouted and un-sprouted amaranth seeds incorporated rusk among the post menopausal women. Post menopause is accompanied by numerous hormonal, physiological and metabolic disturbances in women, altering her nutritional requirement. A survey was done to know the health problems and their causes, nutritional status, food habits and preferences of post menopausal women, based on which a product was developed to cater to their health needs. Amaranth seeds, being a rich source of nutrients and phyto-chemicals were incorporated in Rusk; dry biscuit or double toasted bread which is a preferred tea time snack by middle aged Indian women. Eventually sprouting would enhance the nutritional potency of the product by reducing the anti-nutrient content. Different proportions of both sprouted and un-sprouted amaranth seeds were added by substituting refined flour, the core ingredient of the rusk and sensory evaluation was done to determine its acceptability. On the basis of this evaluation, rusk with 40% un-sprouted amaranth seeds (Product E) and 30% sprouted amaranth seeds (Product D1) were found to be the acceptable variations which can be consumed by these women in order to cater to their health needs.

Key Words: Amaranth Seeds, Menopause, Rusk

Introduction

The focus of women's health researchers and health policy planners has shifted towards postmenopausal women since recent trends suggest an increase in their number and life expectancy. A total of 130 million Indian women are expected to live beyond menopause by 2015. Indian women are likely to spend almost 23.5 years in menopause (Indian Menopause Society, 2007).⁽⁹⁾ Under current demographic trends, postmenopausal health has emerged as an important public health concern in India owing to improved economic conditions, rapid lifestyle changes, and increased longevity.

Menopause is one of the most significant events in a woman's life and brings in a number of physiological changes that affect the life of a woman permanently. It is defined by the World Health Organization as the permanent cessation of menstruation due to loss of ovarian follicular activity. This definition involves both, a symptom that can be identified by a woman which is the end of menstruation and a sign that can be measured which is the loss of follicular activities resulting in changes in levels of hormones.⁽⁹⁾ As a consequence of hormonal changes that occur during menopausal transition, women have more complex and stressful aging process than men. The principal health concerns of menopausal women include vasomotor symptoms, urogenital atrophy, osteoporosis, obesity, hyperlipidemia cardiovascular disease, diabetes and cancer.⁽²⁾

Amaranth seed is a reasonably well-balanced food

with functional properties that have been shown to provide medicinal benefits. Amaranth seeds are a rich source of fibre, minerals like calcium, phosphorous, magnesium, iron as well as contain vitamins like riboflavin niacin and ascorbic acid. Some of the health benefits of amaranth seed includes, decreasing plasma cholesterol levels, stimulating the immune system, exerting an antitumor activity, reducing blood glucose levels and improving conditions of hypertension and anemia. In addition, it has been reported to possess antioxidant activities.⁽⁷⁾ The attributes of amaranth seeds discussed above makes it a potential choice for management of postmenopausal syndrome by incorporating them various types of food products like biscuits, cakes, bread etc.

Methodology

Study Design

In order to make the study systematic, and to successfully fulfill the objectives of the study, the methodology has been discussed under the following heads:

- ◆ Survey: Before developing a product for post menopausal women a survey was conducted on them. A structured KAP questionnaire was formulated which gathered information on the nutritional status, health condition, food habits and life style of post menopausal women. The questionnaire consisted of 31 close ended questions. The sample population of the survey consisted of 50 post menopausal women belonging to the city of Kolkata

- ◆ Selection of the place: The preparation and evaluation of the product was conducted in the food and nutrition laboratory of J.D. Birla Institute.
- ◆ Selection of the sample: The evaluation of the product with variations was done by 20 panel members. All the recipes were evaluated by the same panel members.
- ◆ Procurement of raw materials: Some ingredients used in the development of the product were bought from the local market and some were ordered online.
- ◆ Product Development: Standard recipe of the rusk was developed and different variations of the standard recipe were developed, where the core ingredient refined wheat flour was substituted with un-sprouted and sprouted amaranth seeds.
- ◆ Statistical Analysis: The attributes of the standard recipe and the approved variations were analyzed using the graph pad student t testing calculator.

Table 1- Ingredients and amount used in standard recipe (Product A)

Ingredient	Amount
Refined Wheat flour	100g
Yeast	5g
Sugar	20g
Salt	2.5g
Vegetable oil	15ml
Cardamom	5g
Water	93ml

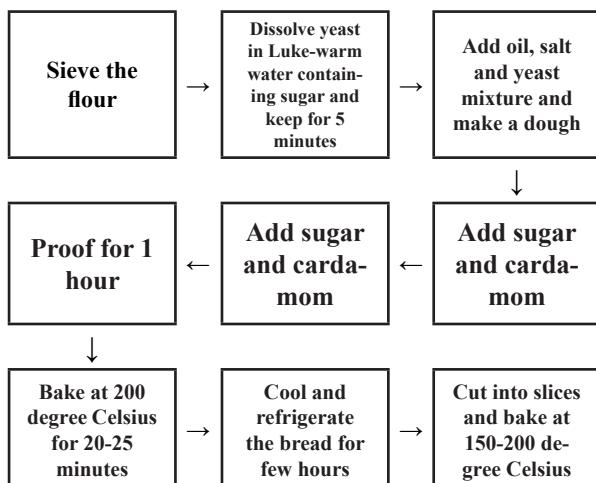


Figure 1- Process flow diagram of standard recipe

The amaranth seeds were sprouted by soaking the seeds in water for 1-1 ½ hours. Once it becomes a bit tender the seeds are wrapped in muslin cloth and kept at room temperatures, exposed to sunlight. The

seeds are rinsed with water at an interval of 12 hours. The seeds sprout within 3-4 days. The sprouted seeds and the un-sprouted seeds were finely grounded and used to substitute the refined wheat flour.

Table 2- Shows Different variations containing sprouted and un-sprouted seeds

Product Code	Percentage of substitution of refined wheat flour with un-sprouted amaranth seeds	Product Code	Percentage of substitution of refined wheat flour with sprouted amaranth seeds
Product B	10%	Product B1	10%
Product C	20%	Product C1	20%
Product D	30%	Product D1	30%
Product E	40%	Product E1	40%
Product F	50%		

Sensory Evaluation

Attributes like color, appearance, odor, texture, taste and the overall rating of each variation was evaluated. On the basis of the sensory scores the variations approved. This was done using a 9 point hedonic scale during the sensory evaluation.

Results and Discussion

A survey was done to study the health and nutritional status of post menopausal women along with their life style and food habits, before developing food products for them, which could help in managing problem associated with menopause.

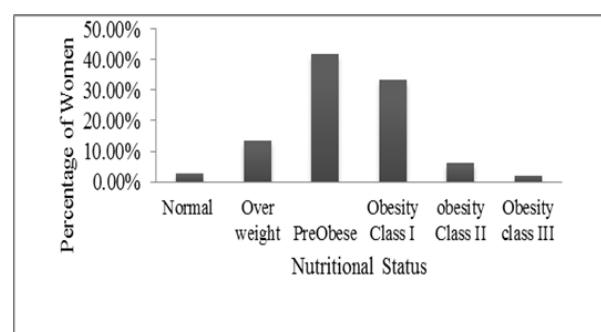


Figure 2- Shows the Nutritional Status of subjects surveyed

It was found in the survey that majority (83.7%) of the women surveyed were pre- obese or obese, around 13.5 % of the women surveyed were overweight and only a small percentage of women (2.7%) were found to have normal body weight. In the survey 45.9% of the women surveyed reported a gain in weight particularly after menopause where as 51.3 % did not report gain in weight proving that menopause alone did not cause gain in weight but

multitude of other factors play a role in causing gain in weight in women after menopause.

Hormone estrogen has an important role in maintaining bone and joint health. After menopause there is depletion in the estrogen level which can cause increased pain post menopause. Estrogen helps in reducing inflammation and retains the calcium in the bones.⁽⁵⁾

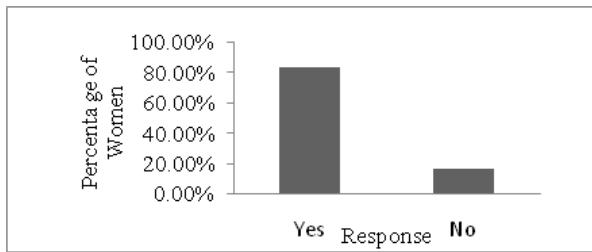


Figure 3- Shows percentage of subjects reporting pain and not reporting pain post menopause

In the survey 83.7% of the women complained of pain and aches. Out of these women 67.5 % that is majority of the women complaint of joint pain and stiffness followed by 43.2% of women who complaint of hip or lower back pain and around 8.3% women suffered from headache and migraine.

Obesity or increased body weight increases the burden on the bones, which can also be the reason for incidences of aches. The increase of incidence of muco-skeletal disorders has caused reduce physical activity in women, which on the other hand has also resulted in increase in weight in these women.

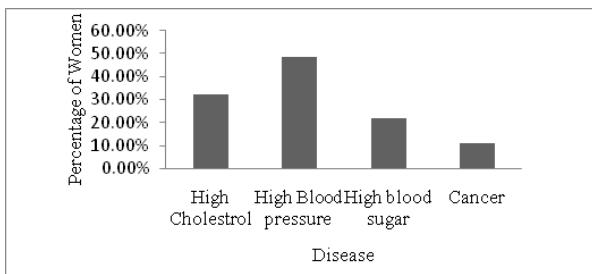


Figure 4- Prevalence of different diseases among the subjects surveyed

The prevalence of high blood pressure was found to be the highest (48.6%) among menopausal women, followed by prevalence of high cholesterol level in 34.2% of the women surveyed. Few incidences of diabetes was also recorded among post menopausal women (21.62%), and 10.8% of the women were found to be suffering from cancer.

Good nutrition and small lifestyle changes can help to maintain a healthy menopause. Exercising and eating right can make a real difference. Some

women may also find it useful to safeguard their diet, through supplementation of essential nutrients at a sensible level. According to the results obtained from the survey 97.45% of the women take supplements to manage their menopausal symptoms. Majority of these women were taking calcium supplements (75%) and vitamin D supplement (72.2%). A relatively fewer percentage were taking iron supplements (19.4%). These supplements were prescribed by the doctor. The data determines the increased requirement of these nutrients post menopause due to hormonal changes and also due to inadequate dietary intake in order to manage the symptoms associated with menopause.

This means post menopausal women usually make use of pharmaceutical means to manage their health problems. They do not resort to lifestyle and dietary modification, which are the healthier ways of managing post menopausal problems. Hence availability of nutritious and healthy food products in the market can enable them to purchase and consume these food products which can help to solve some of their health issues.

Surveying the sample population also revealed that around 56.75% of the women surveyed resort to exercise or yoga, and 2.55% of the women did nothing to manage their symptom. In the present era of modernization, life has become very busy, as a result women may not get time to prepare and consume home-made food especially for snacking. Some time taking proper meal on time may also become difficult. So to satiate their hunger they may make use of ready to eat finger food which is convenient. Since the aim of the present study was to develop a rusk which is usually consumed as a snack, it was important to know the frequency of snacking by the sample population surveyed.

Most of the post menopausal women (67.6%) surveyed consume ready to eat snack on a regular basis at least once a day (37.8%). There are also a proportion of women who consume twice a day (16.2 %) or thrice a day (13.6%) as well. The increased consumption of ready to eat snack shows the increased demand of these kinds of food among women.

There are different varieties of snacks available in the market including biscuits, cookies, rusk. Cereal based mixtures containing puffed rice, corn flake, rice flake, as well as variety of cakes. It was found through the survey that (54.86%) prefer to consume

biscuits and cookies, whereas 47.8% consumes cereal based mixtures. These were the two types of snack which were most preferred by the women surveyed. A relatively smaller percentage 5.4% opted for snack items like cake. Women seem to prefer snack items which are dry, easy to handle and light that is why most of them preferred biscuits and cookies.

Table 3- Results of the sensory valuation of the product A, B, C, D, E and F

	Appearance	Color	Texture	Taste	Odor	Overall rating
Product A	8.25 ± 0.44	8.05 ± 0.6	7.90± 0.55	8.30±0.47	8.15±0.49	8.25±0.44
Product B	8.20 ± 0.52	8.15 ± 0.59	8.05± 0.51	8±0.58	8.10±0.64	8.05±0.69
Product C	7.90 ± 0.55	7.76 ± 0.75	7.85±0.67	7.95±0.51	7.85±0.59	7.85 ±0.59
Product D	7.85 ± 0.59	7.75 ± 0.64	7.75±0.64	7.75±0.44	7.80±0.52	7.70±0.57
Product E	7.75 ± 0.7	7.60±0.68	7.75±0.55	7.75±0.44	7.74±0.56	7.70±0.47
Product F	6.8 ± 0.52	7.30±0.57	6.85±0.59	7± 0.65	6.95±0.69	6.65±0.59

- ◆ Appearance: The appearance of the product deteriorated with increase in proportion of un-sprouted amaranth seeds in the product. The reason behind the subsequent decrease in the appearance score was the denser, darker and more compact structure of the product with increase in substitution of refined wheat flour with un-sprouted amaranth seeds. When compared to the standard recipe and all the other products with lesser proportion of un-sprouted amaranth seeds that is product B, C, D, and E, product F received significantly less score for this parameter and hence the product was acceptable up to 40% level of substitution.
- ◆ Color: The color score of product B was more than product A which is the standard recipe. Beyond 10% level of substitution of refined wheat flour with the un-sprouted seeds the acceptability reduced. The addition of amaranth seeds up to 10% contributed positively to the color of the rusk making it more acceptable than the standard recipe, but beyond this percentage the color darkened with increase in substitution decreasing the color score significantly. Beyond 40% level of substitution, the color score was extremely less than the standard recipe and quite less than the other variations as well. The increase in darkness can be because of the cream color of the amaranth seeds owing to the pigment betacyanin amaranthine.⁽⁵⁾
- ◆ Texture: The texture of the product was not much affected by the addition of un-sprouted amaranth seeds up to 40% level of substitution with un-sprouted amaranth seeds. The finely grounded seeds contributed positively to the crunchiness of the product. Beyond 40% level of substitution

Sensory Evaluation Result: Keeping in mind the need and preference of the postmenopausal women, as well as the benefits and limiting attributes of amaranth seeds, bread rusk was developed for postmenopausal women with sprouted and un-sprouted amaranth seeds which substituted refined wheat flour at different levels, and its acceptability was determined by sensory evaluation.

there was a significant change in the texture making product F unacceptable. The change in the texture was due to the increased content of amaranth seeds in the product which reduced the degree of leavening making the product compact resulting in harder texture. The finely grounded seed were also coming in the mouth at 50% level of substitution.

- ◆ Taste: The score received by this parameter reduced with increase in percentage of un-sprouted amaranth seeds in the product. This can be because of the taste of amaranth seeds, which was contributing to astringent and bitter taste in the product especially beyond 40% level of substitution. Product F with 50% level of substitution had a taste score much less than the standard recipe and quite less than all the other variations. The astringent and bitter after taste of amaranth seeds can be because of the presence of anti-nutritional factors like saponins and tannins in the seeds.⁽⁴⁾
- ◆ Odor: Like taste and appearance the score received by this attribute also reduced with increase in substitution with amaranth seeds. But beyond 40 % level of substitution the score of this attribute reduced significantly not only from the standard recipe but also from the other variation. Thermal treatment of amaranth seed do cause increase in certain volatile compounds which can contribute to the undesirable odor in the product.⁽³⁾
- ◆ Overall Rating: Since for almost all the above attributes the scores were seen to decrease with increase in substitution, the decrease in the overall rating also occurred accordingly. The decrease beyond product E was considerable

when compared to standard recipe and other variations containing lesser proportion of amaranth seeds.

Sprouting increases the bioavailability of nutrients

increases the fiber content as well as reduces the anti-nutrient content in seeds. Hence sprouted amaranth seeds were incorporated in the product to check the acceptable level of substitution of wheat flour with sprouted amaranth seeds in the rusk.⁽¹³⁾

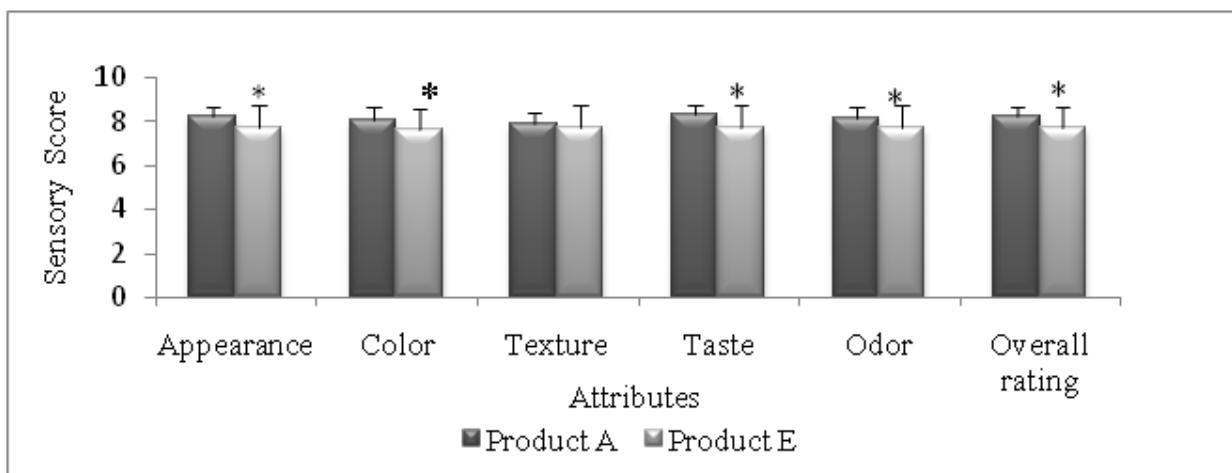
Table 4- Results of the sensory valuation of the product A, B1, C1, D1 and E1

	Appearance	Color	Texture	Taste	Odor	Overall rating
Product A	8.25 ± 0.44	8.05 ± 0.6	7.90± 0.55	8.30±0.47	8.05±0.51	8.25±0.44
Product B1	8.20 ± 0.64	7.85±0.59	8 ± 0.65	8.10 ± 0.79	7.90±0.64	8.05±0.60
Product C1	7.90 ± 0.64	7.80±0.52	7.85± 0.49	7.90± 0.45	7.55±0.69	7.81±0.40
Product D1	7.75 ± 0 .64	7.65±0.59	7.80±0.52	7.70 ± 0.47	7.55±0.60	7.75±0.64
Product E1	6.70 ± 0 .47	7.05± 0.6	7.15±0.67	7.00 ± 0.32	6.60±0.60	6.8±0.7

- ◆ Appearance: The score received by this attribute reduced with increase in percentage of sprouted amaranth seeds. Like in-case of incorporation of un-sprouted seeds, product with sprouted seeds also became denser and darker with increase content of the sprouted seeds. Beyond 30% level of substitution the appearance score is quite less than the score received by the standard recipe and other variation with lesser proportion of seeds.
- ◆ Color: The color of the product turned darker with the increase in the percentage of sprouted seeds in the rusk, due to which the color score reduced with increasing level of substitution. Beyond 30% level of substitution the color score was much less than the standard recipe and also the other variation containing lesser proportion of sprouted amaranth seed. The increase in darkness can be because of the cream color of the amaranth seeds owing to the pigment beta-cyanin amaranthine. Lopez and coworkers found that with germination, amaranth seeds synthesize a red pigment that may be related to amaranthine.⁽⁵⁾
- ◆ Texture: The texture of the product improved up to 10% level of substitution wheat flour with sprouted amaranth seeds. Beyond 10% level of substitution the score received by this gradually decreased. But beyond 30% level of substitution the texture reduced significantly. Product F received the least score, which was much lesser than the standard recipe and quite less when compared to other variation containing lesser proportion of sprouted amaranth seeds. The reason behind the drastic decrease in the texture score in product E1 is the dense structure of the product due to reduced leavening making the product hard, and the coarse mouth feel of the product owing to grounded seeds which were felt in the mouth.
- ◆ Taste: The score received by this attribute decreased gradually with increase in the level of substitution of wheat flour with sprouted amaranth seeds. The presence of amaranth seeds contributed to an astringent and bitter after taste, the prominence of which increases with increase in the content of sprouted amaranth seeds in the product. The taste score of product E1 was significantly less than the standard recipe and the other variations containing lesser proportion of seeds making the product unacceptable beyond 30% level of substitution. . The bitter taste of the sprouted amaranth seed might be because of the components like tannin and saponin present in them.
- ◆ Odor: Heat treatment results in maillard reaction in the amaranth seeds at elevated temperature resulting in the formation of volatile compounds causing a nutty and roasty odor.⁽³⁾ The score received by the odor attribute gradually reduced with increase in the level of incorporation of sprouted amaranth seeds. This is because of the presence of amaranth seeds, which contributed to the odor of the product. The difference in odor of the standard recipe and variations was increasing with increase in content of sprouted amaranth seeds in the variations because the odour of the amaranth seed was increasingly overpowering the odor of the cardamom seeds which is the flavouring agent used in the rusk .Beyond 30 % level of substitution the odor score reduced significantly from the standard recipe as well as the other variations containing lesser proportion of sprouted seeds making product E1 un acceptable.
- ◆ Overall rating: The scores of all the attributes reduced with increase in the level of substitution of sprouted amaranth seeds as a result the overall rating of the product also reduced .Beyond 30%

level of substitution the overall rating is much lesser than the standard recipe and the other

variations making product E1 with 40% sprouted amaranth seeds unacceptable.



- ◆ Figure 5- Student t test result of sensory evaluation score of Product A and Product E. It showed statically significant difference in attributes like appearance, color, taste, odor and overall rating between the two product because the p value < 0.05. There was no statistically significant difference in the texture score of the two product.

According to the student t test results we can conclude that 40% un-sprouted amaranth seeds did not affect the texture of Product E as there was no statistically significant difference in the texture score when compared to standard recipe, where as

incorporation of 30% sprouted amaranth seed did not affect the texture and color of product D1 as no statistically significant difference was estimated in the texture and color score when compared to standard recipe.

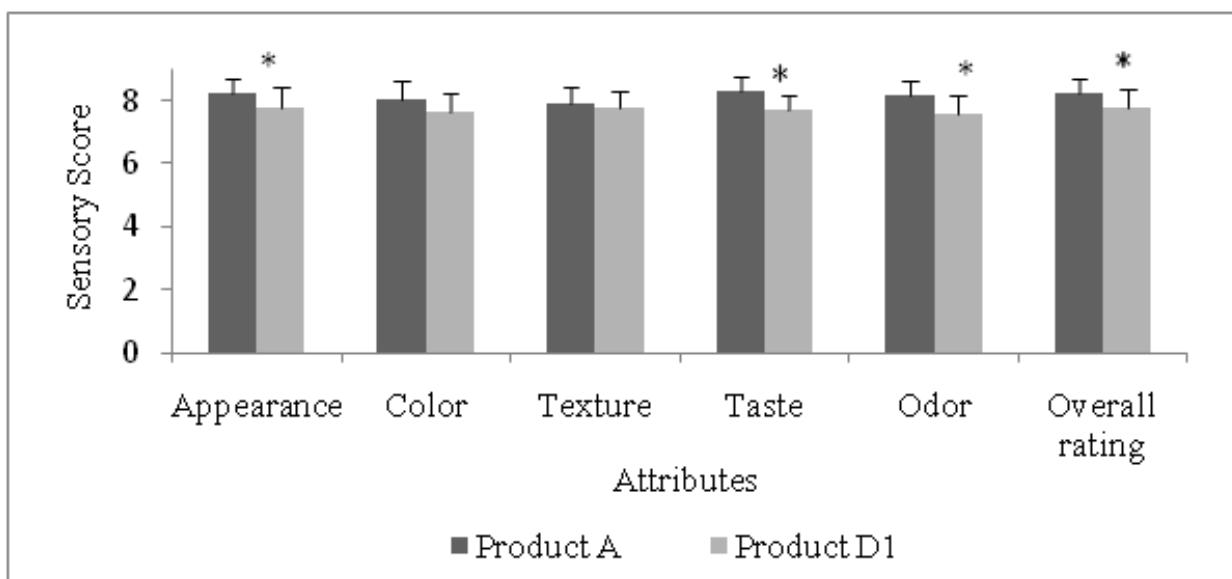


Figure 6- Student t test result of sensory evaluation score of Product A and Product D1 showed statistically significant difference in attributes like appearance, taste, odor and overall rating between the two products since the p value was less than 0.05. The mean score of color and texture did not show any statistically significant difference

Conclusion

According to the survey results and the attributes of amaranth seeds, rusk containing sprouted and un-sprouted amaranth seeds was considered an appropriate choice for catering to the nutritional and health needs of post-menopausal women. On the basis of sensory evaluation rusk containing 30% sprouted seeds and 40% un sprouted seeds was considered acceptable product.

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A study to design a composite mixture containing plantain, whey and hemp as an egg substitute, suitable for chocolate brownie.

Sakshi Surana and Sudeshna Pramanik

ABSTRACT

There has been an increased trend of vegetarianism around the world. This change has led to an augmentation in the development of egg substitutes especially in the bakery industry. This study involves the preparation of a composite mixture of plantain, whey and hemp as a suitable egg substitute in chocolate brownies. The role of plantain was to act as a binding agent whereas that of hemp and whey was to increase the protein quality of the product. The sensory evaluation was conducted for the basic (egg brownie) and the different variations of the composite mixture to obtain the acceptance scores from a panel of 20 members. The results were statistically analyzed for the basic and most accepted product using students' t-test method, which showed significant differences in certain sensory attributes. The most accepted product (B2B) was further chemically analyzed for moisture, ash, protein, albumin, amino acid, carbohydrate, fat, calcium and phosphorus in comparison to the basic product. The chemical analysis showed that the protein content of the most accepted variation was close to the basic egg brownie where as a considerable decrease in the fat content was seen in the most accepted product as compared to the basic. A market survey was also conducted to study the probability of the most approved variation as a marketable product. The market survey revealed the consumers interest in the composite mixture as the core ingredient for chocolate brownie and its potential as a marketable product.

Key words: Egg, Composite Mixture, Plantain, Whey, Hemp, Chocolate Brownie, Sensory Evaluation.

Introduction

The cake category of the bakery industry represents approximately a 600 million dollar industry, and the trend is growing. This is due to consumers' increased demand for goods that can be consumed with little or no home preparation. Although the production of baked goods is considered by many to be an art, it is also a product of science. Therefore, it is extremely important for those developing new baked goods to understand each different ingredient and its purpose in the mixture of the product. There are several essential ingredients important in the formulation of baked goods: flour, eggs, milk, sweeteners, fat, and leavening agents.⁽⁹⁾

The major ingredient in baked products is egg, due to the variety of functional roles plays. Thus making it difficult to reduce or substitute egg completely. Therefore egg substitution requires the use of a combination of different ingredients to get the desired results. A number of substitutes have been developed and used over time keeping in mind the different functional properties. The proteins in eggs, specifically in egg whites assist with the adhesion and ingredient binding. This function is often substituted using starch. Starch is one of the most widely used excipient in the food industries where they are used as fillers, binders, as well as gelling

and bulking agents. Tropical roots and tubers and fruits have a high starch content which has made the potential sources of industrial starch.^(4,7)

Another important function of egg is providing the adequate nutrients to the products. The egg white of the egg contains a number of essential amino acids. It is thus essential to find an appropriate vegetarian substitute that matches the protein quality of egg. This function of egg is substituted by vegetarian sources such as whey, hemp, flax etc.⁽²⁾

The egg is also responsible for aeration in baked products. When air is incorporated into a liquid or viscous solution, the solution entraps the air bubbles forming foam. This important function that helps in the structure build-up of baked products are easily substituted by chemical leaveners.⁽³⁾

Methodology

The development of new food products in today's food industry is becoming increasingly challenging due to the changing trends and competitive products. In the present study a composite mixture of plantain, whey and hemp was used as egg substitute in chocolate brownie. First the basic recipe that contained egg was standardised. (Figure 1)

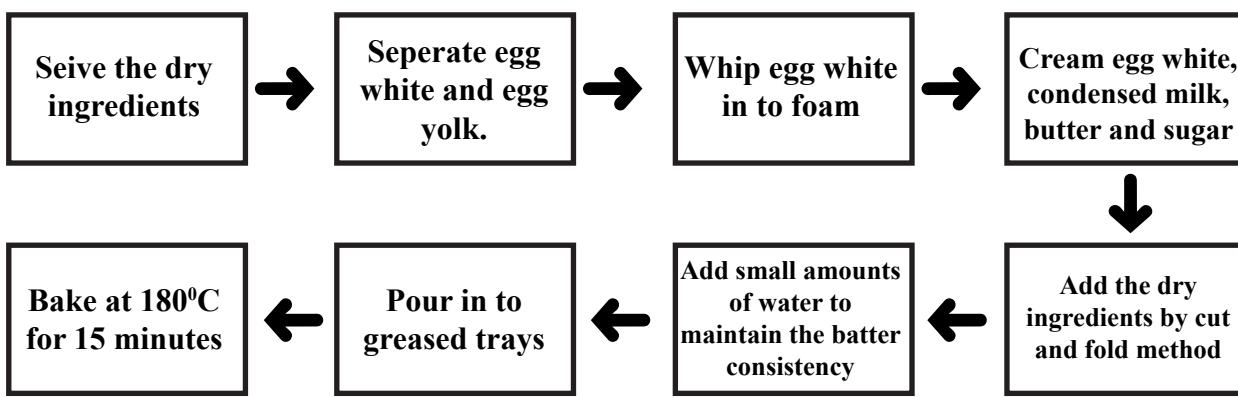


Figure 1- Recipe for the chocolate brownie

The different variations of eggless chocolate brownies were developed using varied amounts of potato, plantain and sweet potato to achieve binding properties similar to egg (Table 1).

Table 1- Variations for the starchy vegetables used as an egg substitute

Product Type	Product Code	Potato (g)	Plantain (g)	Sweet potato (g)	Condensed milk (g)
Product type A: Potato (as natural binder)	A1	30	0	0	90
	A2	60	0	0	60
	A3	90	0	0	30
Product type B: Plantain (as natural binders)	B1	0	30	0	90
	B2	0	60	0	60
	B3	0	90	0	30
Product type C: Sweet Potato (as natural binders)	C1	0	0	30	90
	C2	0	0	60	60
	C3	0	0	90	30

The protein content of the product was enhanced by further addition of hemp and whey along with the most accepted product having a binding property similar to that of eggs (Table 2).

Table 2- Variations for the composite mixture used as an egg substitute

Product Type	Product Code	Variation		
		Plantain (g)	Hemp (g)	Whey (ml)
Product Type: B2	B2A	60	2.5	50
	B2B	60	5	55
	B2C	60	7.5	60
	B2D	60	10	65

Sensory evaluation of the developed products and the basic product was done using the 9-point hedonic scale. The attributes on which the products were scored are appearance, colour, taste, texture, odour and overall acceptability. The most accepted variation and the basic product were statistically analysed using students t-score.

Chemical analysis was done on the basic product and the most approved variation. The protein content was measured using the Kjeldahl method. The albumin content was measured using Bromocresol Green, End Point Assay. The fat and the carbohydrate content of the two products were measured using the soxhlet method for the former and the anthrone method for the latter.^(11,6)

The micronutrients for the products were also tested. Each of the two products was converted to ash in a muffle furnace for micronutrient estimation. The calcium content was measured by the EDTA method while the phosphorous content was measured using the molybdate U.V. method.⁽⁸⁾

The shelf life of the two products was tested by placing the products in zip lock pouches and placing each of the two at room temperature and at a refrigeration temperature.

Keeping in mind the objectives of the present study, a structured questionnaire was prepared to obtain acceptability by a market survey and study the products' potential as a marketable product.

Results and Discussion

Sensory Evaluation Analysis

The products containing varying amounts of starchy vegetables such as potato, plantain and sweet potato were subjected to sensory evaluations. The best accepted products for each of the given variation (table 2) were products A2 (60g potato), B2 (60g

plantain) and C2 (60g sweet potato). The overall acceptability scores (figure 2) for the best accepted products were compared to the basic recipe. The scores were 8.2, 8.4 and 8 for potato, plantain and sweet potato respectively and 8.6 for the basic.

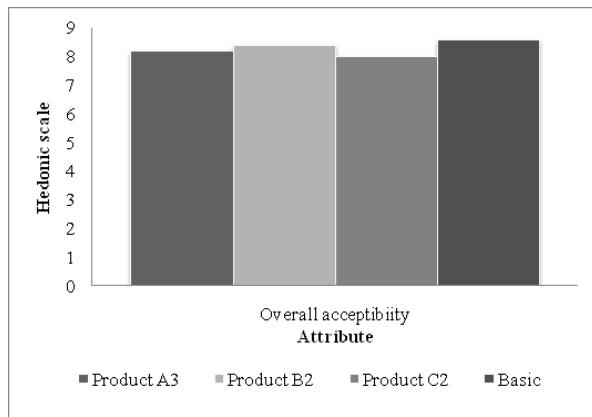


Figure 2- Overall Acceptability for the variations and the basic

The best accepted among all and the closest to the basic recipe was the product B2 with 60g plantain as the binding agent. The study was further conducted to increase the protein content of the product by

Table 3- Sensory Evaluation Scores

Product Type	Appearance	Colour	Taste	Texture	Odour	Overall Acceptability
B2A	8±0.22	8.2±0.41	7.5±0.51	7.7±0.44	7.9±0.31	7.7±0.44
B2B	8.2±0.41	8.4±0.48	7.9±0.31	7.8±0.41	7.7±0.44	7.9±0.31
B2C	7.55±0.51	8.2±0.41	7.7±0.44	7.5±0.51	7.7±0.44	7.6±0.49
B2D	7.65±0.49	8±0.21	7.2±0.44	7.3±0.47	7.5±0.51	7.4±0.5

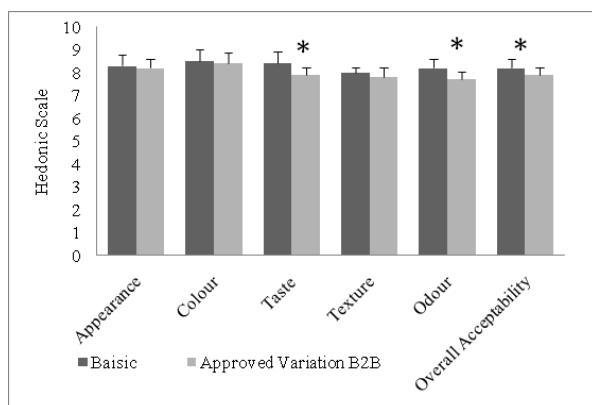


Figure 3- Comparison of the Sensory Evaluation of Basic and Variation B2B (*) P- score < 0.05 represents statistically significant results. The P- score of the attributes were calculated by Students t- score, which showed significant differences in taste, odour and overall acceptability and not statistically significant in attributes like appearance, colour and texture.

the incorporation of whey and hemp in different amounts. The products were then put up for sensory evaluation and the scores were analyzed (Table 3). The sensory attributes and the overall acceptability of the product variation B2B was seen to closest to the Basic product (figure 3).

The figure 3 depicts the statistical analysis of the basic product (egg brownie) and the approved variation B2B (60g plantain, 5g hemp, 50ml whey), by the method of students t testing, on the basis of the sensory attributes. The t-scores of taste, odour and overall acceptability showed statistical significance as the p-value was less than 0.05. The difference could be due to the distinct flavour produced by the essential oil from hemp seeds which imparted its own characteristic taste and odour to the eggless brownie. Appearance, colour and texture did not show any significant difference statistically as cocoa helped in masking the colour thereby not changing the overall appearance and the use of plantain acted as a binding agent equivalent to eggs thus giving the latter a similar texture.

Chemical Analysis: From the data on sensory evaluation, it was evident that product B2B was the most acceptable variation. Thus, comparison between the basic product and the most approved variation B2B was carried out on the basis of the chemical estimation.

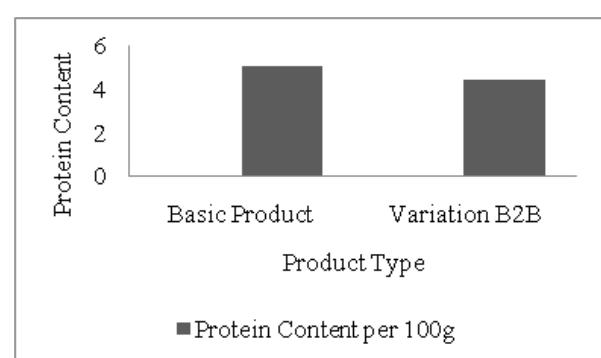


Figure 4- Protein content of the basic and variation B2B

The figure above indicates the protein content per 100 grams of the product. It can be seen that the protein content of the basic product is 5.04g which is slightly higher than the approved variation which has protein content of 4.42g. Eggs are an excellent source of high quality protein, vitamins and minerals.

The albumin content in basic and approved variation is 2.23g and 2.20g respectively. It can be clearly seen that the total albumin content for both the products is very close. Thus the developed egg substitute has similar protein content to egg. Reduced values of albumin in Product B2B could be due to the incorporation of only 5 grams of hemp seeds. Research shows that albumin and edestine are the major two proteins present in hemp seeds.⁽⁵⁾

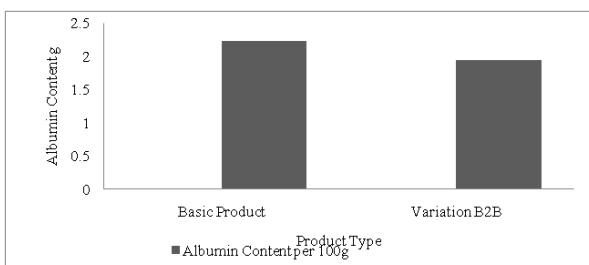


Figure 5- Albumin Content of Basic and Variation B2B

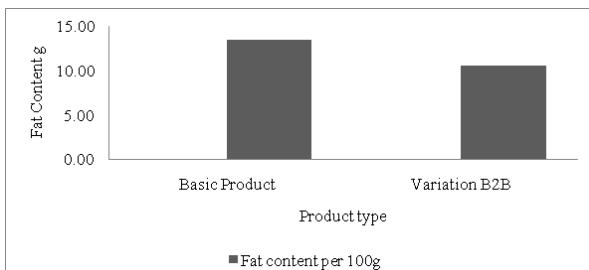


Figure 6- Fat content of the basic and variation B2B

The fat estimation of the two products showed the product B2B contained lower levels of fat (10.6g) when compared to the basic egg brownies (13.4g). A major reason behind this could be the presence of high levels of saturated fatty acids in the egg yolk and the additionally used fat for the brownie. The eggless variation only contained butter as a rich fat source.

The carbohydrate content of the basic was 52.9g per 100g and for the approved variation it was 67.8g per grams. The higher levels of carbohydrate in the approved variation are due to the presence of plantain. Plantain used as binder in the developed product is known for its rich starch content which when mixed with water shows gelling properties that help in binding.

Starch is a polymeric carbohydrate consisting of a large number of glucose units joined by glycosidic bonds. This polysaccharide is produced by most green plants as an energy store. It is the most common carbohydrate in human diets and is contained in large amounts in staple foods. Thus the presence of starchy vegetable causes higher levels of carbohydrate.⁽¹⁰⁾

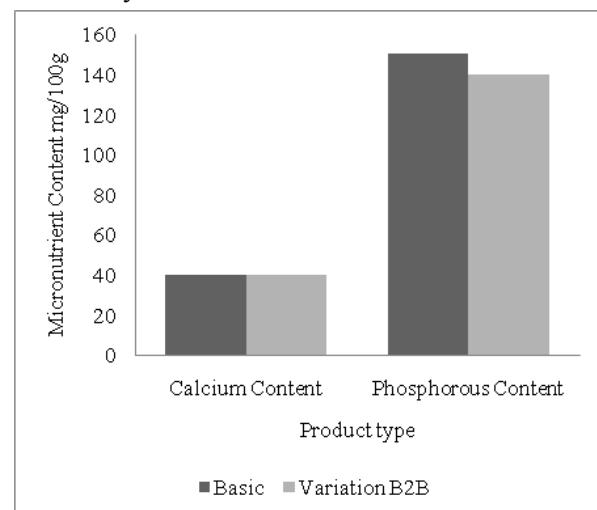


Figure 7- Calcium and Phosphorous content of the basic and variation B2B

The figure 7 shows the calcium and the phosphorous content of the basic and Variation B2B. The calcium content for the products was 40mg and 39.6mg per 100g. The calcium content for both the products is almost equal. Eggs contribute little to considerable quantity of all minerals and vitamins which are known to be needed by the human body. Egg yolk contains a major proportion of vitamins like vitamin A, D and E and minerals like phosphorus, calcium, iodine. The whey used for the preparation of the provided the calcium content to the approved variation.⁽¹⁾

Phosphorus is a vital part of the growth process, as well as the maintenance of teeth and bones. It works in association with calcium to create strong bones. The phosphorous content of the basic and the approved variation was 150mg in the basic product and 140 mg in the Product B2B per 100 gm of each product, thus the plantain used as a binding agent in the eggless variation imparted enough phosphorous when compared to egg.⁽⁸⁾

Shelf Life Study: The Basic product showed microbial growth on the 5th day at room temperature and on the 10th day at the refrigeration temperature while the approved variation B2B showed microbial growth on the 8th day at room temperature and

on the 15th day at refrigeration temperature. The difference in time of microbial growth could be due to the pre-treatment done on the plantain and hemp. Market Survey: The questionnaire contained overall questions to study the need for an egg substitute, and to judge the acceptability of the consumers if the product would be launched in the market. While 56% consumers said that they would prefer the eggless brownie with the composite mixture, 44% consumers were not willing probably because the above mentioned ingredients in a brownie.

The consumers were also asked about the overall interest in the developed product. The graph above shows that while only 6% consumers were not interested more than 50% consumers showed interest in the eggless brownie. Thus, it can be concluded that the developed eggless brownie has potential to grow in the market.

Conclusion

Bakery products are popular due to their convenience, unique taste and easy availability at reasonable cost. Among bakery products, biscuits/cookies and crackers are the most popular and versatile snack foods due to low cost, varied taste, easy availability and longer shelf life. The present study aimed at the use of a composite mixture of plantain, whey and hemp as an egg substitute was done to achieve an egg replacer of the similar protein quality as egg and also that does not affect the taste and the texture too much. The most accepted product for the whey and hemp variation was the product with 5g hemp and 50ml whey in addition with 60g of plantain, coded as variation B2B, with scores of 8.2 on appearance, 8.4 on colour, 7.9 on taste, 7.8 on texture, 7.7 on odour and, 7.9 on overall acceptability. The biochemical parameters of the variation B2B were similar to egg where the protein content were 5.04g and 4.42g per 100g for basic and the approved variation respectively. The calcium and phosphorous content was also similar for the products. Thus, a potential market and consumer acceptance for egg substitutes such as hemp and plantain was observed when used with whey. Hempseed and hempseed food products have become available to the general public in many countries. While the human food potential for hempseed has not yet entered mass markets in the west, its nutritional properties have long been recognized and valued as food for both humans and domesticated animals throughout Asia, India, Russia and Eastern Europe.⁽⁵⁾

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A Comparative Study on the Organoleptic Properties and Chemical Composition of Fermented and Instant Vegan Cheese

Sruti Agarwal and Sudeshna Pramanik

ABSTRACT

Vegan cheese is a non-dairy or plant cheese analogue aimed for vegans and others wanting to avoid animal products. It can be made from soybeans, rice, almonds and other nuts and oilseeds, with nutritional yeast or bacteria. Such a cheese is lactose free and can also be prepared gluten free making it apt for lactose intolerant patients. The present study is aimed at developing and comparing the evaluation from sensory attributes and analysis of nutritional composition between Instant (Nutritional Yeast) and Fermented (Rejuvelac) cheese. The vegan cheese so prepared from different plant sources such as sesame seeds and cashew nuts, showed a significant difference between the two forms of cheese from the results of the sensory evaluation with the latter being preferred more by the panel members ($n=20$). Thus, cashew nut cheese was subjected to chemical analysis including both macro and micronutrients along with moisture, ash and tannic acid. There was not much difference in the nutrient composition between instant and fermented vegan cheese although fermentation reduced tannic acid, an antinutritional property present in nuts. The low shelf life of fermented vegan cheese could be attributed to higher amounts of moisture. Presence of amino acids was also determined. Gram positive bacteria found in Rejuvelac- Probiotic drink used for preparing fermented cheese was an indication of the presence of *Lactobacillus* species. The ultimate goal is to devise novel foods with the use of fundamental insights and techniques that is healthy yet acceptable to consumers.

Key Words: Cashew nuts, Cheese, Nutritional Yeast, Probiotics, Rejuvelac, Sesame seeds, Vegan

Introduction

Cheese is semi-solid, dehydrated milk with a casein or para casein sponge or matrix in which fat and whey are trapped. Conventionally, removal of lactose is accomplished by whey removal and fermentation; water is removed by syneresis and pressure. Cheese substitutes and cheese imitates are synonyms. There are two basic types of processes for manufacturing cheese substitutes. The first is use of liquid 'milk', and involves conventional cheese making methods, the products often being referred to as filled cheese. The second type, referred to as cheese analogues, is made by blending various raw materials together using techniques similar to those for processed cheese manufacture. Development of cheese analogues involves the use of fat and/or protein sources other than those native to milk, together with a flavour system simulating as closely as possible that of the natural product. It is also necessary to develop a suitable processing regime capable of combining these elements to provide the required textural and functional properties. Cheese analogues may be regarded as engineered products. Two broad classes of commercial food products can be distinguished: Foods that normally constitute part of a mixed diet and products that may constitute a sole source of nutrients for some patients or some consumer segments. Cheese analogues belong to foods for a mixed diet with restricted regulatory, scientific and medical complexity.⁽²⁾

The term vegan was coined in 1944 by Donald Watson when he co-founded the Vegan Society in England. Veganism is both the practice of abstaining from the use of animal products, particularly in diet, and an associated philosophy that rejects the commodity status of animals. Vegan cheese is a non-dairy or plant cheese analogue aimed for vegans and others wanting to avoid animal products, including those who are lactose-intolerant.⁽¹⁷⁾ Depending on the brand and recipe that's used, vegan cheese can be made from soy protein (used in shiny, slick, rubbery varieties), solidified vegetable oil (like coconut, palm, or safflower), nutritional yeast, thickening agar flakes, nuts (including cashews, macadamias, and almonds), tapioca flour, natural enzymes, vegetable glycerine, assorted bacterial cultures, arrowroot, cornstarch, tapioca and even pea protein. Some varieties of vegan cheese can also be highly processed to get the flavours and textures. The traditional types of real cheeses known are made from casein, a type of milk protein that comes from the milk of animals like cows, goats, sheep, and buffalo. During production, a group of enzymes that are produced in the animals' stomachs, called rennet, are added to the milk. Rennet is what causes coagulation to take place, and in the end, the product obtained is cheese. Although there are some alternative ways to make other types of dairy cheeses, using rennet is the most common way to produce cheeses of different flavours, textures, and forms.⁽²⁾ Vegan cheese, on the other hand, can be

made of soybeans, rice, almonds and other nuts, and nutritional yeast. Another way of preparing vegan cheese involves consolidating the protein mass from various plant sources with lactic bacteria that may also be added in for acidity. Since vegan cheese doesn't experience any modification in proteins the way dairy cheese does, it may not deliver the same complex flavours that come from coagulated, acidified, pasteurized, and aged milk.

Methodology

Selection of place

The college laboratory was selected to prepare the products and conduct the sensory evaluation.

Selection of raw material: The raw materials selected for the preparation of the products were cashew nuts, sesame seeds, wheat berries, nutritional yeast, agar agar powder, cornflour. The ingredients used for development of vegan cheese were purchased from the local market.

Method of making vegan cheese

Instant Cheese: Cashew nuts (soaked in water overnight) or sesame seeds were ground in a blender along with the addition of nutritional yeast,

cornflour, salt. This mixture was then added to agar agar mixture and stirred for 5 minutes on medium flame. It was poured in a mould to give shape and cooled in refrigerator. Once cooled, sensory evaluation was carried out.

Fermented Cheese: Cashew nuts (soaked in water overnight) or sesame seeds were ground in a blender along with the addition of Rejuvelac, cornflour, salt. This mixture was allowed to ferment for 1-2 days (depending upon tangy taste) at room temperature, away from sunlight. After fermentation, the mixture was then added to agar agar mixture and stirred for 5 minutes on medium flame. It was poured in a mould to give shape and cooled in refrigerator. Once cooled, sensory evaluation was carried out.

Preparation of Rejuvelac: Wheat berries were soaked in water overnight in a sterile glass jar covered with muslin cloth. The water was removed and grains were allowed to sprout. After sprouting sterile water was added and was allowed to ferment until water turned cloudy and white with a tangy flavour. The liquid was strained and stored in refrigerator.⁽¹⁷⁾

Table 1- Standardisation of Instant Vegan Cheese

Basic	Product Code	Cashew nut (g)	Sesame seeds (g)	Cornstarch (g)	Salt (g)	Nutritional yeast (g)	Agar agar (g)
Sesame seed	A1	0	50	5	1.25	1.25	2.5
	A2	0	50	5	1.25	2.5	2.5
	A3	0	50	5	1.25	5	2.5
	A4	0	50	5	1.25	7.5	2.5
Cashew nut	B1	67	0	5	1.25	1.25	2.5
	B2	67	0	5	1.25	2.5	2.5
	B3	67	0	5	1.25	5	2.5
	B4	67	0	5	1.25	7.5	2.5

Table 2- Standardisation of Fermented Vegan Cheese

Basic	Product Code	Cashew nut (g)	Sesame seeds (g)	Cornstarch (g)	Salt (g)	Rejuvelac (ml)	Agar agar (g)
Sesame seed	C1	0	50	5	1.25	20	2.5
	C2	0	50	5	1.25	40	2.5
	C3	0	50	5	1.25	60	2.5
	D1	67	0	5	1.25	20	2.5
Cashew nut	D2	67	0	5	1.25	40	2.5
	D3	67	0	5	1.25	60	2.5
	B3	67	0	5	1.25	5	2.5
	B4	67	0	5	1.25	7.5	2.5

Data collection method: The prepared vegan cheese was organoleptically evaluated by semi trained 20 panel members; who were college students; for its acceptability using nine point hedonic scale. The age group of the panel members was between 21-23 years. The basic product was rated and the best variation was chosen.

Chemical Analysis

- ◆ Estimation of the micronutrient and macronutrients of the best variation of basic was done taking several small fractions of the sample.
- ◆ Estimation of Protein was carried out by Kjeldahl Method.^(12,7)
- ◆ Estimation of Fat was done by Rose Gottlieb method.⁽⁶⁾
- ◆ Determination of carbohydrate was carried out by Anthrone Method. The absorbance was checked in spectrophotometer at 620nm.⁽⁴⁾
- ◆ Determination of calcium was done by end point OCPC Method. The absorbance of which was checked at 570nm.⁽⁵⁾
- ◆ Estimation of Phosphorus was conducted by Molybdate U.V. Method. The absorbance of which was checked at 700nm.⁽¹⁴⁾
- ◆ Estimation of Tannin was conducted by Folin-Dennis Method. The absorbance of which was checked at 700nm.⁽¹³⁾
- ◆ Amino acids Profile was analysed by Paper Chromatography.⁽⁹⁾

Microbiological Analysis: Microbial analysis was conducted in the microbiological laboratory and gram staining was done to identify the microorganism.⁽⁸⁾

Statistical Analysis of Data: Data relating to the sensory characteristics of vegan cheese were calculated using statistical tool (Students t- test and standard deviation) and organized in the form of tables and graphs and interpretation was done.

Shelf life study: The shelf life study of vegan cheese was done by keeping the cheese in the refrigerator as well as at room temperature. The vegan cheese was checked every day and observed for changes in the physical attributes of the product. The shelf life study of the vegan cheese was done by packing it in polythene zip lock pouches and stored for a period of three months.

Results and Discussions

Sensory evaluation

Table 3- Overall Acceptability scores of basic recipe for product A and B (Instant Cheese)

Variations	A1	A2	A3	A4	B1	B2	B3	B4
Overall Rating	6.7± 0.47	6.7± 0.47	7.3± 0.47	6.5± 0.51	7.3± 0.47	7.7± 0.47	8.1± 0.31	7.3± 0.47

By doing the average of the results, it was seen that the most acceptable product's overall rating was 7.3, 8.1, for Products A3 (Sesame Seeds instant cheese), B3 (Cashew Nuts instant cheese) respectively. Most acceptable variation of instant cheese had light yellow colour and gave a same flavour as that of normal cheese since Nutritional yeast added, has a relatively strong flavour that is somewhat similar to that of a pungent taste found in cheese. Compounds responsible for flavour in cashew nut cheese can also be due to methyl butanoate while compound responsible for flavour in sesame seeds can also be attributed to 3-formylthiophene. Instant cheese had a stiff texture which could be due to addition of Cornstarch. Since, it has water absorption property, it provides the texture needed for the product and reduces the moisture content of product which might also increase the shelf life of the product.

Table 4- Overall Acceptability scores of basic recipe for products C and D (Fermented Cheese)

Variations	C1	C2	C3	D1	D2	D3
Overall Rating	5.2 ± 0.41	6.8 ± 0.62	4.6 ± 0.5	5.6 ± 0.5	7.7 ± 0.44	3.8 ± 0.41

The average of the results, showed that the most acceptable product's overall rating was 6.8, 7.7 for Products C2 (Sesame Seeds fermented cheese) and D2 (Cashew Nuts fermented cheese) respectively. Fermented vegan cheese had white colour which could be attributed to the addition of Rejuvelac which is a translucent fluid. Variation D2 gave the same flavour as that of dairy cheese with slightly tart or lemon flavour, while variation C2 had a mild bitter aftertaste which could be due to the presence of antinutrients, phytic acid and tannin. Fermented cheese had a soft texture which was obtained due to the reaction of acid present in Rejuvelac with cornstarch which reduced the thickness of hot starch paste and firmness of the cooled paste. Cornstarch loses potency when mixed with acids. Therefore, to obtain the texture needed for the product other form of starches such as tapioca flour or arrowroot may be used.

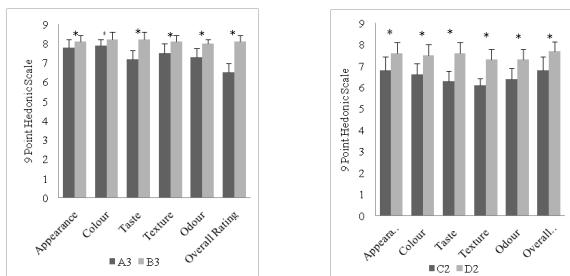


Figure 1- (a) Comparison of Basic recipe for product A3 and B3, (b) Comparison of Basic recipe for product C2 and D2. (*)P-score <0.05 represents statistically significant results. The p-score of the attributes were calculated by student's t-score which revealed that there were statistically significant differences in all the attributes of the products because of core ingredients used in products A3, B3, C2 and D2.

Due to this significant difference, Products B3 (Cashew Nuts instant cheese) and D2 (Cashew Nuts fermented cheese) were chosen for further chemical analysis

Analysis of nutrient

Macronutrients Estimation: From figure 2 (a) it can be determined that Cashew Nut Instant Cheese (Product B3) and Cashew Nut Fermented Cheese (Product D2) have 10.95 grams and 10.87 grams of protein content in 100 grams of Vegan

cheese respectively and from figure 2(b) it can be determined that Product B3 and Product D2 have 16.3 grams and 13.8 grams of fat content in 100 grams of the cheese respectively. The decrease in the concentration of cashews with the addition of fluids like water from Rejuvelac in the fermented cheese could have led to a decrease in the protein and fat content of Product D2 when compared to instant cheese. Nuts are an excellent source of protein (approximately 25% of energy) and often have a high content of L-arginine. As this amino acid is the precursor of the endogenous vasodilator, nitric oxide (NO), nut intake might help improve vascular reactivity.⁽¹⁶⁾

Cashew nuts are rich in monounsaturated fatty acids like oleic acid. It is also a good plant source of omega-3 essential fatty acids such as linoleic acid, alpha-linolenic acid (ALA) and arachidonic acids. In a study conducted by incorporating cashews (28–64 g/d) into an average American diet for 4 wk improved the serum lipid profile of adults with high LDL cholesterol or who were at risk of high LDL cholesterol. When compared with the control diet, the cashew diet significantly decreased LDL cholesterol by 4.8%, total cholesterol by 3.9%, and non-HDL cholesterol by 5.3% without affecting HDL cholesterol and triglyceride.⁽¹⁸⁾

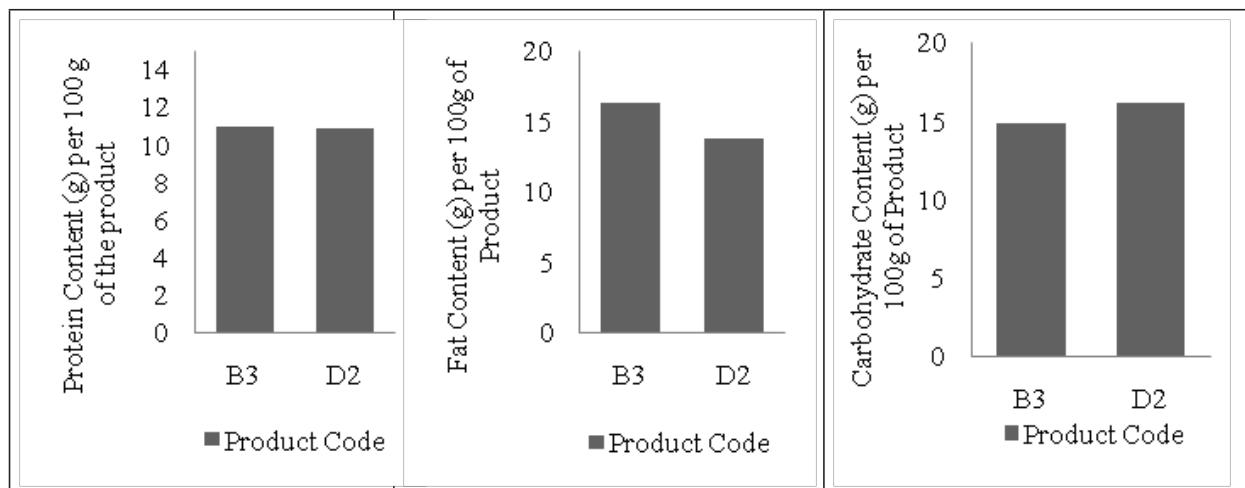


Figure 2- (a) Comparison of Protein content of Vegan Cheese, (b) Comparison of Fat content of Vegan Cheese, (c) Comparison of Carbohydrate content of Vegan Cheese

Epidemiologic studies have suggested that diets with a high proportion of MUFA's in the form of oleic acid, such as in the Mediterranean diet, reduce CVD risk.⁽³⁾

From figure 2(c) it can be determined that Cashew Nut Instant Cheese containing 5g of Nutritional Yeast (Product B3) and Cashew Nut Fermented Cheese containing 40ml of Rejuvelac (Product D2)

have 14.9 grams and 16.2 grams of carbohydrate content in 100 grams of Vegan cheese. The addition of Rejuvelac made from wheat berries could have led to increase in the carbohydrate content in product D2. Some interventional studies have examined the effects of nut-enriched diets on glycemic control in diabetic patients and insulin sensitivity in insulin-resistant states. According to two small

studies, it was found that insulin levels in patients with metabolic syndrome and diabetes had reduced after nut feeding. The three-month report of the larger Prevention with Mediterranean Diet study also showed that the Mediterranean diet enriched with nuts was associated with improved insulin sensitivity and fasting glucose levels in non-diabetic and diabetic participants, respectively.^(16,3,10)

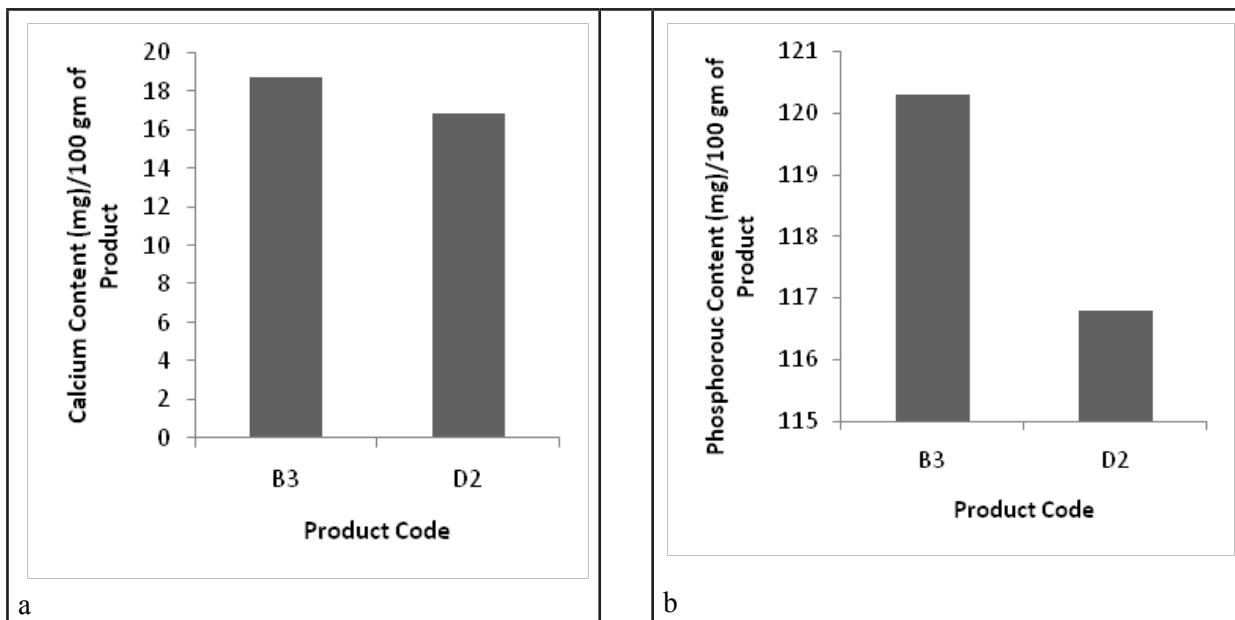


Figure 3- (a) Comparison of Calcium content of Vegan Cheese, (b) Comparison of Phosphorous content of Vegan Cheese

From Figure 3(b) Product B3 and Product D2 have a phosphorus content of 120.3 milligrams and 116.8 milligrams respectively in 100 grams of Vegan Cheese. In product D2 calcium and phosphorous content could have decreased due to addition of fluids such as water from Rejuvelac, diluting the cashew nut concentration as compared to Instant cheese.

Antinutrients Estimation

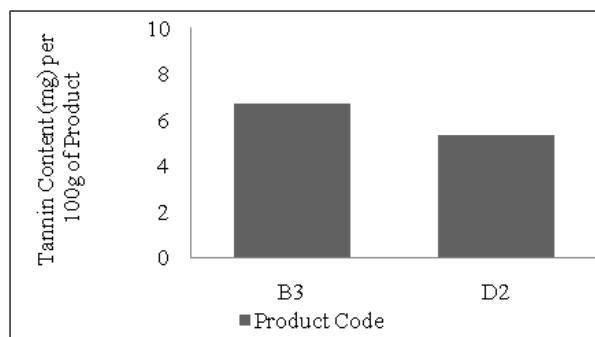
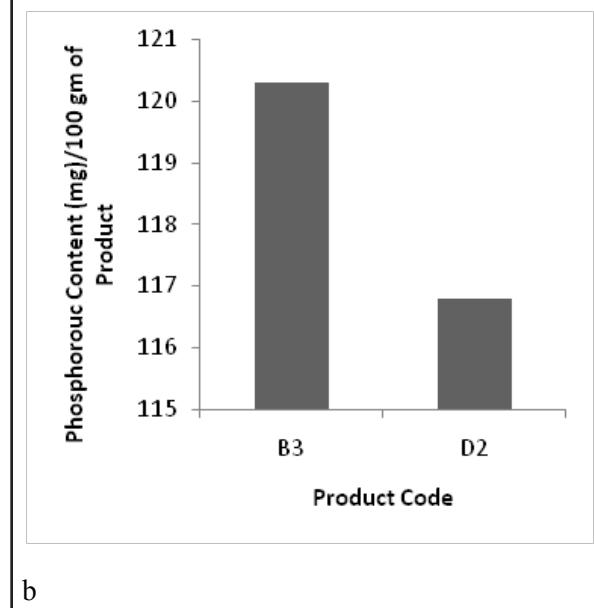


Figure 4- Comparison of Tannin content of vegan cheese

From figure 4 it can be seen that the Tannin content of Cashew Nut Instant Cheese (Product B3) and Cashew Nut Fermented Cheese (Product D2) has 6.7 milligrams and 5.3 milligrams respectively in 100

Micronutrient Estimation

From figure 3(a) it can be comprehended that the calcium content of Cashew Nut Instant Cheese (Product B3) and Cashew Nut Fermented Cheese (Product D2) has 18.75 milligrams and 16.91 milligrams respectively in 100 grams of Vegan Cheese.



grams of the Cheese. Low levels of tannin may be due to certain processing techniques like soaking, sprouting and fermentation. Cashews were soaked overnight and for fermented cheese, fermentation was also conducted which might have further reduced the tannin content.⁽¹⁾

Amino Acids Testing: To check the presence of amino acids in the sample several Amino Acids Test was conducted. From the results obtained from amino acid assay, it can be said that vegan cheese contains amino acids such as isoleucine, histidine, arginine, alanine, aspartate and tyrosine. Fermentation of cereals by lactic acid bacteria has been reported to increase free amino acids and their derivatives by proteolysis and/or by metabolic synthesis. Fermentation has been shown to improve the nutritional value of grains such as wheat and rice, basically by increasing the content of the essential amino acids lysine, methionine and tryptophan.⁽¹⁹⁾

Microbiological testing: Purple coloured (Gram positive) rod shaped bacteria were observed under the microscope. The occurrence of gram positive bacteria indicates the presence of Lactic Acid Bacteria which is present in Rejuvelac, the Probiotic

drink incorporated into fermented vegan cheese. Lactobacilli MRS Agar is specifically used for growth and cultivation of *Lactobacillus* species. Lactic acid bacteria (LAB) are historically defined as a group of microaerophilic, Gram-positive organisms that ferment hexose sugars to produce primarily lactic acid.⁽¹⁵⁾

Shelf life study: For Product D2 (fermented), microbial growth was observed after 5 days when kept at room temperature condition and under refrigerated conditions no microbial growth was observed, but slight off odour was evident after refrigeration for 1 month. For Product B3 (Instant), slight off odour was evident after 1 month when kept at room temperature conditions and there was no significant change when kept under refrigerated conditions for 3 months. Low shelf life of fermented cheese was probably due to high moisture.

Conclusion

Vegan cheese has been prepared not only for vegans and vegetarians but for other people who consume meat, as the ingredients used to prepare vegan cheese contain unsaturated fatty acids which serve as a healthy alternative for different dairy cheese which are high in saturated fatty acids. The study included standardisation of basic recipe for both instant and fermented cheese. Cashew nut and sesame seeds were used to prepare the vegan cheese. The sensory evaluation of vegan cheese showed that there was a significant difference for all the sensory attributes between instant and fermented cheese. Student t- score was used as the statistical tool to find the difference between cheese made from sesame seed and cashew nut for both instant and fermented varieties which showed a significant statistical difference between sesame seeds and cashew nut cheese due to which chemical analysis was conducted on cashew nut cheese (both instant and fermented). For assessing the nutritional quality, biochemical parameters like the protein, fat, carbohydrates, tannin, calcium, phosphorus, moisture content, ash content were estimated. Shelf life testing was conducted on the most acceptable products, variations B3 (instant) and D2 (fermented) showed that product B3 had a better shelf life than product D2 due to its low moisture content. Cashew nut has a high nutritional value because it is rich in monounsaturated fatty acids and polyunsaturated fatty acids since it contains oleic (ω -9) (59-61%) and linoleic (ω -6) (16-20%) fatty acids.⁽¹¹⁾

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Chemical analysis and sensory evaluation of soy milk based sandesh for geriatrics

Sabia Nazmin and Sweata Rani Rai

ABSTRACT

In old age degenerative diseases such as cardiovascular and cerebrovascular diseases, diabetes, osteoporosis and cancer are among the common disease affecting the elderly. There is a decline in the appetite and reduce affinity to food, however many of the elderly people have an inordinate craving for sweets. Sandesh represents the traditional Indian dairy product used as sweet dairy desserts, prepared by acid and heat coagulation of milk. It is popular throughout eastern part of India especially in West Bengal. Therefore, the present study was undertaken to evaluate the combined effect of soymilk, dates, pumpkin seeds and watermelon seed on the sensory and chemical evaluation of sandesh. The constituents present in the sandesh is cardio protective, anti-diabetic and good source of antioxidants. Product acceptability was done in St Joseph's Old Age Home where 25 male and 25 female elderly (aged >60 years) were selected. The standard and the most approved product was analysed for physical and chemical parameters.

Keywords: Non-dairy sandesh, geriatrics, degenerative diseases, functional food.

Introduction

Old age is not a disease but a biological process that no one can avoid. As age advances, several chronic diseases affect our health. Many of these like obesity, hypertension and diabetes are diet related and hence can be controlled and even prevented by modifying diet. These further compromise the quality of life in old age.⁽⁴⁾ Nutrition has emerged as a major modifiable determinant of chronic disease and age related decline. Physiological changes occur with aging in all organ systems. The cardiac output decreases, blood pressure increases and arteriosclerosis develops. The lungs show impaired gas exchange, a decrease in vital capacity and slower expiratory flow rates. The creatinine clearance decreases with age although the serum creatinine level remains relatively constant due to a proportionate age-related decrease in creatinine production. Functional changes, largely related to altered motility patterns, occur in the gastrointestinal system with senescence, and atrophic gastritis and altered hepatic drug metabolism are common in the elderly.⁽⁴⁾ Progressive elevation of blood glucose occurs with age on a multifactorial basis and osteoporosis is frequently seen due to a linear decline in bone mass after the fourth decade. The epidermis of the skin atrophies with age and due to changes in collagen and elastin the skin loses its tone and elasticity. Lean body mass declines with age and this are primarily due to loss and atrophy of muscle cells. Degenerative changes occur in many joints and this, combined with the loss of muscle mass, inhibits elderly patients' locomotion.⁽²⁾

An obsession with dessert is widely shared by the eighty million citizens of West Bengal. Many of the elderly people also have inordinate craving for sweet. According to The Times of India, West Bengal, around 8 percent of the nation's population, consumed half the country's sixteen billion rupees' worth of sweets in 2003. With time sweet making business went on flourishing and made the city sweet capital of the country. Chhana is a principal ingredient of sweet industry of Kolkata.⁽¹⁶⁾

Sandesh represents the traditional Indian dairy product used as sweet dairy desserts, Traditional method of sandesh making involves preparation of chhana, mixed with sugar (30-35% of chhana), kneaded and cooked at 70-75°C for 10-15 minutes. The cooked mass is transferred to moulds for desirable shape.

The traditional sandesh prepared by the addition of cow milk chhana and sugar was replaced by soymilk chhana and dates respectively, and for further enrichment pumpkin seed and watermelon seed was added to enhance the nutritional property of the sandesh.

Ingredients Used In Sandesh

Soybean (*Glycine max*): Soy is used for high cholesterol, high blood pressure & preventing diseases of the heart & blood vessels. It is also used for type 2 diabetes, asthma, lung function, all type of cancers (lung cancer, endometrial cancer, prostate cancer & thyroid cancer) as well as preventing weak

bone (osteoporosis). Women use soy for preventing hot flashes, menopausal symptoms and premenstrual syndrome.⁽⁸⁾

Dates (*Phoenix dactylifera*): Dates, the fruit of date palm, can be considered as an ideal food that provides a wide range of essential nutrients with many potential health benefits. The sugars in dates are easily digested and can quickly metabolized to release energy for various cell activities.⁽¹⁾

Pumpkin Seeds (*Cucurbita*): Pumpkin seeds have become more popular as a medical treatment for urinary complaints associated with benign prostatic hyperplasia (BPH).[10] Pumpkin Seeds are rich in minerals, calories and protein. Pumpkin seeds are a concentrated source of iron, zinc and magnesium and contain omega 6 and omega 3 fats. They are also high in fibre.⁽⁵⁾

Watermelon Seed(*Citrullus lanatus*): Watermelon seeds are known to be highly nutritional, they are rich sources of vitamins B, minerals (such as magnesium, potassium, phosphorous, sodium, iron, zinc, manganese and copper) and fat as well as phytochemicals. In spite of the various potential applications, the watermelon seeds are often discarded while the fruit is eaten.⁽¹³⁾

Keeping all these in mind the objective of the study was to develop a sweet which is soft, easily digestible and nutrient dense for geriatric population.

Methodology

The present study was undertaken to study the sensory evaluation of Sandesh enriched with soymilk, dates, pumpkin seeds and watermelon seeds on geriatric population. The preparation of the product was conducted in the college laboratory of J. D. Birla Institute set up. Initially, the evaluation of the product with variations was done by 50 panel members comprising of 25 male and 25 female old people of St Joseph's Old Age Home. All the recipes were evaluated by the same panel members. Source of – All the ingredients of the Sandesh were collected from good source raw materials of department stores in Central Avenue.

Product Development: Flow diagram for Industrial production of Sandesh from cow milk

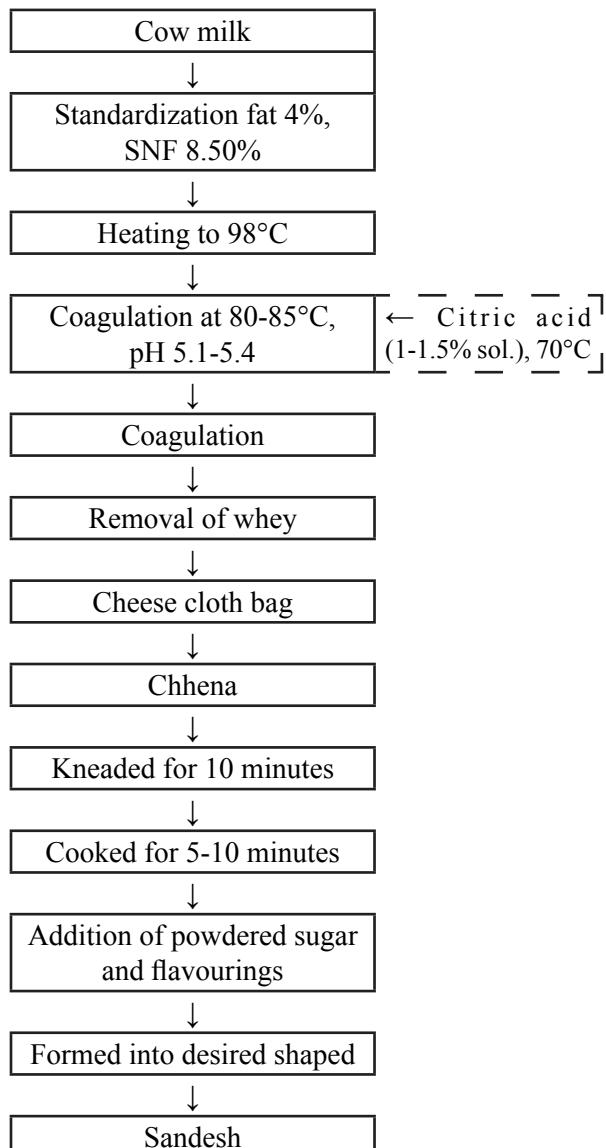


Figure 1: Flow sheet for preparation of Sandesh

The Sandesh was incorporated with varying proportions of dates syrup, watermelon seeds and pumpkin seeds to the recipe in the laboratory of J. D. Birla Institute.

Table1:Variations of Sandesh

Product Code	Additional Ingredients							
	cow milk chhena	soy milk chhena	powdered sugar	dates syrup	cardamom powder	watermelon seeds	pumpkin seeds	rose water
Product B	20gm	-	5gm	-	1.25gm	-	-	5ml
Product S	-	20gm	5gm	-	1.25gm	-	-	5ml
Product A1	-	20gm	-	5ml	1.25gm	-	-	5ml
Product A2	-	20gm	-	10ml	1.25gm	-	-	5ml
Product A3	-	20gm	-	15ml	1.25gm	-	-	5ml
Product B1	-	20gm	-	10ml	1.25gm	5gm	-	5ml
Product B2	-	20gm	-	10ml	1.25gm	10gm	-	1.25ml
Product B3	-	20gm	-	10ml	1.25gm	15gm	-	1.25ml
Product B4	-	20gm	-	10ml	1.25gm	20gm	-	1.25ml
Product B5	-	20gm	-	10ml	1.25gm	25gm	-	1.25ml
Product C1	-	20gm	-	10ml	1.25gm	10gm	5gm	1.25ml
Product C2	-	20gm	-	10ml	1.25gm	10gm	10gm	1.25ml
Product C3	-	20gm	-	10ml	1.25gm	10gm	15gm	1.25ml
Product C4	-	20gm	-	10ml	1.25gm	10gm	20gm	1.25ml
Product C5	-	20gm	-	10ml	1.25gm	10gm	25gm	1.25ml

Sensory Evaluation: Attributes to be scored was appearance, colour, flavour, texture, taste and overall rating. Each variation of Sandesh was placed in a plate with corresponding codes such as A1, A2, A3, B1, B2, B3, B4, B5, C1, C2, C3, C4 and C5. A sensory evaluation sheet (Appendix) was also kept. The panel members were briefed with the process of evaluation. They strictly asked not to discuss or communicate during the process of evaluation. Acceptability of recipes was evaluated from the ratings obtained through the score card using 9 point hedonic scale during the sensory evaluation. The sample with the maximum score in each recipe was identified as most acceptable variation.

Chemical analysis: Chemical analysis of the standard (S) and most approved variation (C2) was performed. Proximate analysis: Estimation of protein was done by Biuret method, estimation of total Carbohydrate by Anthrone method and

estimation of fat by Rose Gottlieb method.^(7,17,19)

Mineral analysis: Estimation of calcium by OCPC method, estimation of iron by Ferrozine method and estimation of phosphorus by Molybdate U.V method.^(14,18)

Antioxidant analysis: Determination of total antioxidant activity by DPPH, Determination of total phenolic content by folin-ciocalteu reagent.⁽¹⁵⁾

Statistical Analysis: The standard deviation and student t test was done of all the sensory attributes of the standard variation and most approved variation. The mean score was also estimated for the most approved variation with the standard recipe.⁽²⁰⁾

$$\text{Calculation: } t = \frac{(\bar{x}_1 - \bar{x}_2)}{\sqrt{(s_1)^2 / n_1 + (s_2)^2 / n_2}}$$

Where,

\bar{x}_1 = is the mean of the standard

s_1 = is the standard deviation of the standard

n_1 = is the no. of individuals in standard

\bar{x}_2 = is the mean of the most approved

s_2 = is the standard deviation of the most approved

n_2 = is the no. of individuals in most approved

Result and Discussion

Sensory evaluation of basic and standard:

Acceptability of recipes was evaluated from the ratings obtained through the score card using 9 point hedonic scale during the sensory evaluation. Product B is the basic recipe whereas product S is the standard recipe with the maximum score identified.

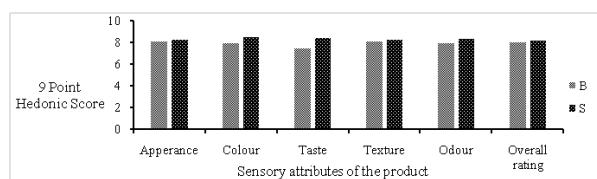


Figure 2- Comparison of the Sensory Evaluation of Basic and Standard Recipe. B- 20 g cow's milk chenna+5g sugar+1.25 g of cardamom powder+1.25ml rose water. S-20g soy milk chenna+5g sugar+1.25 g of cardamom powder+1.25 ml rose water

Figure 2 depicts a comparison between the sensory evaluation of basic product (B) and standard product (S) by respondents. The hedonic score for appearance, colour, taste, texture, odour and overall rating was obtained. Panel member often look at a product and make a decision largely based on appearance at first sight. The appearance of the standard recipe was a light yellow colour which gave the product an appealing look, better taste and colour. Cardamom, rose water and sugar improved the taste, cardamom pod is split open to expose underlying seeds with fingers and then crushed before adding to Sandesh which gives a refreshing, and unique taste. The beany flavour of soymilk is the result of the action of an enzyme called lipoxygenase which was removed during processing which resulted in removal of off flavour from the soymilk Sandesh.

The standard product scored better than the basic in terms of taste, texture, odour, colour, appearance and overall rating this was because the panel member appreciated the new innovative product.

This standard recipe of sandesh with sugar was then replaced by the dates syrup and variations was done to check the acceptability of different concentration

of dates syrup. A2 variation was the most acceptable amongst all. Further the product was fortified with watermelon seed and variations were done to check the acceptability of different amount of watermelon seed, where B2 scored the best. Furthermore pumpkin seed was added and different variation was done to check the acceptability level where C2 was the most appreciated product among all in terms of appearance, texture, colour, flavour, taste and overall rating.

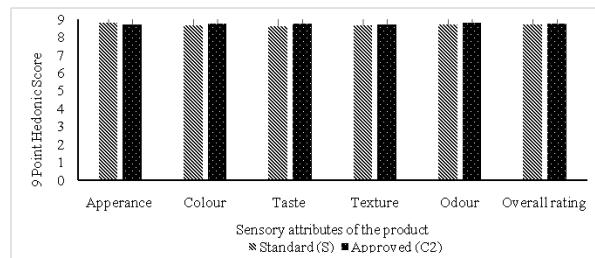


Figure 3- Comparison of student t test of sensory attributes of standard(S) and most approved variation (C2).

S-20g Soymilk chenna+1.25g cardamom powder+1.25ml rose water+10ml dates syrup, C2-20g Soymilk chenna+1.25g cardamom powder+1.25ml rose water+10ml dates syrup+5g watermelon seeds+5g pumpkin seed

When the mean score of the sensory attributes of the standard (S) was compared with the most approved variation (C2), there was no significant difference observed. This can lead to higher acceptability of the product.

From figure no 4, it can be concluded that the protein content of the standard (S) is 8.5 gram and most approved product (C2) is 10.2 gram respectively. Product S is the standard recipe having soybean chenna as the only source of protein. In the most approved product C2 apart from soybean chenna (43.2gm/100gm), watermelon seeds (34.1gm/100gm), pumpkin seeds (24.3gm/100gm) and dates are added to enhance protein content. Soybean proteins contain all amino acids essential to human nutrition, which makes soy products almost equivalent to animal sources in protein quality but with less saturated fat and no cholesterol.⁽¹¹⁾

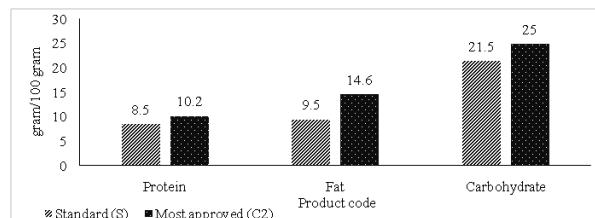


Figure 4- Comparison of protein, fat and carbohydrate content of standard (S) and most approved product (C2)

In old age there is a reduction in other physiologic proteins such as organ tissue, blood components, and immune bodies which contributes to impaired wound healing, loss of skin elasticity, and an inability to fight infection. The protein in dates contains 23 types of amino acids. Watermelon seed is high in citrulline and arginine. Pumpkin seed is a good source of L- tryptophan which reduces depression; it gets converted into serotonin and niacin, which aids in sleeping, thereby beneficial for geriatrics.

The total carbohydrate content of product standard (S) and most approved product was 21.5 gram and 25 gram respectively. The carbohydrate content of the most approved product was more as the sugar in the standard product was replaced with the dates syrup. Dates are ideal fruits to substitute added sugar in foods. The sugars in dates are easily digested and can quickly be metabolized to release energy for various cellular activities. Dates are rich in dietary fiber, phenolic compounds, minerals, vitamins and antioxidant compounds. A study on dates reported that the dietary fiber content of dates ranged from 8.1 to 12.7% per 100g. (1) The presence of insoluble fibers such as cellulose, hemicellulose, pectin, and lignins in dates, reduces the chances of bowel cancer and increases cardiac vitality and it can help to regulate the digestive system.

The standard (S) and most approved (C2) have 9.5 grams and 14.6 grams of fat content in 100 grams of Sandesh. Fat percentage is a very important constituent of the sweets. It gives a better texture to the finished product and also improves the flavour and taste. The fat content of the most approved was more when compared to the standard due to the addition of watermelon seed and pumpkin seeds. Soy bean has low saturated fat content with high amount of polyunsaturated fat and is a readily available source of essential fatty acids. Watermelon seed is cholesterol free. (9) The hypolipidaemic functions of watermelon seed extracts is be due to its ability to induce regeneration of the beta cells of the Islet of Langerhans in the pancreas and potentiation of insulin secretion from surviving beta cells. The increase in the insulin secretion and consequent decrease in blood glucose levels may lead to stimulation of fatty acid biosynthesis and also incorporation of fatty acid into triglyceride in the liver and adipose tissues. In the presence of insulin, action of enzyme lipase will be inhibited thereby arresting the mobilization of fatty acids by glucagon and hence decrease in the plasma levels

of fatty acids will be observed.⁽³⁾ Pumpkin seeds, are one of the best sources of plant-based omega-3 (alpha-linolenic acid), which helps to lower total as well as LDL and increase HDL levels in blood. Fat provides energy and assist the absorption of essential nutrients such as vitamins A, D, E, K, and carotenoids.⁽⁵⁾ The ingredient added in sandesh contain monounsaturated and polyunsaturated fats which reduces the risk of heart disease owing to the anti-inflammatory property and cholesterol lowering effect which is beneficial for the elderly population.

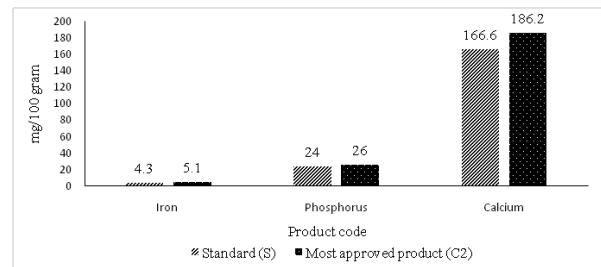


Figure 5- Comparison of iron, phosphorus and calcium content of the standard (S) and most approved product (C2)

From 5, it can be concluded that the iron content of standard (S) and most approved (C2) is 4.3 mg and 5.1 mg per 100 gram respectively. Increase in the iron content can be due to the addition of dates (1mg/100mg), pumpkin seed (5.5mg/100mg) and water melon seed (7.4mg/100mg). Iron deficiency anaemia is prevalent in old age, particularly after the age of 80. Serum ferritin concentrations also decline. Soybean (10.4 mg/100g) contains ferritin, a multimeric iron storage protein. The iron from soybean ferritin is easily absorbed which helps to prevent the risk of anaemia in old age and prevents undesirable health outcomes, including increased susceptibility to fall and depression. Dates contain thiamine, riboflavin, niacin, and pantothenic acid. These vitamins and minerals help the body produce haemoglobin, which is a protein in red blood cells that binds to oxygen and carries oxygen from the lungs to tissues.

The calcium content of standard (S) and most approved (C2) is 166.6mg and 186.2mg respectively. The calcium content of the most approved (C2) was more due to the addition of functional ingredient such as dates, pumpkin seeds and watermelon seed. 100g of dates, pumpkin seed and watermelon seed contains 22mg, 50mg and 100mg of calcium respectively. Calcium helps to ease insomnia and helps regulate the passage of nutrients through cell walls, without calcium the muscles in the body cannot contract correctly. Diet deficient in

calcium can result in the uptake of calcium from the bones leading to bone resorption. In order to absorb calcium, nutrients such as magnesium, and copper is required which aids in bone formation. Soymilk contains 12 times the amount of copper and 42 times the amount of manganese as compared to cow milk which is needed for bone formation. The isoflavones daidzein and genistein, found in significant amounts only in soybean and soy foods, may directly inhibit bone resorption thereby reducing the risk of osteoporosis in the elderly population. Furthermore watermelon seed contains significant amounts of lysine, which plays an important role in calcium absorption and formation of collagen and connective tissue in body. Pumpkin seeds contain a significant amount of zinc, it act as natural protector against osteoporosis, since zinc deficiencies can lead to higher rates of osteoporosis.⁽⁶⁾

The result obtained in this study of phosphorus content is shown in figure 5, the standard (S) and most approved (C2) contains 24mg and 26mg respectively. The phosphorus content of the most approved was more due to the addition of pumpkin seed and water melon seed. 100 g of pumpkin seed and watermelon seed contains 830mg and 937mg of phosphorus. The main function of phosphorus is in the formation of bones and teeth. It plays an important role in how the body uses carbohydrates and fats. It is also needed for the body to make protein for the growth, maintenance, and repair of cells and tissues. Phosphorus also helps the body make ATP, a molecule the body uses to store energy. Soybean contains phosphorus, which help to strengthen teeth and prevent nerve disorder. Soybean consumption on regular basis delays the ageing process.

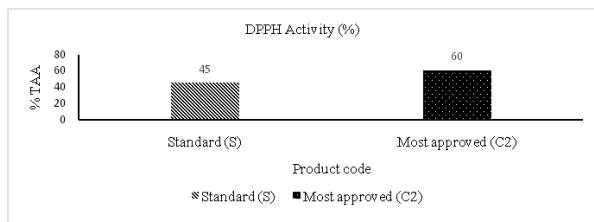


Figure 6- Comparison of total antioxidant activity of standard (S) and most approved (C2)

From the above figure no 6, it can be concluded that total antioxidant activity of the standard and most approved one is 45% and 60% respectively. In old age inflammation and decrease in the immune system to fight against them is predominant which in turn increases the formation of free radical in the body leading to several serious or life-threatening

diseases and health problems including heart disease, cancer, immune dysfunction, diabetes, and degenerative brain disorders (including dementia and Alzheimer's disease). Antioxidants are known to quench free radicals, thus are essential components of anti-ageing formulation.⁽¹⁵⁾ Consumption of the pumpkin seed and water melon seed reduces the risk of getting cardiovascular diseases and cancers due to the appreciable amount of total phenols and vitamin E present, they act as a protective mechanism against the free radical. Dates have highest concentration of polyphenols (3942 mg/100g) among dried fruits. The antioxidant activity of phenolic compounds is a result of their redox properties which play an important role in absorbing and neutralizing free radical.

Conclusion

Sandesh is very popular in eastern parts of India and forms the part and parcel of social life, ceremonies and festivals. It is soft and can be easily digested. Soybean protein is one of the least expensive source of dietary protein and is considered to be a good substituent for animal protein, according to the standard for measuring protein quality, soy milk protein has a biological value of 91. Thus the traditional sandesh prepared from cow's milk chenna was substituted with soy milk chenna. The sugar added in the traditional sandesh was replaced with dates syrup. Further the product was fortified with seeds (pumpkin seed and watermelon seed) which are good source phytosterols which reduces the risk of heart diseases. Thus the product was made keeping in mind the nutritional requirements of the geriatrics. The most approved product was variation C2 as concluded after sensory evaluations, using the 9 point hedonic scale method with the help of the panel members. One serving (50g) of the product provides 5.1g of protein, 12.5g of carbohydrate, 7.3g of fat, 2.55mg of iron, 93.1mg of calcium, 13mg of phosphorus and the total antioxidant activity (%) was 30 %. Thus it can be concluded the sandesh fortified with soya milk chenna, dates, pumpkin seeds and watermelon seeds can prove beneficial for the overall health of elderly population and also reduce the risk of morbidity.

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Development of Nutritive Biscuit by Incorporating Soy Flour and Mushroom Powder for Women

Debanjana Saha and Jincy Abraham

ABSTRACT

The current study intended to explore the possibility of fortifying biscuits with soy flour and mushroom powder to formulate a functional biscuit which has the ability to improve the quality of life among women in general. Addition of soy flour and mushroom powder in whole wheat flour and wheat bran was done at the proportion of (40:40:15:5), (35:35:20:10), (30:30:25:15), (25:25:30:20), (20:20:35:25), (15:15:40:30). Prepared biscuits were subjected to physical, sensory and nutritional analysis to evaluate the suitability of the biscuits for consumption. The width and diameter of the most accepted biscuit was measured to be 5.564 cm and 0.44 cm respectively. Nine-Point Hedonic scale System was used for sensory evaluation of prepared biscuit. From overall sensory evaluation rating, 30% soy flour + 20% mushroom powder incorporated biscuit obtained the highest rating compared to other variations. Nutritional evaluation of best rated supplemented biscuit gave results as carbohydrate (64%), protein (10.79%), fat (19%), fiber (29.92%), ash (23.65%), moisture (6.3%), vitamin D (24mcg/100g), calcium (49 mg/kg). Also the isoflavon content of the product was assumed to be 51.76 mg per 100 gm of product. The cost of the product was also estimated worth Rs 40/ 100gm of product which is also quite economical comparing with other commercially available nutritive biscuits. Shelf life of the developed nutritive biscuit was estimated to be 23 days. Thus supplementation of soy flour and mushroom powder at 30% and 20% level respectively, would improve the nutritional quality without adversely affecting the sensory parameters.

Keywords: nutritive biscuit, soy flour, mushroom powder, women

◆ Introduction

Women of different age groups require different nutritional care. A woman's health in her total well-being is not determined solely by her biological factors and reproduction, but also by effects of work load, nutrition, stress, war and migration, among others.

Obesity negatively impacts the health of women in many ways. Being overweight or obese increases the relative risk of diabetes and coronary artery disease in women. Obesity negatively affects both contraception and fertility as well. Maternal obesity is linked with higher rates of cesarean section as well as higher rates of high risk obstetrical conditions such as diabetes and hypertension. Adequate fiber intake promotes a healthy weight, and prevents heart disease, type 2 diabetes, cancer, constipation and diverticulosis. The Recommended Daily Allowance for women 50 years of age and older is 21 grams of fiber per day. However, the RDA may not be adequate to prevent diabetes, weight gain, or heart disease. Increasing all high fiber foods, including replacing refined carbohydrates with whole grains, improves endothelial function and possibly decreases inflammation. Obesity is inversely associated with fiber intake and decreased visceral fat (without weight loss) is seen in intervention studies. Viscous fiber (oats, barley) decreases low-density lipoprotein (LDL) and Blood Pressure and improves insulin responses. Insoluble fiber moderately lowers blood

glucose and Blood Pressure. The prebiotic effect of resistant carbohydrates varies by the type of grain but may affect caloric availability and improve both lipid metabolism and glycemic control.^(17,13)

A major cause of disability for women is osteoporosis. Osteoporosis reduces the quality of bone, making it porous. Calcium is crucial for preventing or treating osteoporosis and may reduce hypertension. Only 4% of women meet the RDA for calcium. Even though supplements of calcium are often necessary to meet the RDA, dietary sources of calcium provide many essential nutrients, unlike supplements, which provide calcium alone or in combination with only a few other nutrients. For example, dark, leafy greens provide fiber, potassium, and folic acid in addition to calcium. Vitamin D also plays a major role in treating osteoporosis and maintaining good bone health. It is a fat-soluble vitamin that is naturally present in few foods and added to others like fortified milk, fish, eggs and mushrooms. It is also produced endogenously when ultraviolet rays from sunlight strike the skin and trigger vitamin D synthesis.⁽⁴⁾ Mushrooms are the only vegetable that contain natural vitamin D. They contain a compound called ergosterol that is turned into vitamin D in the body.⁽⁵⁾

Menopause is another factor which affects women health and life style to a great extent. It begins between the ages of 45 to 55 for most women, and it is defined by the lack of a menstrual cycle for 12

months. Food and nutrition play significant roles in the health and quality of life of menopausal women. The symptoms of menopause vary among women. Reported symptoms include weight gain, loss of muscle mass, increased abdominal weight gain, mood changes, hot flashes, night sweats, anxiety, dry skin, irregular menstrual bleeding, memory problems, and reduced libido.(12) The most studied of the botanicals for menopause-related conditions are isoflavones, sometimes called phytoestrogens. They are plant-derived compounds with estrogen-like biologic activity and a chemical structure similar to that of estradiol. Soy is the most widely used isoflavone-containing food. The term soy usually refers to a product derived from the whole soybean (or soya bean). Soy protein refers to a product derived by extracting the protein out of the whole bean. Soy protein is usually a rich source of isoflavones. The primary isoflavones of soybeans are genistein, daidzein, and glycinein.⁽²³⁾

Soyabean is an excellent source of protein (35-45%) (20)with all essential amino acids required for proper growth and maintenance of body. Beside this, it is high in vitamin, mineral and antioxidant like Isoflavones which helps in cholesterol reduction, preventing cancer and regulation of menopause. The main ingredients of any bakery products is wheat, which is having deficiency of essential amino acid lysine (3, 8, 16).Whereas soyabean is richer in lysine and can be complement to wheat in bakery products. Soyabean protein is more economical than high priced meat protein and so they are considered as best source of protein especially in vegetarian diet.⁽¹⁵⁾

Methodology

Selection of Place: The preparation and evaluation process were done in food laboratory and the chemical analysis was done in the chemistry laboratory of J. D. Birla Institute. Besides this chemical analysis were also done in NABL accredited laboratories outside the institute like SGS India Private Limited (Joka) and Mitra S.K Private Limited (Maniktala). Samples were also sent to Qualissure Laboratory Services (Kasba) for analysis.

Collection of raw materials: Raw materials for the preparation of standard biscuit recipe were collected.

- ◆ Refined flour/ blend (whole wheat flour and wheat bran)
- ◆ Sugar powder
- ◆ Vegetable oil/shortening
- ◆ Skim milk powder

- ◆ Glucose
- ◆ Ammonium bicarbonate
- ◆ Common salt
- ◆ Baking powder
- ◆ Sodium bicarbonate
- ◆ Vanilla flavor.⁽²¹⁾

Product development: The raw materials are collected in proper amount. Water as required for proper consistency. Sugar, fat and flavor (vanilla) were creamed in a mixer. To this, a well-mixed blend of wheat flour, skim milk powder and baking powder was added along with water containing glucose, common salt, ammonium bicarbonate and sodium bicarbonate. All composites were sifted through 60 mesh sieve to obtain uniform mixing. The contents were mixed further for 2 minutes to make the dough. Using a wooden rolling pin, the dough was sheeted on a specially fabricated aluminium platform to a uniform thickness. Circular biscuits were cut and baked for 8-9 minutes at 200 °C in a baking oven.⁽²¹⁾

The amount of soy flour and mushroom powder added in the basic product is mentioned in the following table.

Product Code	Additional ingredients			
	Whole Wheat Flour	Wheat Bran	Soya Flour	Mushroom Powder
Variation A	40gm	40gm	15gm	5gm
Variation B	35gm	35gm	20gm	10gm
Variation C	30gm	30gm	25gm	15gm
Variation D	25gm	25gm	30gm	20gm
Variation E	20gm	20gm	35gm	25gm
Variation F	15gm	15gm	40gm	30gm

Sensory evaluation: Sensory evaluation was performed to evaluate attributes like colour, appearance, texture, taste, odour and overall rating. Each variation of biscuit was presented with the code of Basic, A, B, C, D, E, F. Acceptability of recipes were evaluated from the ratings obtain through the score card using 9 points hedonic scale by 30 panel members during sensory evaluation. The sample with maximum score in each recipe was identified as most acceptable product.

Chemical analysis: Chemical analysis was performed on the basic and best products as chosen by the panel members. Both products were chemically analysed for the following nutrients –

- ◆ Protein by Kjeldahl Method⁽¹⁾
- ◆ Fat by Soxhlet method⁽²⁾
- ◆ Carbohydrate by Anthrone method⁽⁷⁾
- ◆ Dietary fibre by AOAC Official Methods 19th Ed, 2012. 986.29,
- ◆ Moisture and ash content by the standard method of (AOAC, 2000)⁽¹⁸⁾
- ◆ Calcium by EDTA method⁽⁶⁾
- ◆ Vitamin D by High-performance liquid chromatography⁽²²⁾
- ◆ Isoflavon content⁽²³⁾

Physical analysis: The most accepted product was analyzed for width and thickness by following the procedure of AOAC (2000).⁽¹⁸⁾

Shelf life: Shelf life of the product is estimated by keeping the most accepted biscuit sample in an air tight container in room temperature until there is any onset of deterioration in the color, texture, taste, odour and appearance.

Cost estimation: The cost estimation was done for the standard and most acceptable product.

Results and Discussion

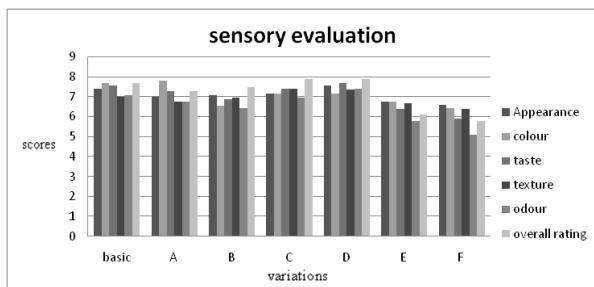


Figure 1 Result of comparison of sensory evaluation scores between the basic product and different variations of nutritive biscuit incorporated with soy flour and mushroom powder.

Sensory evaluation:

Sensory analysis is carried out by using 30 panelists to measure sensory characteristics like senses of appearance, color, taste, texture, odour and overall acceptability of food product. Sensory rating of biscuit for appearance shows that product D (7.53) ranked at top due to excellent appearance, followed by basic (7.4) & product C (7.13). While product A (7.78) got the maximum rating for colour. The mean score of colour had been decreased from 7.66 to 6.43. With increasing level of substitution the color of biscuit turned from light brown to dark brown, leading to lower acceptance. The darker colour may

be due to the non enzymatic reaction (Maillard reaction) between reducing sugar molecules and lysine amino acid. Soyabean and rice bran are reported to be rich in lysine which produces darker shades of brown colour (24). Mean score of taste had been decreased from 7.53 to 5.9 with increasing level of substitution. Mean for taste shown in Figure 1 revealed that the product D had highest score (7.67) followed by basic (7.53) and product C (7.4). Mean score for odour of biscuit had been decreased from 7.06 to 5.07 with increasing level of substitution. Mean for odour shown in figure 1 revealed that the panel members ranked product D (7.4) at top position followed by basic (7.06) product C (6.93). This could be due to the ingredients involved while baking. There are a series of chemical reactions that take place during the baking process which also contributes to the pleasant odour developed. Mean score of texture had been decreased from 7 to 6.36 with increasing level of substitution. Overall acceptability was determined on the basis of quality scores obtained from the evaluation of appearance, color, taste, texture, odour and texture of the biscuit. The mean regarding overall acceptability of biscuit are shown in figure 1 revealed that the overall acceptability of product D (30 % soya flour+20 % mushroom powder) was highest while product F has lowest acceptability with maximum level of substitution. The decrease in overall acceptability was due to decrease in appearance, color, flavor, and taste texture score. Considering the above results of sensory evaluation variation D was chosen as the most acceptable product among all the 6 variations. It contains 30 gm of soy flour and 20 gm of mushroom powder.

Chemical analysis

Moisture content: The total moisture content of the most accepted product (6.3%) is slightly lower than the basic product (6.5%). According to USDA (United States Department of Agriculture) report, the moisture content of wheat bran (9.89%) is higher than soy flour (5.16%). (9,10) The reduction in the amount of wheat bran (25g) is the reason for the reduction of moisture content in the most accepted product.

Ash content: The total ash content of the standard product (25.3%) is slightly higher than most accepted product (23.65%). According to USDA (United States Department of Agriculture) report, wheat bran (5.79 %) has higher mineral content as compared to soy flour (4.46%) and whole wheat flour. (9-11) The basic product contains 50 gm of

wheat bran, where product D contains only 25gm as it is substituted with soy flour and mushroom powder. The decrease in mineral content could be due to the reduction of wheat bran fraction of the blended flour in the developed product.

Total carbohydrate content: The total carbohydrate content of the basic product is higher (78 g) than the most accepted product (64g) per 100 gm of product. Because according to USDA (United States Department of Agriculture) report, the total carbohydrate content of whole wheat flour (70%) and wheat bran (64.51%) is higher than soya flour (31.92%) and mushroom powder.(9-11) The basic product contains 50 gm of both whole wheat flour and wheat bran, where the most accepted developed product contains less amount of whole wheat flour and wheat bran (25 gm each) as it is substituted with soy flour and mushroom powder. Hence, product D contains less carbohydrate than the basic product. As the nutritive biscuit is also intended for the women with diabetes and heart diseases, thus this level of carbohydrate is desirable.

Protein content: The protein content of the most preferred nutritive biscuit has higher protein content (10.79) than the basic product (7.67). The protein content of the biscuit increased with the increase in supplementation. The increase in protein content could be due to the soya fraction of the blended flour as according to USDA (United States Department of Agriculture) report, soy flour has higher protein content (37.81%) as compared to wheat bran (15.55%) and wheat flour (13.33%).(9-11) Soyabean is an excellent source of protein & a complement to lysine-limited cereal protein. Addition of soy flour improves the quantity & quality of protein content of the food product, thereby has the great potential in combating protein energy malnutrition.

Fat content: The most accepted nutritive biscuit has higher fat content (19g) than the basic (15g). The increase in fat content could be due to soya fraction of the blended flour as according to USDA (United States Department of Agriculture) report, this ingredient is rich in oil (20.65%).⁽⁹⁾ The oil of soybean contains 85% unsaturated fatty acid which includes 61% of polyunsaturated fatty acid and 24% of monounsaturated fatty acid. Polyunsaturated fats include the linoleic & linolenic acids that are not produced in the body but essential for proper development and maintenance of human health.⁽¹⁸⁾

Dietary fibre content: The fibre content of the basic

and most accepted product (product D) are 27.9 % and 29.92 % respectively per 100 gm of product. That is because of the addition of whole wheat flour, wheat bran and soy flour all together, which are good sources of dietary fibre.

Calcium content: The calcium content of product D (49mg/kg) is higher than the basic product (40mg/kg). The calcium content of the biscuit increased with the increase in supplementation. The increase in calcium content could be due to the soya fraction of the blended flour as according to USDA (United States Department of Agriculture) report, soy flour contains higher amount of calcium (206 gm) than whole wheat flour (34g) and wheat bran (73g) per 100g of product.⁽⁹⁻¹¹⁾

Vitamin D content: Product D contains 23.92mcg/100gm of vitamin D which is mainly due to the addition of sundried mushroom powder (20g). Mushrooms are one of the plant foods which contain ergosterol, a precursor to vitamin D2. The amount of vitamin D2 in mushrooms can be significantly increased by exposing to sunlight. (19) The adequate intake of vitamin D for adults to age 70 is 15 mcg (600 IU) per day(14) and consumption of 4-5 biscuit a day can meet ½ of the requirement of vitamin D for an adult person.

Isoflavon content: The isoflavan content of soy foods can vary considerably depending on growing conditions and processing. Soy flour (textured) generally contains 172.55 mg of isoflavan per 100g.(23) In variation D amount of soy flour used was 30 gm. So, it can be roughly said that product D contains near about 51.765 mg of isoflavan per 100 gm.

Physical analysis: The result of the physical analysis of the nutritive biscuit produced from whole wheat flour, wheat bran, soy flour and mushroom powder blends shows that the supplementation of various levels of soy flour and mushroom powder has a significant effect on width and thickness of the biscuits. The result obtained agreed with result reported by Neha Mishra and Ramesh Chandra (18). The width of the most accepted biscuit (5.564 cm) is lower than the width of the standard product (5.701cm). It decreases with increasing in the level of substitution of soy flour and mushroom powder. However, biscuit thickness increases with increasing level of substitution. The result shows that product D (0.44 cm) has higher thickness than the basic product (0.39 cm).

Shelf Life Study: The most accepted product and the basic product were stored in an air tight container in room temperature. The most approved product was spoilt quicker than the basic product within 23 day since there was an addition of soy flour and mushroom powder which can lead to rancidity. Prolonged storage under ambient condition adversely affects the different attributes such as taste, smell, texture, colour which decreases the acceptability of the product.

Cost Estimation: Cost of the basic and most accepted product was estimated. It was seen that cost of the most accepted product was higher than the basic product due to the inclusion of the additional ingredients, soy flour and mushroom powder in the developed product. Cost of product D is Rs. 40. However, the developed product is cheaper than other commercial nutritive biscuit available in the market.

Conclusion

It is evident from the experiment that biscuit can be made with substitution of soy flour & mushroom powder upto 30 % and 20% respectively without adversely affecting the sensory characteristic of biscuit. This functional biscuit is nutritionally more superior to that of biscuit solely prepared by whole wheat flour and wheat bran. It can be used as a vehicle for protein fortification due to addition of soy flour. Soy flour also contains high amount of isoflavon which helps to treat the menopausal symptoms and breast cancer amoalso contains good amount of protein which is helpful in the treatment of osteoporosis. In the addition the presence of mushroom powder supplies sufficient amount of vitamin D which supports the better absorption of calcium and itself helps to treat bone related complications.

Hereby it is concluded that the nutritive biscuit incorporating soy flour and mushroom powder is accepted by all panel members and its primary objective of incorporating soy flour and mushroom powder into the biscuit is fulfilled nutritionally.

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Development and Assessment of Antioxidant Rich Savoury Cake

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ABSTRACT

Antioxidants are an inhibitor of the process of oxidation, even at relatively small concentration and thus have diverse physiological role in the body. Fruits and vegetables are very important source in the diet because they provide several vital vitamins and phytochemicals. In fruit processing industry, large volumes of peels are dumped and thrown as waste material which can be used for therapeutic purpose. This study involves the development of wholesome, nutritious, savoury cake with inclusion of Citrus peels (Citrus limon peel and Citrus limetta peel individually as well as in combination) for enriching its antioxidant, phytochemicals, and hence overall nutritive value which are required by the entire population for its potential health benefits. Chemical analysis was conducted for the standard product and approved products selected on the basis of sensory evaluation results. The highest moisture content was found in the product (C2) containing 15 gram of Citrus limon, while ash content was found to be highest in the product (C3) containing 7.5 gram each of Citrus limetta peel and Citrus limon peel. The protein content was highest in product C2 and C3; the fat content was highest in product (C1) containing 15 gram of Citrus limetta peel; and carbohydrate content was highest in product C2. The ascorbic acid, beta-carotene, and total phenolic content were found to be highest in product C3. Product C3 containing the combination of peels (7.5 gram each) also exhibited highest free radical scavenging activity. Therefore, from the study it was found that citrus peels were helpful in increasing the antioxidant content of the product.

Keywords: Antioxidant, citrus peels, phytochemicals.

Introduction

Antioxidant is a stale molecule which can decrease the oxidative damage directly via reacting with free radicals or indirectly by inhibiting the activity or expression of free radical generating enzymes or enhancing the activity or expression of intracellular antioxidant enzymes. Antioxidants act as radical scavenger, hydrogen donor, electron donor, peroxide decomposer, singlet oxygen quencher, enzyme inhibitor, synergist, and metal-chelating agents.⁽¹³⁾ Almost all organisms possess antioxidant defence and repair systems, but these systems are insufficient to prevent the damage entirely. For this reason, dietary supplementation is necessary to strengthen the intrinsic protection systems. There are growing interests in using natural resources as antioxidants for preventive and therapeutic medicine. It has been postulated that a network of antioxidants with different chemical properties may work in a synergistic way, protecting cells from damage. Without the necessary intake of antioxidants, free radicals can spread and eventually lead to stroke, heart attack, arthritis, vision problems, Parkinson's disease, Alzheimer's disease and various types of cancer.⁽⁶⁾

Citrus belonging to the largest genus in the family Rutaceae is the most traded horticultural product in the world. Citrus contain a variety of vitamins, minerals, fiber, and phytochemicals such as carotenoids, flavonoids, and limonoids, which

appear to have biological activities and health benefits. The main industrial transformation of citrus is focussed on juice production which results in the accumulation of huge amounts of by-products that account for about the half of the fruit weight. The industrial by-products contain peels, seeds and pulp membrane residues. Citrus peel, which is generally thrown away, contains a wide variety of secondary components with substantial antioxidant activity in comparison with other parts of the fruit. (14) Much of the total antioxidant activity of citrus peel is related to their phenolic content, not only to their vitamin C content, also, a correlation exists between the polyphenol content and antioxidant activities. Hence, the aim of this study is to use citrus peel into a healthy savoury cake to enrich it with antioxidants which will help to foster health-related benefits.

Methodology

Sample collection: Fresh citrus fruits (Citrus limetta and Citrus limon) were purchased from local market. Citrus peels were finely grated from the fresh citrus fruits.

Reagents required: Bovine Serum Albumin (BSA), Biuret reagent, Anthrone reagent, petroleum ether, 2,6-dichloro indophenol dye, metaphosphoric acid, Folin-Ciocalteau reagent, DPPH (2,2-diphenyl-1-picrylhydrazyl) reagent.

Product Development: Standard recipe of savoury

cake was chosen for development.⁽³⁾ Different variations were tried by incorporating two different citrus peels, i.e., Citrus limetta peel and Citrus limon peel with varying amounts of 5 gram, 10 gram, 15 gram, 20 gram, and 25 gram individually as well as in a combination (equal amounts) in the standard recipe of savoury cake.

Sensory Evaluation: Savory cake were made with different variation and sensory evaluation performed by 20 panel members of J.D Birla Institute, Kolkata. Attributes to be scored were colour, appearance, flavour, texture, taste and overall rating. A sensory evaluation sheet was placed. The panel members were briefed with the process of evaluation. Acceptability of recipes was evaluated from the ratings obtained through the score card using 9 point hedonic scale during the sensory evaluation and comparative study between the products was done.⁽⁷⁾

Nutrient and Antioxidant Analysis: The standard and accepted products by sensory evaluation were chemically analysed for their moisture content, total ash, protein, fat, total carbohydrate, vitamin C, beta carotene, phenolic compounds, and DPPH radical scavenging activity.

Determination of moisture and ash content: Moisture content of the products was determined by drying sample in a pre-weighed crucible in a hot air oven at 130°C for two hours. Ash content of the products was determined by placing the measured amount of sample in a pre-weighed crucible in a muffle furnace at 600°C for 3 hours.⁽²⁾

Determination of macronutrient content : Protein content of the products was estimated by Biuret method.⁽⁵⁾ Fat content of the products was measured by using Soxhlet method.⁽¹⁰⁾ Total carbohydrate of the products was estimated by the Anthrone method.⁽¹⁶⁾

Determination of ascorbic acid content: The ascorbic acid content of the products was measured by indophenol dye method. In a conical flask, equal amount of metaphosphoric acid and standard ascorbic acid was filtered through cotton. In a test tube, 1 ml of 2,6-dichlorophenol indophenol dye was taken which was titrated with the filtered solution of metaphosphoric-ascorbic acid until colourless. The readings were noted in triplicates. Similarly, test samples were prepared by filtration of equal amounts of metaphosphoric acid-sample solution which was used to titrate the dye until colourless and the readings were noted in triplicates. The

concentration of the ascorbic acid in the test samples was calculated.⁽⁹⁾

Determination of beta-carotene content: Five gram of sample was taken, crushed in 10-15 ml of acetone with the help of pestle and mortar and few crystals of anhydrous sodium sulphate were added. The solution was centrifuged at 3000 rpm for 3-4 minutes. The supernatant was transferred to a separating funnel, 10-15 ml of petroleum ether was added and mixed thoroughly. Two layers separated out on standing. The lower layer was discarded and upper layer was collected in 100 ml volumetric flask. The volume was made to 100 ml with petroleum ether and optical density was recorded at 452 nm using petroleum ether as blank.⁽²⁾

$$\text{Beta-carotene (mg/100 gram)} = \frac{\text{Optical density of sample} * 139 * 10^3 * 100}{\text{Weight of the sample} * 560 * 1000}$$

where,
Molar extinction coefficient = $139 * 10^3 \text{ L mol}^{-1} \text{ cm}^{-1}$
Molecular weight of beta-carotene = 560 g/mol

Determination of Total Phenolic content: Total phenolic content was measured by Folin-Ciocalteau's method. Firstly, 0.1 mL of extract was made up to 5 mL with distilled water in a 10-mL volumetric flask, followed by addition of 0.5 mL 2 N Folin-Ciocalteau's phenol reagent. About 1 mL of saturated (35% w/v) sodium carbonate solution was added into the mixture after three minutes. The mixture was made up to 10 mL with water. After 1 hour, the mixture was measured spectrophotometrically at 725 nm against the reagent blank. Gallic acid within the concentration range of 0–400 µg/mL assay solution was used as the standard curve for the total phenolic acids content. The reaction between the Folin-Ciocalteu reagent and phenolic compounds in alkaline medium results in the formation of a blue chromophore constituted by a phosphotungstic/phosphomolybdenum complex that absorbs radiation and allows quantification. Results were expressed as mg gallic acid equivalents (GAE)/100 g of fresh weight. (4)

DPPH Free Radical Scavenging Activity : 0.4 mM solution of DPPH in ethanol was prepared. 1 ml of DPPH solution was added to 3 ml of ethanolic test sample extract. A control was made by adding 1 ml of DPPH solution to 3 ml of ethanol. The mixture was shaken vigorously and allowed to stand at room temperature for 30 min then absorbance was measured at 517 nm by using spectrophotometer.⁽¹⁵⁾

$$\text{DPPH scavenging effect (\%)} = ((A_0 - A_1) / A_0) \times 100$$

where,
A₀ was the Absorbance of control, and
A₁ was the Absorbance in presence of test sample

Statistical Analysis: The results of nutrient analysis were expressed as mean \pm standard deviation of triplicate analyses while mean of sensory scores for each attribute was based on twenty judgements.

Results and Discussion

Sensory Evaluation: Acceptability of the products was determined by using 9 point hedonic scale. Standard product was labelled as 'Product S'. Product A1 to Product E1 contains different concentrations of Citrus limetta peel; Product A2 to Product E2 contains different concentrations of Citrus limon peel; and Product A3 to Product E3 contains combination of the peels with varying amounts of 5, 10, 15, 20, and 25 gram for all the

three categories. The mean \pm S.D. values of all the sensory attributes for all the variations are given in the table 1.

It is implied that the savoury cake incorporating the combination of citrus peels of 7.5 gram each (Product C3) was the most acceptable product. Apart from it, among variations of Citrus limetta peel, Product C1 containing 15 gram peel; and

among variations of Citrus limon peel Product C2 containing 15 gram of peel were the acceptable products on the basis of hedonic score for overall rating (Table 1). Hence from the sensory evaluation results, three approved products (C1, C2, and C3) as well as the standard product were chosen for the chemical analysis.

Table 1: Sensory Evaluation Results

Product code	Appearance	Colour	Texture	Taste	Odour	Overall rating
S	7.80 ± 0.59	7.90 ± 0.69	7.90 ± 0.63	7.45 ± 0.87	7.55 ± 0.59	7.85 ± 0.66
A1	7.70 ± 0.54	7.65 ± 0.52	7.80 ± 0.60	7.30 ± 0.56	7.50 ± 0.50	7.35 ± 0.48
B1	7.65 ± 0.48	7.70 ± 0.53	7.80 ± 0.60	7.30 ± 0.64	7.40 ± 0.49	7.40 ± 0.49
C1	7.70 ± 0.56	7.75 ± 0.62	7.75 ± 0.54	7.40 ± 0.81	7.50 ± 0.67	7.50 ± 0.50
D1	7.70 ± 0.64	7.65 ± 0.58	7.75 ± 0.43	5.75 ± 0.95	7.15 ± 0.80	7.00 ± 0.55
E1	7.70 ± 0.72	7.60 ± 0.52	7.70 ± 0.73	4.40 ± 0.98	7.05 ± 0.50	6.10 ± 0.77
A2	7.65 ± 0.73	7.60 ± 0.53	7.75 ± 0.77	7.65 ± 0.66	7.50 ± 0.67	7.65 ± 0.73
B2	7.70 ± 0.56	7.70 ± 0.62	7.75 ± 0.70	7.70 ± 0.72	7.55 ± 0.50	7.70 ± 0.72
C2	7.85 ± 0.66	7.75 ± 0.57	7.85 ± 0.57	7.75 ± 0.77	7.60 ± 0.74	7.75 ± 0.83
D2	7.70 ± 0.85	7.70 ± 0.55	7.75 ± 0.53	6.50 ± 0.50	7.60 ± 0.67	7.50 ± 0.59
E2	7.65 ± 0.57	7.45 ± 0.54	7.70 ± 0.73	5.10 ± 0.77	7.20 ± 0.51	6.80 ± 0.60
A3	7.60 ± 0.74	7.70 ± 0.55	7.80 ± 0.68	7.45 ± 0.59	7.60 ± 0.67	7.45 ± 0.67
B3	7.70 ± 0.72	7.75 ± 0.62	7.75 ± 0.77	7.50 ± 0.67	7.50 ± 0.59	7.50 ± 0.67
C3	7.75 ± 0.63	7.85 ± 0.58	7.75 ± 0.70	7.75 ± 0.70	7.75 ± 0.63	7.80 ± 0.68
D3	7.70 ± 0.64	7.70 ± 0.55	7.75 ± 0.77	6.30 ± 0.56	7.45 ± 0.50	7.10 ± 0.63
E3	7.70 ± 0.56	7.50 ± 0.54	7.70 ± 0.85	5.90 ± 0.70	7.25 ± 0.43	6.90 ± 0.90

Nutrient and Antioxidant analysis

Total moisture and ash content: Total moisture content of the standard product was found to be 39.4% per 100 gram of the product, which increased in the approved products while being highest in product C2 containing Citrus limon peel. The increase in moisture content of the product was due to the moisture content of peels. Total ash content of the standard product was found to be 12.6% per 100 gram of the product, which increased in the approved products while being highest in product C3 containing Citrus limetta peel and Citrus limon peel. (Figure 1).

Total Macronutrient content: The protein content was found to be highest in product C2 containing 15 grams of Citrus limon peel as well as in product C3 containing combination of peels. The highest fat content was seen in Product C1 which contained 15 gram of Citrus limon peel. The carbohydrate content was found to be highest in Product C2 containing 15 gram Citrus limon peel. Citrus peels contains very low amount of protein, fat, and carbohydrate,

hence the macronutrient content of the product is mainly acquired by the basic ingredients used in the standard recipe. The energy provided by product S, Product C1, Product C2, and Product C3 was 315.57 kcal, 318.67 kcal, 320.33 kcal, and 318.69 kcal respectively.

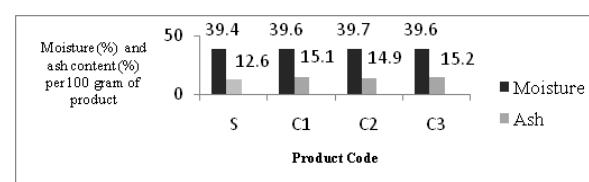


Figure 1- Moisture and Ash content (%) of the samples

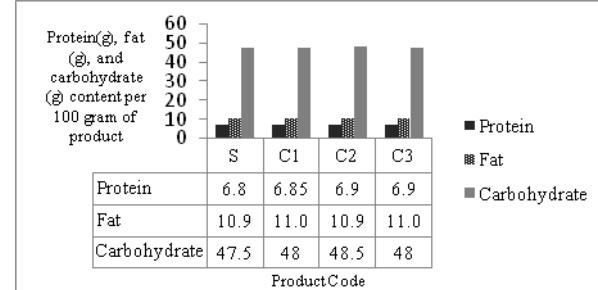


Figure 2- Protein, fat, and carbohydrate content per 100 gram of product

Beta-carotene content: The beta-carotene content of the approved products was higher than the standard product. The highest beta-carotene content was seen in product C3, i.e., 585.75 µg per 100 gram of product, while the standard product (product S) contained 496.4 µg per 100 gram of the product. (Figure 3)

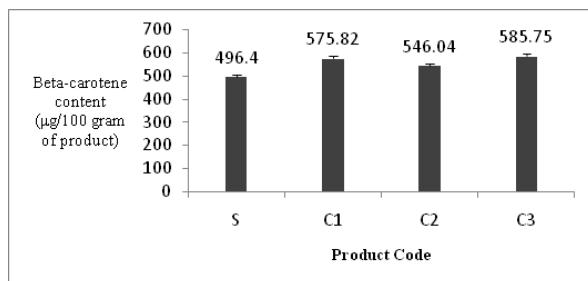


Figure 3- Beta-carotene content per 100 gram of the product

Ascorbic acid content: The results showed that the ascorbic acid content increased in the approved products than the standard product (Figure 4).

The highest ascorbic acid content was seen in product C3, i.e., 29.16 mg per 100 gram of product, while the standard product (product S) contained 14 mg per 100 gram of the product. Since ascorbic acid is a heat sensitive vitamin, the amount of ascorbic acid will be less in the product compared to the theoretical values. According to a research, 62.64% - 68.83% of ascorbic acid might be lost in an oven depending on the temperature and time.⁽⁸⁾ Another study showed that the polyphenols present in citrus peels protects the ascorbic acid against oxidation.⁽¹²⁾ Even after accounting for the losses of the ascorbic acid content that took place, the product contained a considerable amount of ascorbic acid.

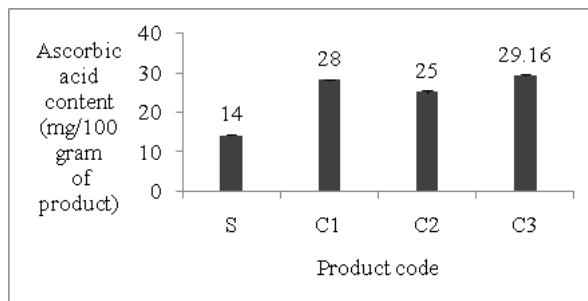


Figure 4- Ascorbic acid content of the products measured by Indophenol dye method

Total Phenolic content: The results showed that the total phenolic content was higher in the approved products than the standard product (Figure 5).

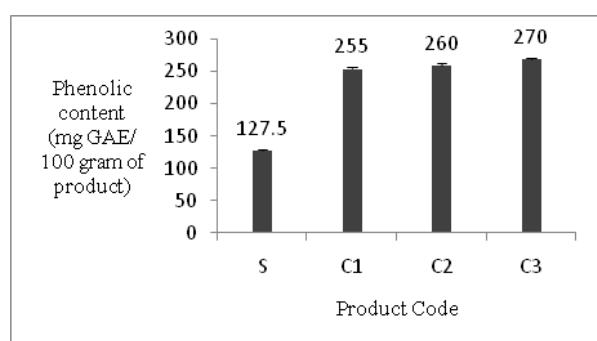


Figure 5: Total Phenolic content of the samples measured by Folin-Ciocalteau assay

The highest phenolic content was seen in product C3 containing a combination of both the peels, i.e., 270 mg GAE per 100 gram of product, while the standard product (product S) contained 127.5 mg GAE per 100 gram of the product. Citrus fruit peels contain significant amount of phenolic compounds, especially phenolic acids and flavonoids.⁽¹⁴⁾

DPPH free radical scavenging activity- DPPH (2,2-diphenyl-1-picrylhydrazyl) free radical scavenging ability is frequently used in the determination of free radical scavenging ability. Scavenging effect % revealed an increase in scavenging ability of the approved samples than the standard product. (Figure 6)

Product C3 containing the combination of peels showed highest scavenging activity among all the approved samples, i.e., 50.88% than the product S (standard product) which showed 17.75%. Higher scavenging effect (%) indicated higher antioxidant activity in the product.

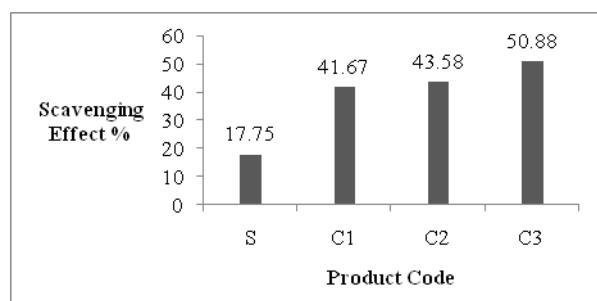


Figure 6- Scavenging effect % of the samples determined by DPPH free radical scavenging activity

Conclusion

Thus from the results obtained, it can be concluded that addition of citrus peels to the savoury cake significantly increased ascorbic acid, beta-carotene, phenolic content, and also exhibited higher DPPH free radical scavenging activity. Vitamin C being

an important dietary antioxidant, significantly decreases the adverse effect of reactive oxygen and nitrogen species that can cause oxidative damage to macromolecules such as lipids, DNA and proteins which are implicated in chronic diseases including cardiovascular disease, stroke, cancer, and neurodegenerative diseases. (11) β -carotene acts as an antioxidant by quenching singlet molecular oxygen and scavenging reactive oxygen species, especially peroxy radicals. (1) Phenolics are capable of scavenging free radicals, chelate metal catalysts, activate antioxidant enzymes, reduce α -tocopherol radicals, and inhibit oxidases and helps in the management of degenerative diseases, such as diabetes and hypertension.⁽⁷⁾ Increased DPPH scavenging activity indicated higher antioxidant activity of the product due to addition of citrus peels.

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To Conduct a Survey for Consumer Awareness on Tea adulteration and Comparative Analysis of Adulteration between Packaged tea and Local tea

Tania Das and Anindita Deb Pal

ABSTRACT

Food adulteration is a process in which the quality of food is lowered either by the addition of inferior quality material or by extraction of valuable ingredient. Tea is one of the most preferred drinks and it is being adulterated with certain harmful material like artificial colour, azo dye, coal tar dye and many more. The present study was done to access the consumer knowledge on tea adulteration and to perform comparative analysis of adulteration between packaged tea and local tea. For the purpose of study, 150 housewives were selected and a survey was performed using KAP questionnaire. Furthermore, different tea samples were collected from different areas of Kolkata to detect common adulterants. The results displayed the present knowledge of people on food adulteration as well as tea adulteration and their practice and attitude towards the same. Moreover, the results obtained from chemical analysis of different tea samples showed the presence of different adulterants in local tea and packaged tea. The overall study indicates that people have a lack of knowledge about tea adulteration and common adulterants are indeed present in packaged as well as local tea samples of Kolkata.

Key words: Adulteration, consumer awareness, KAP, tea

Introduction

An adulterant is a chemical substance which should not be contained within other substances (e.g. food, beverages, and fuels) for legal or other reasons.⁽¹²⁾ The addition of adulterants is called adulteration. Food is declared adulterated if a substance is added which depreciates or injuriously affects it or any cheaper or inferior substances are substituted wholly or in part.⁽¹³⁾ Food is also considered adulterated if any valuable or necessary constituent has been wholly or in part abstracted or if it is imitational, coloured or otherwise treated to improve its appearance. Adulterated food may also contain added substances which may be injurious to health.⁽²⁾ Foods can be adulterated by different ways which include intentional adulteration, unintentional adulteration and natural adulteration. Intentional adulteration takes place when something is added intentionally with knowledge to earn profit.⁽⁵⁾ Accidental food adulteration occurs accidentally in nature, without knowledge.⁽³⁾ Natural adulteration occurs due to the presence of certain chemicals, organic compounds or radicals naturally occurring in foods which are injurious to health and are not added to the foods intentionally or unintentionally.⁽⁶⁾ Consumption of adulterated food can cause severe health problems in the human body which include digestive system disorders, stomach infections, liver disorders, cancer of stomach, disorders of blood, lung cancer, epidemic dropsy, glaucoma, cardiac arrest, lathyrism, diarrhoea, carcinogenesis, stomach disorders, food poisoning etc.⁽⁸⁾

Tea is an ancient beverage steeped in history and loved by many. Tea is the most commonly consumed beverage in the world after water. All varieties of tea are derived from *Camellia sinensis*. Tea can be classified according to procedure, quality and preparation methods. There are four types of tea, according to the method of processing which include black tea, green tea, oolong tea and herbal tea.^(9,10) One of the most commonly used adulterant in tea is colour. Tea leaves which were damaged during manufacturing process or are of inferior quality are being treated with various colouring agents to improve their appearance and price.⁽⁴⁾ According to earlier reports, tea has been found to be adulterated with azo dyes such as sunset yellow, tartrazine, carmosine, brilliant blue and indigo carmine.⁽⁵⁾ Other than colouring materials teas are also adulterated with starch, sand, china clay, french chalk, iron fillings, chicory, lather flakes, caffeine, used tea leaves etc.⁽⁷⁾ Furthermore, previous studies have shown that 10.48% of tea available in the market is adulterated and adulteration is more common in loose tea with comparison to the branded and packaged tea.⁽¹¹⁾

Today tea adulteration is a common practice in the market since tea is the most commonly consumed beverage in the world. The present study was done to check the knowledge, practice, attitude of the general population toward the adulteration of tea and to chemically analyze tea samples for presence of adulterants from different regions of Kolkata.

Methodology

Selection of place: Kolkata, West Bengal.

Sources of subjects: Housewives staying in Kolkata.

Sample size: 150

Sampling technique: The samples were selected by using random sampling technique which is a type of non probability sampling approach.

Duration of study: 60 days

Method of preparing questionnaire questionnaire: A suitable survey format was made which was known as KAP questionnaire. The primary objective eve of this study was to evaluate the knowledge, attitude, and practices (KAP) of the general population regarding food adulteration as well as adulteration of tea.

Analysis of collected data of survey: Results collected from the survey was calculated and then converted to percentage. Then the data was represented using bar graph.

Collection of raw materials: Two types of black tea i.e. local tea and packaged tea (both high priced and low priced tea) were collected for chemical analysis. Four types of packaged tea were collected which were renamed as Brand A, Brand B, Brand D and Brand F for the study purpose. The local tea samples were collected from East Kolkata (E1 (low cost) and E2 (high cost)), North Kolkata (N1 (low cost) and N2 (high cost)), South Kolkata (S1 (low cost) and S2 (high cost)) and central Kolkata (C1 (low cost) and C2 (high cost)).

Table 1: Detection of different tea adulteration

Test	Procedure
Artificial colour	The tea was spread on the surface of clean glass containing water. Changes in the colour of water indicated that the tea sample was dyed with water soluble colours.
Iron fillings	Tea samples were placed in plates and a magnet was held near the plates. If iron filling were present then tea samples were attached to the magnet.
Coal tar dye	Tea samples were taken in a test tube and 5 ml of dilute sulphuric acid or concentrated Hydrochloric acid to it. Appearance of pink colour or crimson colour indicates the presence of coal tar dye in tea samples.
Catechu	Tea samples were taken in the test tube and 5ml water was added. Then water was stained and lead acetate was added. The solution was thereafter filtered followed by addition of few drops of silver nitrate. Appearance of greyish cloudiness indicated the presence of catechu.
Sand	Tea samples were taken in test tubes. Then 7ml of water was added and mixed well. Formation of any sedimentation indicated presence of sand in tea samples.
Cereal starch	Small quantity of tea sample was taken in a test tubes and distilled water was added to it. The contents were heated to produce colour. Potassium permanganate solution and diluted hydrochloric acid (1:1) were added to it to decolorize the mixture. Then 1 % aqueous solution of iodine was added. If blue colour was observed, then the tea samples were adulterated with cereal starch.
Azo colour	Tea samples were treated with a strong alcohol and the solution was evaporated to dryness. Then it was treated with water. Appearance of characteristic color of the dye(red or yellow or orange) indicated adultration with azo dye
Chicory	The samples were boiled in a test tube with 2 drops of concentrated hydrochloric acid. 15 drops of potassium ferrocyanide solution was added and liquid was again boiled till the appearance of dark green colour. The liquid becomes brown and murky, if chicory is present in tea samples, otherwise a precipitate settles at the bottom, leaving a supernatant solution of light yellow color

Results & Discussion

Result of survey analysis: The KAP questionnaire contained group of questions to analyze general population's knowledge, attitude and practice about tea. Overall results (fig no.1) gave a brief idea about a person's practice related to tea consumption. Result (A) showed that 87.33% people were aware about the incidence of food adulteration whereas 12.66% did not know the phrase "food adulteration". 77.33% people had information about harmful effect of food adulteration whereas 22.66% people were uninformed about their adverse effect (B). Many

of people fool themselves into believing that the food they eat is healthy and safe by buying food products manufactured by reputed companies and brands. According to some individuals, most of the times they believe the food is safe due to perfect packaging, labeling, etc. However, some said they could not identify adulterated food from the original one. Moreover, 52% people had idea about adulteration of tea and 48% people did not have idea about tea adulteration (C). 47.33% people knew about the type of adulterant can be present in tea whereas 52.66% people did not know about it (E).

It was seen that some individual were aware of the type of tea adulteration and had found adulterants like pieces of wood, sand, used tea leaves and most commonly coloured tea leaves. It was observed in the survey that 44.66% people were aware of the information that adulterant can be present in both local tea and packaged tea, whereas 55.33% people had no idea regarding this matter (D). Result also indicates that 64.66% people agreed that their tea purchase was affected by price and 35.33% person did not agree with the same (F). The overall result indicated that 68.66% people did not prefer to report in consumer forum by creating awareness among common people and didn't want to put a step forward towards to prevent adulteration whereas 31.33%people preferred to do so (G,H,I). After analyzing all the results collected from the survey, it was revealed that most people were generally ignorant and reluctant in spreading awareness about the common adulteration practices. The result also indicates that 44.66% population had found adulterant in tea, whereas 55.33% population did not find tea adulteration (J). After analyzing all the results, it was concluded that most of the individuals did not have knowledge about food adulteration and as well as its consequences. They were unaware of the fact that food is being adulterated and this consumption would lead to serious health injury. In Kolkata, most of the people preferred packaged tea for their convenience. Some people knew about tea adulteration as they had found adulterants like artificial colour, sand, iron fillings etc. But despite of these people are not enthusiastic enough to create awareness among common people about food adulteration.

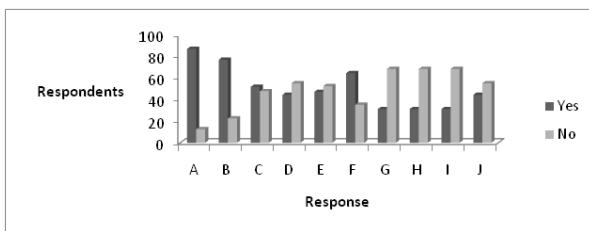


Figure 1- Graphical representation (%) of survey result. A= Response about adulteration of food, B= Response about harmful effect of food adulteration, C= Response about adulteration of tea, D= Response about presence of adulteration in packaged tea and local tea, E= Response about types of adulterants in tea, F= Response about cost effecting tea purchase, G= Response of reporting in consumer forum about adulteration, H= Response about creating awareness among other people about food adulteration, I= Response about steps taken to stop adulteration J= Respondents who have found adulterants in tea

Result of chemical analysis of Various Tea Samples:

- Artificial colour: The result shows that Brand "F" among packaged tea and among local tea "N1" sample were adulterated with artificial colour. Apart from these two samples, rest of the samples gave negative results. Those tea samples were not adulterated with artificial colour (table no. 2).

Table no. 2: Detection of artificial colour

Tea samples (code)	Result
Sample- A	Negative
Sample- B	Negative
Sample- D	Negative
Sample- F	Positive
Sample- E1	Negative
Sample-E2	Negative
Sample-N1	Positive
Sample- N2	Negative
Sample- S1	Negative
Sample- S2	Negative
Sample-C1	Negative
Sample- C2	Negative

- Iron fillings: The result shows that there were no iron fillings in any of the tea samples. So the test gave negative result for all the tea samples (table no. 3).

Table no. 3: Detection of iron filling

Tea samples (code)	Result
Sample- A	Negative
Sample- B	Negative
Sample- D	Negative
Sample- F	Negative
Sample- E1	Negative
Sample-E2	Negative
Sample-N1	Negative
Sample- N2	Negative
Sample- S1	Negative
Sample- S2	Negative
Sample-C1	Negative
Sample- C2	Negative
Sample- C2	Negative

- Coal tar dye: Brand "B" and brand "F" amongst packaged tea and S1, E1, E2 and N1 local tea samples showed a positive result for presence of coal tar dye (table no. 4)

Table 4: Detection of coal tar dye

Tea samples (code)	Result
Sample- A	Negative
Sample- B	Positive
Sample- D	Negative
Sample- F	Positive
Sample- E1	Positive
Sample-E2	Positive
Sample-N1	Positive
Sample- N2	Negative
Sample- S1	Positive
Sample- S2	Negative
Sample-C1	Negative
Sample- C2	Negative

4. Catechu: The result indicates negative for all the tea samples. So the tea samples were not adulterated with catechu (table no. 5).

Table 5: Detection of catechu

Tea samples (code)	Result
Sample- A	Negative
Sample- B	Negative
Sample- D	Negative
Sample- F	Negative
Sample- E1	Negative
Sample-E2	Negative
Sample-N1	Negative
Sample- N2	Negative
Sample- S1	Negative
Sample- S2	Negative
Sample-C1	Negative
Sample- C2	Negative

5. Sand: The result indicates negative for all the tea samples. So the tea samples were not adulterated with sand (table no. 6).

Table 6: Detection of Sand

Tea samples (code)	Result
Sample- A	Negative
Sample- B	Negative
Sample- D	Negative
Sample- F	Negative
Sample- E1	Negative
Sample-E2	Negative
Sample-N1	Negative
Sample- N2	Negative
Sample- S1	Negative
Sample- S2	Negative
Sample-C1	Negative
Sample- C2	Negative

6. Cereal starch: The result shows negative for all the tea samples. So the tea samples were not adulterated with cereal starch (table no. 7).

Table 7: Detection of cereal starch

Tea samples (code)	Result
Sample- A	Negative
Sample- B	Negative
Sample- D	Negative
Sample- F	Negative
Sample- E1	Negative
Sample-E2	Negative
Sample-N1	Negative
Sample- N2	Negative
Sample- S1	Negative
Sample- S2	Negative
Sample-C1	Negative
Sample- C2	Negative

7. Azo dyes: The result indicates positive for brand “D” among packaged tea, whereas “E2” and “N1” from local tea also showed the presence of the dye. So these three tea samples were adulterated with azo dye (table no. 8).

Table 8: Detection of azo dye

Tea samples (code)	Result
Sample- A	Negative
Sample- B	Negative
Sample- D	Positive
Sample- F	Negative
Sample- E1	Negative
Sample-E2	Positive
Sample-N1	Positive
Sample- N2	Negative
Sample- S1	Negative
Sample- S2	Negative
Sample-C1	Negative
Sample- C2	Negative

8. Chicory: The result indicates that only "C1" was adulterated with chicory. Apart from that, other tea samples were not adulterated with chicory (table no. 9).

Table 9: Detection of chicory

Sample- A	Negative
Sample- B	Negative
Sample- D	Negative
Sample- F	Negative
Sample- E1	Negative
Sample-E2	Negative
Sample-N1	Negative
Sample- N2	Negative
Sample- S1	Negative
Sample- S2	Negative
Sample-C1	Positive
Sample- C2	Negative
Sample- C2	Negative

9. Comparison between packaged tea and local tea: From the chemical analysis of all the tea samples, it was revealed that tea samples were mainly adulterated with different colouring materials which include water soluble artificial colour, coal tar dye, azo dye and chicory. Calculating the result, it was seen that 37.5% of the packaged tea was adulterated whereas 50% of the local tea was adulterated with either of the above mentioned adulterants (fig no. 2).

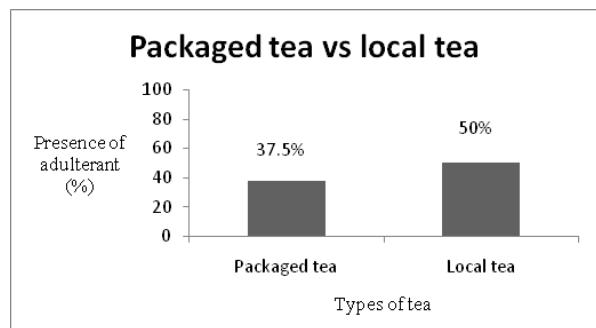


Figure 2: Presence of adulterant in packaged tea and local tea

10. Comparison between high cost tea and low cost tea: From the result, it can be concluded that low cost tea contained more adulterants compared to high cost tea. On the whole, 50% adulteration was present in low priced tea where 25% adulterant was present in high priced tea (fig no.3). The possible reason behind this practice was to gain more profit by adding adulterants like artificial colour and other types of colour to the inferior quality of tea so as to make them more appealing to the customer. Generally

tea leaves were dyed with artificial colour to increase profits, and sometimes to sell low cost tea dyed with color at a high price.

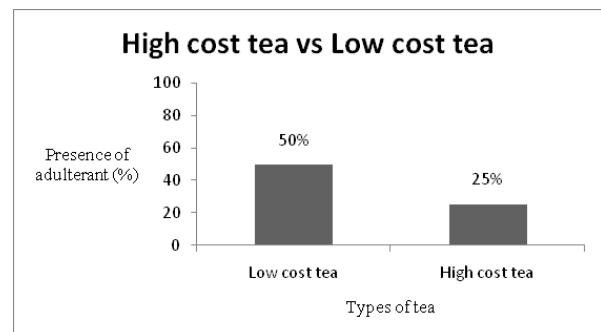


Figure 3- Comparison of Prices

Conclusion

After the study, it was concluded that most of the individuals did not have knowledge about food adulteration and as well as its consequences. They were unaware of the fact that food is being adulterated and this consumption could lead to serious health injury. In Kolkata, most of the people preferred tea as a drink and some of them preferred it twice or thrice a day. Adulterants like artificial colour, sand, iron fillings were found in the tea samples. Most of the people preferred packaged tea, which was less adulterated compared to local tea as it was observed in chemical analysis that local tea contained more adulterants. In chemical analysis, it was seen that tea contained mainly colours as an adulterant to give an attractive look. From the result it was seen that low priced tea contained more adulterants as compared to high priced tea. This can be further understood from the survey result which shows that the price of tea affects an individual's purchase. However, despite of these it was seen that people were not enthusiastic enough to create awareness among common people as well as take steps to prevent adulteration of food. They were less interested in reporting to the consumer forum or creating awareness among general people. The practice of adulteration can be prevented only when the population at large takes a step forward. Moreover, people also need to be more conscious about the quality of product that is been served. Regular and routine analysis of different tea samples would help in generating awareness about tea adulteration.

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To Study the Development of a Fibre Rich Fruit Concentrate and its Nutritional Analysis

Shazia Nadir and Anindita Deb Pal

ABSTRACT

People with reduced dietary fibre intake are prone to various diseases related to upper and lower gastrointestinal discomfort like constipation, diarrhea and dyspepsia which may be caused by not consuming fibre, or not drinking enough fluids. Ideally, laxatives are used for short periods of time until symptoms ease. The purpose of this study is to introduce fibre rich fruit concentrate which can act as a natural laxative. The key ingredients used to develop this product were dates, figs, pectin, ginger extract, barley water and wood apple. The insoluble and soluble fiber found in dates help to clean out the gastrointestinal system, allowing the colon to work at greater levels of efficiency. The high concentration of fiber present in figs helps promote healthy and regular bowel function. Pectin, the fibre found in fruits binds to food inside the intestine and adds bulk to the stool. Ginger extract, speeds up emptying of the stomach, which is beneficial for people with indigestion. Barley helps to prevent constipation and promotes a healthy digestive tract. The final ingredient used was wood apple juice which is known for its property to provide relief from constipation, peptic ulcer, piles and diarrhea. Therefore a fruit concentrate was made with the above ingredients and sensory evaluation of the product was executed among the panel group of 25 members. The most approved product was further biochemically tested for its nutritional composition. The product prepared contained high amounts of fibre, iron, magnesium and phosphorous as compared to the basic product.

Keywords: Digestion, fiber, fruit concentrate, gastrointestinal disorders, nutrients

Introduction

Fibre is mainly a carbohydrate and The main role of fibre is to keep the digestive system healthy. Other terms for dietary fibre include 'bulk' and 'roughage', which can be misleading since some forms of fibre are water-soluble and aren't bulky or rough at all. Dietary fibre is mainly needed to keep the digestive system healthy. It also contributes to other processes, such as stabilizing glucose and cholesterol levels. In countries with traditionally high-fibre diets, diseases such as bowel cancer, diabetes and coronary heart disease are much less common than in Western countries. The Heart Foundation recommends that adults should aim to consume approximately 25–30 g daily. Children aged between four and eight should consume 18 g of fibre each day. Girls aged 9 to 13, and 14 to 18 years, need 20 g and 22 g per day respectively. Boys aged 9 to 13, and 14 to 18 years, need 24 g and 28 g per day respectively.⁽¹⁾ Disorders that can arise from a low-fibre diet include constipation, irritable bowel syndrome, diverticulitis, heart disease as well as colon cancers.

There are two categories of fibre and we need to eat both in our daily diets, which are soluble and insoluble fiber. Soluble fibre includes pectin, gums and mucilage, which are found mainly in plant cells. One of its major roles is to lower LDL (bad) cholesterol levels. Good sources of soluble fibre include fruits, vegetables, oat bran, barley, seed husks, flaxseed, psyllium, dried beans, lentils, peas,

soy milk and soy products. Soluble fibre can also help with constipation. Insoluble fibre includes cellulose, hemicelluloses and lignin, which make up the structural parts of plant cell walls. A major role of insoluble fibre is to add bulk to feces and to prevent constipation and associated problems such as hemorrhoids. Good sources include wheat bran, corn bran, rice bran, the skins of fruits and vegetables, nuts, seeds, dried beans and wholegrain foods. Both types of fibre are beneficial to the body and most plant foods contain a mixture of both types. According to previous studies, low fiber diet, hypothyroidism , excess use of laxatives, excess consumption of dairy products were some of the many reasons which led to gastrointestinal discomfort.⁽²⁾ Therefore in order to curb the unwanted circumstances, the aim is to introduce a natural laxative in the form of a fibre rich syrup which can prevent gastrointestinal discomfort such as constipation. The key ingredients used in the syrup were dates, figs, pectin, ginger extract, barley water and wood apple respectively.

Dates are rich in both soluble and insoluble fiber; it eases the movement of bowels by making it loose to pass it down the gut. Figs as it makes stool softer for easier digestion as it is rich in fibre. Pectin works with natural intestinal bacteria, or good bacteria, which turns the fiber into a soothing coating for irritated intestinal walls, it adds bulk to the stool, which can help to ease diarrhea symptoms as well

not only this but also the soluble fiber present in pectin can help relieve symptoms of constipation, giving more bulk to the stool which helps it to move through the colon more easily. Ginger extract being a natural laxative helps to promote bowel movement, and soothes the intestinal tract and aids proper digestion, helping regulate bowel movements. Barley because of its fiber content, barley helps to prevent constipation and promote regularity for a healthy digestive tract.^(4,5,6) Wood apple has been added in the product to further enhance its fibre content as well as to boost up its nutritional value. The health benefits of Beal Fruit or Wood Apple include relief from constipation, indigestion, peptic ulcer, piles, respiratory problems, diarrhea, and dysentery. It also boosts the immune system, fights off bacterial and viral infections, reduces inflammation and various inflammatory conditions, prevent cancer, increases milk production for nursing mothers, cures diabetes, increases ocular health. Beal fruit is great for digestion because it helps to destroy worms in the intestine, and is a good remedy for digestive disorders. It is also recommended as a remedy for chronic dysentery. Hence a product was developed to fulfill all the above requirements. The product developed is a fruit concentrate which can be consumed by all the age groups if they are prone to gastrointestinal discomfort. The laxatives available in the market generally contain artificial sweeteners which can otherwise cause addiction and more adverse health effects. Therefore, the product developed was made free from artificial sweeteners. Instead it contained natural sweetness due to the presence of dates, figs and wood apple. This property of the concentrate makes it a natural laxative and hence different from the ones available in the market.

Methodology

The present study was undertaken to develop a fibre rich fruit concentrate and to determine its nutritional importance.

Selection of the Place - The preparation and evaluation process of the product was conducted in the college laboratory of J.D.Birla Institute.

Selection of the Sample - Initially, the evaluation of the products with variations was done by 25 panel members comprising of teaching faculty and under graduate students from the department of food science and nutrition management of J.D.Birla Institute. Source of all the ingredients present in the fibre rich syrup were collected from Spencer's

Departmental store, Park Circus, Kolkata. The raw materials used to make the syrup were dates, figs, pectin, ginger extracts and barley water.

Product Development - Basic recipe of fibre rich syrup was chosen for development. The process for the preparation of syrup is given in the flow chart-

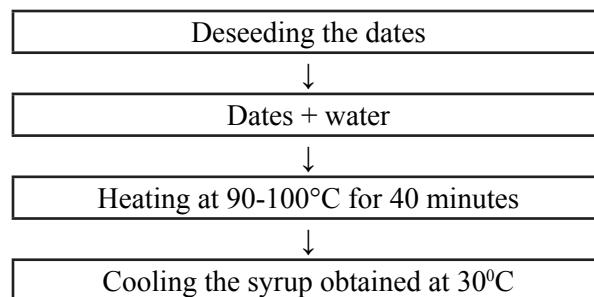


Figure 1: Flowchart for preparation of dates syrup

Sensory evaluation - The product was evaluated by the panel members on the basis of appearance, colour, texture, odour, taste and overall ratings. The panel members were briefed about the process of evaluation. They were strictly asked not to discuss or communicate during the process of evaluation. Acceptability of the recipes were obtained through the score card using 9 point hedonic scale.

Biochemical analysis - Protein, fat, carbohydrate, dietary fibre, crude fibre, iron, calcium, magnesium, phosphorous, moisture and ash were determined in the laboratory of J.D. Birla Institute and Qualissure.

Shelf life study - The shelf life of both a basic and approved product was carried out on a gap of 12 days. The first 5 days detected no change in the taste, odour and texture when kept at room temperature and in refrigerator. After 12 days, prominent changes were observed with respect to colour which became darker, texture became viscous, taste was sour and odour was pungent.

Results and Discussion

The comparison between the basic and approved product was initially determined by the sensory evaluation.

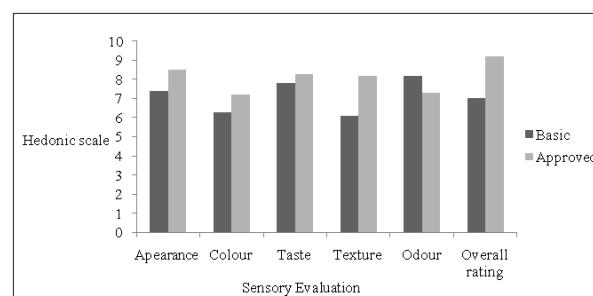


Figure 2 Comparison between basic product and approved product with respect to sensory evaluation

The above graph (figure 2) denotes that the approved product obtained greater appraisal when compared to the basic product with respect to appearance, colour, taste, texture, odour and overall rating.

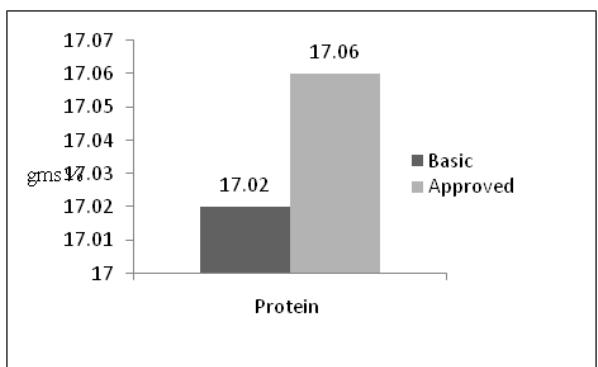


Figure 3- Comparison of the protein content of basic and approved product

It was seen that there was an increase in the protein content with respect to the basic and approved product. Basic product contains only dates and on the other hand, approved product was modified with certain other ingredients such as figs, pectin extract, ginger extract, barley water and wood apple juice which contains slightly high amount of protein in them due to which its protein content was comparatively increased as shown in figure 3.

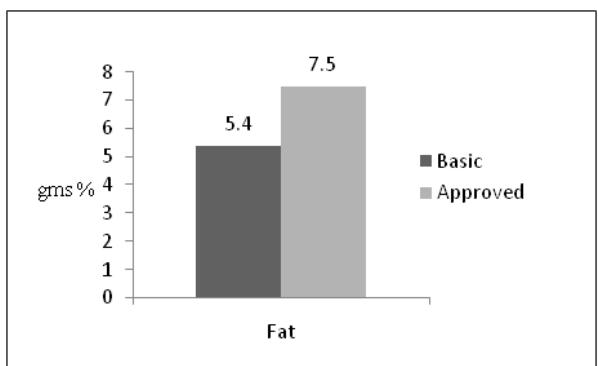


Figure 4- Comparison of the fat content of basic and approved product

Dates comparatively contain low amount of fat when compared to ingredients like figs and barley which has been added to the approved product. Therefore the fat content of basic product was less than the approved product as shown in figure 4.

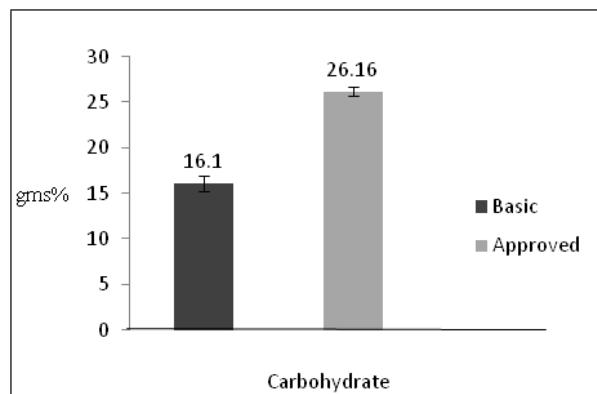


Figure 5- Comparison of the carbohydrate content of basic and approved product

It was seen that the basic product which contains dates syrup has reduced amount of carbohydrate when compared with the approved product due to the presence of barley which belongs to the category of cereals. Hence the carbohydrate content of the approved product was more than the basic product as shown in figure 5.

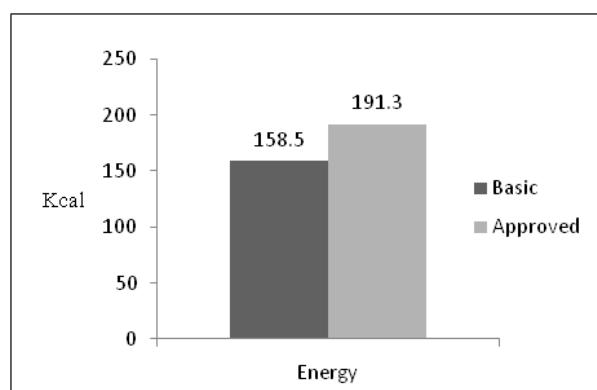


Figure 6- Comparison of the energy content of basic and approved product

The energy content of the basic product was estimated to be 158.5 kcal whereas the approved product contained 191.3 kcal which was comparatively high than the basic product due to the addition of ingredients such as figs which is energy dense, ginger extract, pectin extract, barley and wood apple respectively which increases the energy content of the approved product as shown in figure 6.

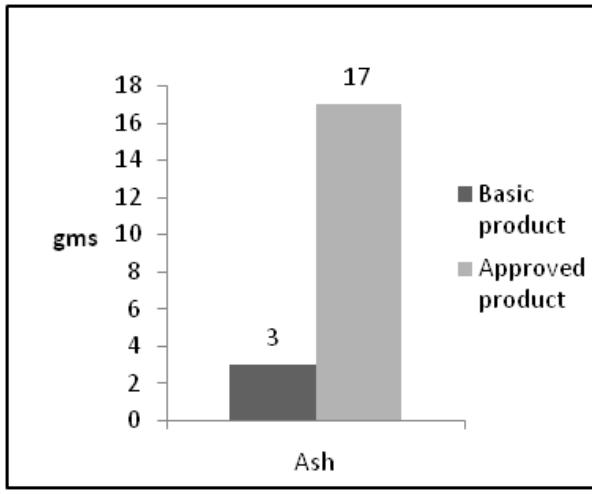
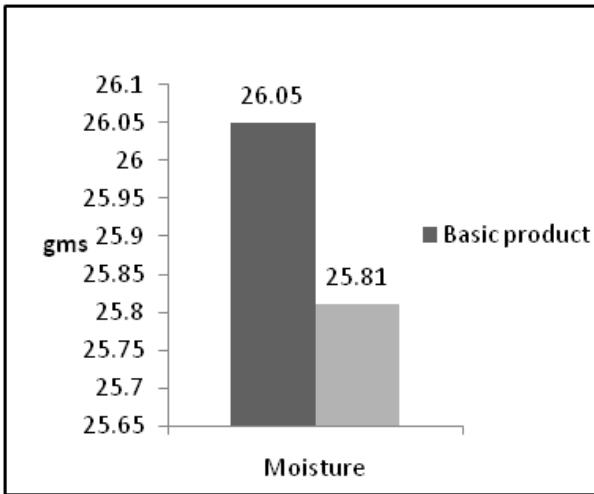


Figure 7 Comparison of the moisture and ash content of basic and approved product

It was seen that the moisture content of the basic product was more than the approved product because of the enrichment of the approved product with various other ingredients.

The ash content of basic product was found to be low when compared with the approved product. This was because the approved product contained a higher mineral content in wood apple juice.

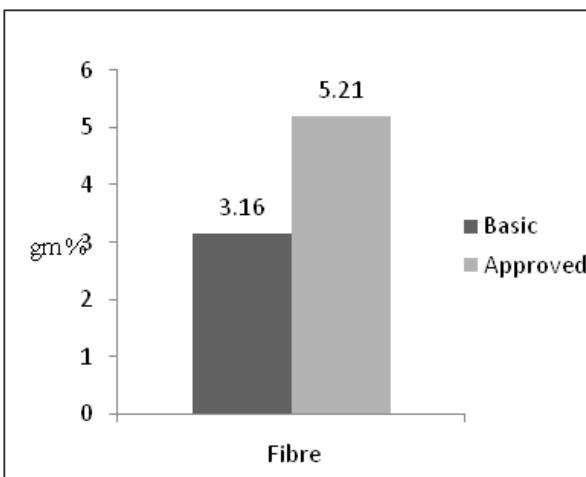


Figure 8 Comparison of the fibre content of basic and approved product

The crude fibre of basic product was less than the approved product when tested in the laboratory J.D. Birla Institute. This was seen because of the presence of figs, pectin extract, barley ginger and wood apple which are known to be rich in crude fibre when compared with dates only.

Conclusion

Thus from the data derived from the nutritional content of the fruit concentrate, it can be concluded that the product developed contains relatively higher

amounts of fibre, carbohydrate, energy in it. The product coded as product M which contained 40ml of dates syrup, 10ml of figs paste, 1gm of pectin, 0.25gm of ginger extract and 10 ml of barley water and 10 ml of wood apple juice was highly acceptable by the panel members with respect to its appearance, taste, texture, colour, odour as well as overall ratings. The product was analyzed to be fibre rich by carrying out analytical estimations. The product fortified with various fibre rich ingredients may have the potential to cure certain gastrointestinal problems of people such as constipation, diarrhea etc. It can thus be concluded that the fibre rich fruit concentrate which was prepared contained comparatively more fibre and additional nutrients than the basic recipe. The iron, phosphorous, calcium and magnesium content of the approved product was also seen to be high respectively.. The approved product was acceptable by the panel members because of its affordable cost as compared to other Nutraceutical available in the market. The colour, consistency as well as after taste of the approved product was greatly appreciated by the panel members.

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A comparative study of developed and commercially available ready-to-cook flour mix.

Shruti Kejriwal and Manika Das

ABSTRACT

Convenience food doesn't require a lot of preparation and is easy for consumption. A shift in consumer preferences for packaged food products is a prime concern for consumers and thus has led to transitions in this market. Ready to Mix food holds an essential place under convenience food segment owing to its benefits such as less time to prepare, easy consumption and low calorie. Ready to cook/bake flour mixes was developed which is rich in protein, calcium and iron which can be used to make sweet, savoury pancakes, waffles, crepes, muffins and cupcakes. The product has powdered milk which is the host of vitamins such as A, D, E and K. Vitamin A is beneficial for your immune system, reproductive system and vision and aids in cellular growth and differentiation. Vitamin D helps your intestines absorb phosphorous and calcium, which aids the bones, joints and heart. Vitamin E is a powerful antioxidant that stimulates your body's immune response to disease. Vitamin K is important for proper blood clotting. The key ingredient of the product is Lotus Stem, Chia Seeds, Flax Seeds which have phyto nutrients, minerals and vitamins. It is an excellent source of vitamin C with a powerful water soluble antioxidant required for the collagen synthesis in the human body. These ingredients provide significant amounts of some important minerals like copper, iron, zinc, magnesium, and manganese. It is also the excellent source of protein and iron.

Introduction

Most convenience foods provide little to no nutritional value and have excessive amounts of sodium, sugar, and saturated fats although it doesn't require a lot of preparation and is easy for consumption. Everyone should avoid these types of foods, mainly those individuals with health conditions like heart disease, hypertension, or diabetes.^(1,2) Although phytonutrient is very important for our health, proteins are building block of bones, muscles, cartilage, skin, and blood. Our body uses protein to build and repair tissue. We need it to make enzymes, hormones, and other body chemicals. In this present investigation we tried to make a protein and phyto nutrient rich ready to cook flour mix using lotus stem, chia seeds and flax seeds. Lotus stem is an indigenous vegetable (underwater rhizome of plant lotus) confined to selective cuisines of South East Asia. Lotus stem is a nutritionally balanced food-low in fat but high in protein, minerals and vitamins. Lotus stem have been found to be rich in dietary fiber, vitamin C, potassium, thiamin, riboflavin, vitamin B6, phosphorus, copper, manganese, and iron while very low in saturated fat.⁽³⁾

Flax is a blue-flowered plant grown in the cool, northern climate of the western Canadian prairies and northern United States. The seed from flax can be consumed in whole seed, milled (ground), or oil form. It is a powerhouse of disease-fighting compounds, such as the omega-3 fatty acid, alpha-linolenic acid (ALA), fibre, lignans (which are

powerful antioxidants) and high quality protein. Flaxseed has been found to help protect against heart disease, inflammatory disorders and certain cancers. The mild nutty flavour of flaxseed adds flavor, nutrition, and health benefits to a variety of foods.^(4,5)

Chia seeds come from the desert plant *Salvia hispanica*, a member of the mint family. *Salvia hispanica* seed often is sold under its common name "chia". Its origin is believed to be in Central America where the seed was a staple in the ancient Aztec diet. The seeds of a related plant, *Salvia columbariae* (golden chia), were used primarily by Native Americans in the southwestern United States. Chia seeds have recently gained attention as an excellent source of omega-3 fatty acid. They also are an excellent source of fiber, and contain protein and minerals including iron, calcium, magnesium and zinc. Emerging research suggests that including chia seeds as part of a healthy diet may help improve cardiovascular risk factors such as lowering cholesterol, triglycerides and blood pressure.⁽⁶⁾

Methodology

Procurement of raw materials: All the raw material including Lotus stem, Flax seeds and Chia seeds were purchased from the local market of Kolkata, India. To prepare ready to cook flour mix Lotus stem, Flax seeds and Chia seeds were sundried and ground into a fine powder using household grinder.

Development of product: For the product

development muffins were made from the ready to cook flour mix. Basic ingredient of the flour mix given below, which is considered as basic recipe (Table: 1)

Table1: Basic recipe / Basic ingredient of flour mix

Ingredients	Amount (gms)
All purpose flour	35
Powdered Milk	10
Sugar	5
Baking powder	5
Cooking soda	2.
Butter	5 (need to add)
Cold water	As per required

Based on this basic recipe variations were done in the ingredients (specially with 35 gms of all purpose flower) to make the ready to cook flower mix, which is protein and phyto nutrient rich. List of the variation was given below (Table:2)

Table 2- Different variation of ready to cook flour mix (variation was done with only all purpose flour, while other ingredients remain constant)

Variations Code	Ingredients
Variation A	2.5 gm of lotus stem powder + 10 gm of protein powder + 22.5 gm flour
Variation B	5 gm of lotus stem powder + 10 gm of protein powder + 20 gm flour
Variation C	7.5 gm of lotus stem powder + 10 gm of protein powder + 17.5 gm flour
Variation D	10 gm of lotus stem powder + 10 gm of protein powder + 15 gm flour
Variation E	5 gm of lotus stem powder + 5 gm flax seed + 5 gm Chia seed + 20 gm flour
Variation F	5 gm of lotus stem powder + 7.5 gm flax seed + 7.5 gm Chia seed + 15 gm flour
Variation G	5 gm of lotus stem powder + 10 gm flax seed + 10 gm Chia seed + 10 gm flour
Variation H	5 gm of lotus stem powder + 15 gm flax seed + 15 gm Chia seed + 10 gm flour

Sensory Evaluation: Muffins were made with different variation and sensory evaluation performed by 20 panel members of J.D. Birla Institute, Kolkata. Attributes to be scored were colour, appearance, flavour, texture, taste and overall rating. A sensory evaluation sheet was placed. The panel members were briefed with the process of evaluation. Acceptability of recipes was evaluated from the ratings obtained through the score card using 9 point hedonic scale during the sensory evaluation and

comparative study between the products was done.⁽⁷⁾ Chemical Analysis: For chemical analysis Protein⁽⁸⁾, Fats⁽⁹⁾, Carbohydrate⁽¹⁰⁾, Iron⁽¹¹⁾, Calcium⁽¹²⁾ and Vitamin C⁽¹³⁾ levels were estimated. All the chemical analysis was done for the most accepted variations and a popular branded product. Protein was estimated by Biuret method. Carbohydrate was estimated by Anthrone method. Fat was estimated by Soxhelt method. Iron was estimated by thiocyanate method. Calcium was estimated by EDTA titration method and Vitamin C was estimated by redox titration method.

Result & Discussion

All the results were analyzed statistically using mean and Standard Deviation.

Sensory Evaluation: Acceptability of variation product/ recipe including basic were evaluated from the ratings obtained through the score card using 9 point hedonic scale during the sensory evaluation and comparative study between the products was done.(Table 2) Results showed that Variation B, C, F, G is most accepted recipe compared to others.

Table 3: Sensory evaluation of different variations

Variation A	8.7 ± 0.44	8.6 ± 0.49	8.6 ± 0.36	8.6 ± 0.37	8.4 ± 0.49	8.6 ± 0.51
Variation B	8.3 ± 0.49	8.5 ± 0.45	8.5 ± 0.35	8.5 ± 0.33	8.5 ± 0.17	8.7 ± 0.23
Variation C	8.5 ± 0.53	8.4 ± 0.51	8.4 ± 0.82	8.5 ± 0.74	8.5 ± 0.79	8.5 ± 0.45
Variation D	8.0 ± 0.53	8.1 ± 0.5	8.0 ± 0.49	8.1 ± 0.46	8.0 ± 0.49	8.0 ± 0.49
Variation E	8.0 ± 0.52	8.5 ± 0.5	7.3 ± 0.6	7.4 ± 0.7	8.1 ± 0.35	7.5 ± 0.71
Variation F	8.0 ± 0.53	8.5 ± 0.51	8.1 ± 0.35	7.5 ± 0.5	8.1 ± 0.35	7.8 ± 0.64
Variation G	8.5 ± 0.75	8.5 ± 0.51	7.8 ± 0.46	7.5 ± 0.88	7.8 ± 0.7	7.8 ± 0.46
Variation H	7.5 ± 0.53	7.6 ± 0.75	6.4 ± 0.88	6.7 ± 1.3	7.6 ± 0.75	6.8 ± 1.06

Chemical analysis- Protein, carbohydrate and fat were estimated using most accepted variation of ready to cook flour mix and popular branded product. It was found that the amount of protein is high in variation B C F G compared to basic and branded product. Whereas amount of carbohydrate is low in variation B C F G compared to basic and branded product. (Fig 1)

In case of Iron, calcium and vitamin C, it was found that the amount of iron, calcium were high in variation B C F G compared to basic and branded product where as vitamin C showed not much variation (Table: 3, Fig:2).

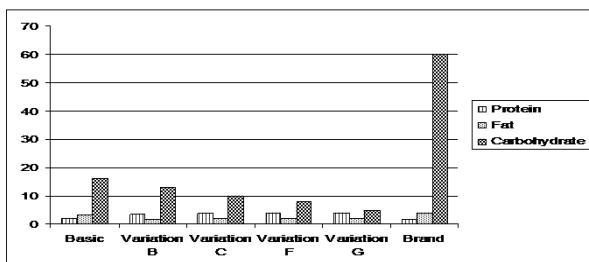


Figure 1- Graphical presentation of the amount of protein, carbohydrate and fat present in different variation and branded product.

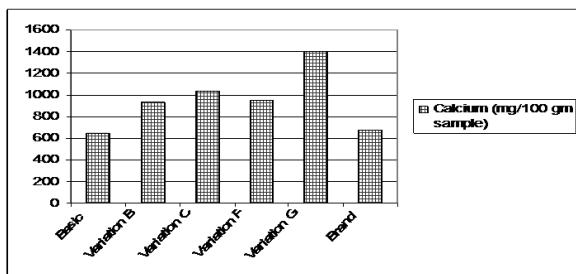


Figure 2- Amount of calcium in different variation and branded product.

Table 4: Amount of Iron and Vitamin C in different variation and brander product.

Para-meters	Basic	Variation B	Variation C	Variation F	Variation G	Brand
Iron (mg /100 gm sample)	0.22 ± 0.06	0.26 ± 0.09	0.31 ± 0.09	0.32 ± 0.1	0.39 ± 0.1	0.2 ± 0.07
Vitamin C (mg /100 gm sample)	18.55 ± 4.5	17.25 ± 3.8	15 ± 2.7	16.25 ± 3.2	16.75 ± 2.7	15.5 ± 2.9

Conclusion

All the results indicate that developed products are richer source of protein; iron and calcium compare to ready to cook brand and the basic products. Highest amount of protein and nutrients present in it Variation G followed by Variation F, C & B. The branded and the basic have the least amount of nutrients and are only rich in carbohydrates and/or fats. Analysis of results indicates that only protein supplement cannot make the food nutrition rich. Supplementation of phytonutrient is also important. Here in this investigation it was found that Variation G and F were more nutrition rich compared to Variation B and C. Variation B and C was only supplemented with protein powder and Lotus stem. Whereas Variation F and G were supplemented with lotus stem, flax seed and chia seed, which make the product more calcium, iron and protein rich. So it can be concluded that developed ready to cook flour mixes were accepted by panel member (Table 2, Sensory evaluation data) and nutritionally rich compared to basic and ready to cook branded product.

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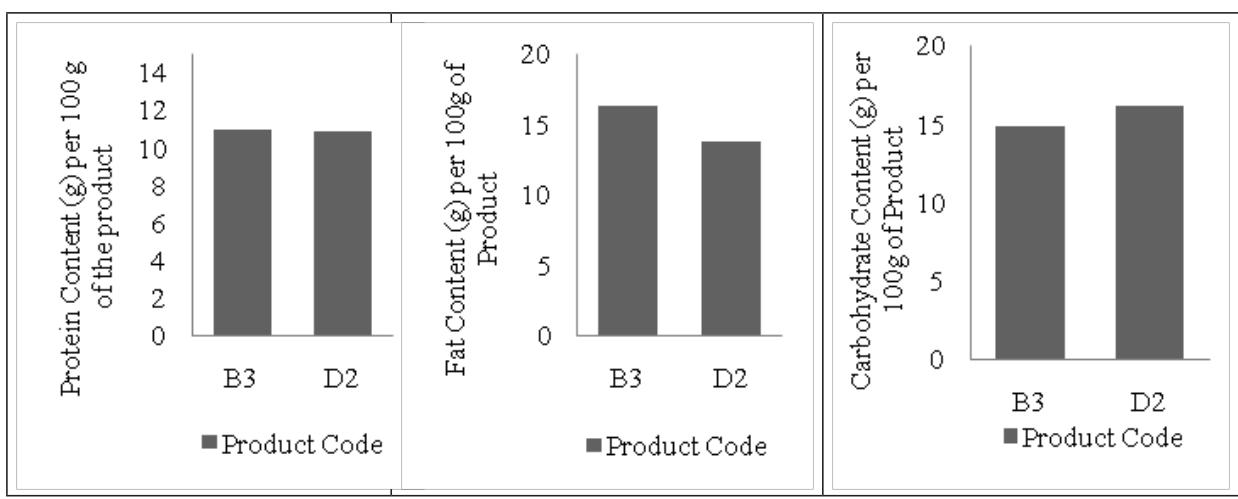


Figure 2- Comparison of the Sensory evaluation of Products S, A and B (Coconut Ice-cream).

