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RESEARCH ARTICLE

PREBIOTICS: IT'S IMPACT ON COLONIC FUNCTION OF CONSTIPATED ELDERLY

Sridevi Sivakami, PL* and Subhashree, S**

Department of Food Service Management and Dietetics, Avinashilingam University for Women, Coimbatore-641 043

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ABSTRACT

Twenty first century is often called the "age of ageing". Reduced fertility and rapid dwindling of mortality rates due to biomedical advances, has led to a rise in the ageing population and decline of the youth of the nation. The variable slowing of the organ systems make the elderly more susceptible to many lifestyle and gastrointestinal disorders of which constipation is very predominant. The advent of functional foods like prebiotics shows a promising way ahead. To assess the impact of prebiotics on colonic function of constipated elderly, thirty females above 50 years were chosen for the intervention study. They were assessed on their nutritional status, diet pattern and bowel habits. Prebiotic health mix using dietary sources like whole wheat, oats, saamai. soyabean and artichoke was prepared and packed in hygienic packages. All the samples consumed 10g of the prebiotic mix everyday for a period of 60 days as a drink and its impact assessed. Conclusively, it was found that the formulated drink had profound impact on the colonic function, thereby reducing constipation among the elderly. Positive signs like semisolid stools, increased frequency, lack of strain and less time was taken during defecation.

INTRODUCTION

Ageing of population is one of the most important developments of the 20th century all over the world and will be one of the major challenges for the next millennium. In India, the elderly population is likely to increase from 70 million in 1995 to 141 million by 2020 and 508 million by 2100 according to World Bank projections (2000).

With a gradual reduction in the fertility rate and a rapid reduction of mortality rate due to medical interventions, the youth population has declined and the elderly numbers have increased. The twenty-first century is often called the age of ageing. Since 1950, the proportion of the world's population aged 60 and over has changed from one in thirteen to one in ten, with some developing countries ageing faster than developed countries. Marked differences exist between regions. Elderly, represent the fastest growing population in the world. The rapidly growing number of older people in both developed and developing countries mean that more and more people will be entering the age when the risk of developing certain chronic and debilitating diseases is significantly higher.

The ageing process causes a variable decline in function in a variety of organ systems, thus making elderly persons of the same chronological age different from each other. Besides this, the additional negative impact of chronic substance-abuse (principally smoking and alcohol intake), lack of physical activity, and adverse socioeconomic factors, makes the elderly a repository of

***Corresponding author:** *mathisri@rediffmail.com*

poor health parameters (Troisi, 2005). It is therefore not surprising that they are more vulnerable to chronic illnesses and also to acute sudden deterioration of health, as compared to younger people. Acute illnesses, unlike chronic problems, are amenable to therapy, but only if they are recognized early. Nutrition is an important factor contributing to health and functional ability. The effect of nutritional status on physical and psychological well being is especially high in elderly. With the increasing longevity, nutrition status plays a significant role in the quality of life in the elderly. Physical conditions common in elderly like disability, medication induced anorexia, poor dentition, restrictive diets, gastrointestinal diseases and metabolic disorders affect nutrients intake and metabolic demands. Furthermore, cultural and psychological issues such as living alone, bereavement, situational depression and religious beliefs may reduce nutrients intake and affect their health status (Baweja, 2008).

During old age numerous changes that affect the nutrient intake, digestion, absorption and metabolism occur in the gastrointestinal tract (Macfarlane, 2006). Gastrointestinal disorders constitute the most frequent complaint of this population, of which constipation dominates (Annals, 2003). Constipation is a common problem in elderly characterised by hard stools and difficulty in defecation with prevalence ranging from 15 to 20 percent in the community dwelling elderly and upto 50 percent in nursing home residents (Bosshara, 2001). Low dietary fibre, lowered physical activity and inadequate fluid intake may be the contributing factors for constipation. India underwent a transition. Nutritional transition from a diet rich in minerals and vitamins to one rich in carbohydrates and fat has taken place in our country. Food is no longer consumed only for its nutrients. But food has been looked upon for its ability to foster good health and well being among the consumers. This has led to the advent of Functional Foods. Functional food is a part of an everyday diet and is demonstrated to offer health benefits and to reduce the risk of chronic disease beyond the widely accepted nutritional effects. Among the best known functional compounds probiotics and prebiotics form the best examples.

The term functional foods comprise some bacterial strains and products of plant and animal origin containing physiologically active compounds, beneficial for human health and reducing the risk of chronic diseases (Grajek, 2005).Probiotics are “live microbial feed supplements that beneficially affect the host by improving the intestinal microbiota”. Prebiotics, on the other hand are non-digestible oligosaccharides that enhances the colonization of gut friendly organisms. Among the identified prebiotic components, inulin is found as a natural component in several edible fruits and vegetables. The average daily consumption has been estimated to be one to four grams in the United States (Moshfegh *et al.,* 1999). Many studies have proved that prebiotics are colonic foods that confer many health benefits on the host. Inulin type fructan primarily enhance calcium absorption and had an effect on colonic absorption in humans (Abrahams and Hamthrone, 2007). Holloway *et al.,* (2007), also concluded that there was a five percent increase in the mean absorptive efficiency of calcium among 15 elderly. Inspite of proven benefits of prebiotics on the gut, lack of sufficient research in India has made its implementation futile. Hence with the aim of improving the colonic function of elderly, this study was undertaken to study the impact of a self formulated prebiotic health drink on constipated elderly.

MATERIALS AND METHODS

A total of 30 elderly female in the age group of 50 to 85 years were chosen as the sample by purposive sampling for the conduct of the study. All the selected samples had constipation, characterized by hard stool consistency and decreased bowel movements. The study was undertaken at a small hamlet in Coimbatore, TamilNadu. A self formulated interview schedule was used as a tool to collect information regarding socio-economic data, diet pattern, hygiene and sanitary practices and bowel habits of the elderly. Nutritional assessment was carried out using the after ABCD technique. Anthropometric measurements namely height, weight was measured and BMI computed. Clinical evaluation was done to identify visible signs of malnutrition with the help of a clinician. 24 hour dietary recall for three consecutive days was collected in order to assess their diet composition. A food frequency questionnaire was also used to understand the frequency of consumption of selected Indian prebiotic foods.

A health mix using dietary prebiotic sources like soyabeans, oats, whole wheat, samai and artichoke was formulated. All the ingredients were selectively chosen because of its high fibre content and proven health benefits. The selected ingredients were subjected to suitable processing like soaking, germination, dehydration and powdering. To test the acceptability of the health drink, six variations were prepared for which the ingredients were mixed in various proportions. The best acceptable variation was chosen after sensory evaluation and its nutrient composition analysed. The selected sample was advised to mix 10gm of the health

mix in 100ml of warm milk. Health drink was the most ideal form of supplementation as it did not require chewing and was easy to prepare. Measuring spoons were also distributed along with the health mix packets to measure the accurate amount of the mix. The intervention study was done for a period of 60 days. During the supplementation, normal home diet was followed. At the end of the supplementation parameters like stool consistency, frequency of bowel movements, difficulty while defecation etc were studied

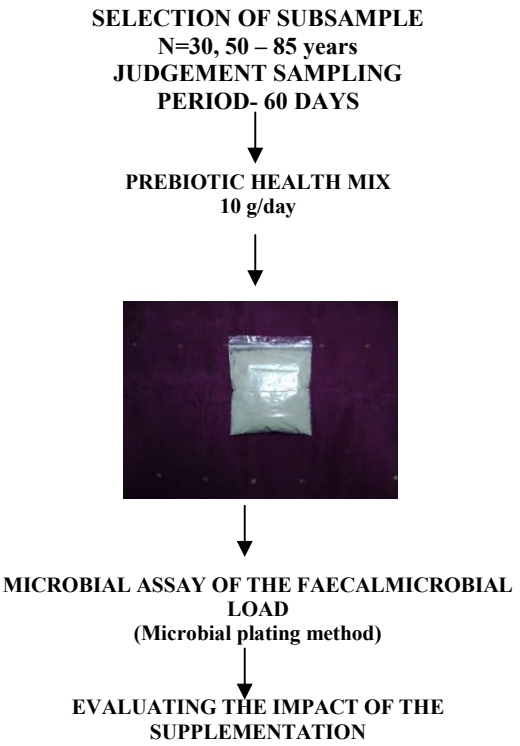

Fig. 1. Schematic representation of the suppplementation

RESULTS AND DISCUSSION

Demographic profile

Majority of the selected elderly fall in the age group of 60 to 69 years (33%).About 37 % were involved in sedentary activity like scavenging, shop keeping, flower selling and performing their day to day household chores. About 20 percent of the selected elderly were involved in heavy work, which included stone tenders and coolie workers. However majority was unemployed (30%) and did not do much of physical activity. Most of the elderly (87%) in the selected area earn less than Rs.4500 a month and only three percent come under the high income category.

Nutritional status

The elderly (17%) in the age group of 50 to 59 years had a normal BMI from 18.5 to 24.9 and three percent were class I obese. Signs of pale conjunctiva and mouth ulcer were seen in 20 percent and 17 percent of the selected elderly respectively. Ten percent of the elderly reported falling of teeth and pitting pedal oedema was observed in 20 percent. Three percent and seven percent of the elderly had Bitot's spot and angular stomatitis respectively. Hypertension was the most common with prevalence in about 12 out of 30 elderly, followed by diabetes mellitus in seven. Three persons suffered from arthritis, two each from osteoporosis and cardiovascular diseases and one each from ulcer and asthma.

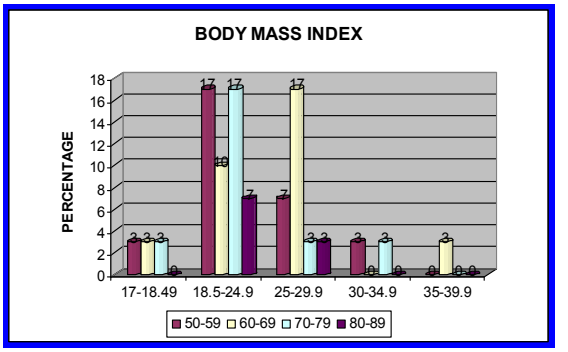

Fig. 2. Body Mass Index

Dietary habits

Microbial analysis of data collected with regard to the dietary habits of the selected elderly revealed that, 90 percent were non-vegetarians and the rest ten percent of the elderly were vegetarians. However of the 90 percent non-vegetarians only 60 percent of the elderly consume non-vegetarian foods presently.

A. Consumption of prebiotic foods

On studying the consumption of prebiotic food (Table 1), it was found that onion and garlic were the most commonly consumed prebiotic foods with 87 percent consuming them everyday. Onion and garlic were added in almost all the accompaniments like sambhar, rasam, kulambu, chutney, poriyal and gravies. Ten percent had the habit of consuming oats daily in the form of porridge or with buttermilk. Yet another prebiotic food, soyabean was consumed by 23 percent of the selected elderly atleast once a week. It was eaten in the form of a sundal or added to gravies and sambhar. A study by Seth *et al.,*

(2007), also concluded that 88 percent of the selected female elderly in Vadodara district consumed curd and onion more frequently. However the consumption of garlic ranged from daily to fortnightly by a majority of the elderly

Whereas after consumption of prebiotic drink for 2 month, a drastic change was noted in 80% having semi-solid stools. The mean time taken to defecate was 25

Table 1. Consumption pattern of probiotic and prebiotic foods

(N=30)

FOOD ITEMS	DAILY		WEEKLY THRICE		WEEKLY TWICE		WEEKLY ONCE		RARELY		DO NOT CONSUME	
	N	%	N	%	N	%	N	%	N	%	N	%
Oats	3	10	-	-	-	-	1	3	-	-	26	87
Soyabean	-	-	1	3	5	17	7	23	2	7	15	50
Onion	26	87	-	-	-	-	-	-	-	-	4	13
Garlic	26	87	-	-	-	-	-	-	-	-	4	13
Green leafy Vegetables	5	17	1	3	6	20	4	13	5	16	9	30

B. Mean nutrient intake of selected sample

The computed mean energy, protein and carbohydrates intake were lower than the Required Dietary Allowances by 42 percent, 30 percent and 61 percent respectively. The fat intake of the selected sample met the RDA as they used oil for cooking and consumed meat varieties. The mean fibre intake was grossly less than the RDA. The low fibre intake was due to the inclusion of low fibre foods and avoidance of high fibre foods like green leafy vegetables in the diet. The mean intake of vitamin-C, calcium, iron, carotene, thiamine and riboflavin were very much deficient than the Required Dietary Allowance. The reason for this deficiency was lack of inclusion of sufficient seasonal fruits and vegetables in their diet.

Colonic function of the selected elderly

20 percent of the selected elderly always strained during defecation. An incomplete emptying sensation was often felt by 27 percent. The stool consistency of 27 percent was always hard. Manual handling was reported in about 40 percent of the selected elderly. About 34 percent of the selected elderly spent more than ten minutes to pass stool always. All the selected samples had strain while defecation before the supplementation. But post supplementation, 80% did not experience any strain during defecation. Hard stool, a characteristic of constipation was experienced by all samples before supplementation.

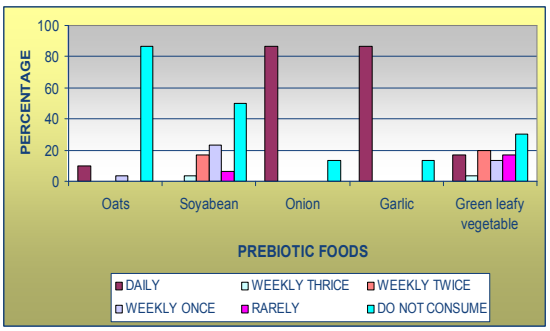

Fig. 3. Frequency of consuming prebiotic foods

Impact of supplementation

STRAIN WHILE DEFECATION	PERCENT	
	BEFORE	AFTER
YES	100	20
NO	-	80

mins, before supplementation which had decreased to 15 mins mid way, at 15 days. At the end of 30 days, there was a statistically significant change in the mean time taken to 10 mins which indicated non existence of constipation and difficulty in defecation. Bowel movements less than 3 times a week is considered a characteristic of constipation. All the selected samples had bowel movements only twice a week. Post supplementation, the frequency increased to five times a

week which was statistically significant at one percent level.

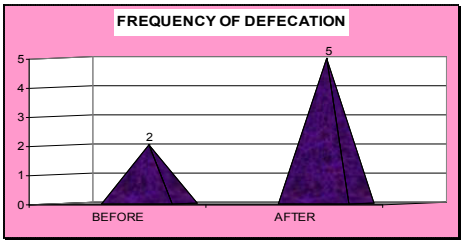

Fig.4. Frequency of defecation by the selected sample

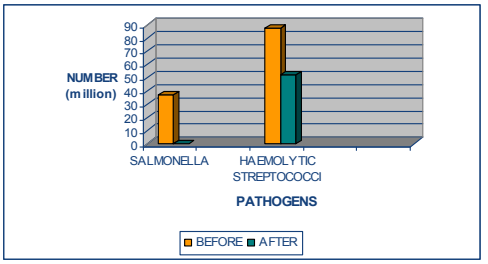

Fig. 5. Microbial load of the selected sample

On microbiologically analysing the faecal samples of the elderly it was found that one sample each had moderate counts of haemolytic streptococci and salmonella. Whereas, after supplementation salmonella was absent and there was a reduction in the streptococci count as shown in the figure

CONCLUSION

The study clearly indicated that prebiotics especially dietary prebiotics had a potential role in reducing constipation and thereby improving the colonic function in old age, the age group that was most affected with gastrointestinal problems. This has also opened a galore of opportunities for further in depth research in the field of functional foods.

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