



ABSTRACT

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Health promotion and disease prevention are important priorities for older adults. Studies indicate that healthy eating, physical activity, mental stimulation, social support and regular health care are important in maintaining health and independence of the elderly. Low nutrient intake has been a consistent finding in most of the studies so far reported on Indian elderly. Though there are many factors, which are responsible for diminished food intake, living arrangement seems to be one of the important factors having greater impact on the health of the elderly. Since sizeable proportion of our elderly population live alone or with their spouses and manage the house on their own, it was thought worthwhile to explore their problems at each stage of their activity related to food, to study the influence of living arrangements on their health and nutrition related problems and evolve suitable strategies to combat with such situations. Thus, the study was mainly focused on problems faced by the elderly in relation to diet and health and develop suitable measures for health promotion for the aged. In the light of the problems faced by the elderly subjects, two approaches were tried out and evaluated for improving the health of the elderly. These were either nutrient based or food based intervention. Thus, the present study was designed with main focus on exploring problems related to diet and health and developing suitable measures for health promotion for the aged.

The specific objectives included assessment of problems concerned with food related activities, diet, nutrition and disease profile of the elderly women with different living arrangements and age (aged 60 years and above). Information on socio demographic profile, lifestyle factors and general dietary information was also collected and subsequently impact of Iron Folic Acid supplementation on health of elderly women was also studied. Development and evaluation of selected nutritious food items suitable for geriatric population were also carried out. Finally intervention with soy based food items was carried out on institutionalized elderly for 3 months and their health and nutritional status were evaluated.

The study was divided into four phases. In the first phase, one hundred eighty elderly women (aged 60 years and above) belonging to middle and upper class were selected by purposive sampling followed by snowball technique from various zones of Vadodara city. These elderly women were categorized further as per their living arrangements (women living alone, women living with spouse and women living with family) and age groups (aged 60-75 years as young-old and >75 years as old-old). Data on socio demographic status, diet, nutritional status and disease profile were collected in addition to problems associated with food related activities. In the second phase Iron Folic Acid supplementation was carried out for 6 weeks for assessment of health of 75 elderly anemic women selected from subjects under phase I. Their respective age and hemoglobin-matched controls were selected from free-living population. In phase three, formulation and evaluation of two sets of nutritious food items were carried out which included either soy based fresh foods or convenient quick cooking nutritious foods from developed mixes. Analyses of all food items were carried out. Fourth phase of the study included intervention with soy items for 3 months in 20 institutionalized elderly. Baseline data was collected on socio demographic status, activity pattern, addition pattern, nutritional status, clinical parameters and morbidity profile. Soy food item was served in the morning breakfast in the institution for 3 months along with soy roti for lunch and dinner. Post intervention data was collected on nutritional status, clinical parameters and morbidity profile for assessment of the effect of soy foods on health and nutritional status of the institutionalized elderly.

The data on socio-demography of elderly women and institutionalized elderly were collected through questionnaire with respect to age, education, religion, mother tongue, marital status, type of family and source of income. Activity pattern of elderly women was assessed by 24-hour activity pattern, along with self-reported time spent in work related, religious, social and leisure time activities including sleep whereas activity pattern of institutionalized elderly included activities like walking, reading, watching TV, listening to music / bhajans/ lectures, meditation, prayers and sports. In addition, addiction pattern was assessed in institutionalized elderly with respect to

pan, supari, cigarette, tea, alcohol consumption and tobacco chewing using a questionnaire.

In phase I, survey of problems concerned with food related activities included information on purchasing, storing, preparation, cooking and eating/serving of foods. General dietary information of elderly women with different living arrangements and age was collected through questionnaire which included type of meal, munching of foods, eating practices, fasting pattern, adjustment with evening meals, type of meal substitutes, frequency of consumption of uncooked and cooked foods and water consumption pattern. Dietary intake was collected using 24-hour dietary recall method. Nutritional status was assessed using anthropometric measurement such as height, weight, mid upper arm circumference (MUAC) and body mass index (BMI). Clinical parameters like hemoglobin, blood glucose and blood pressure measurements were assessed in 180 subjects of phase I. Serum total proteins and lipid profile were also measured in case of institutionalized elderly. Supplementation of iron folic acid tablets on health of anemic elderly women was also assessed by their physical performances (score for standing balance, walking speed and rise from a chair by Seshadri, 1996) and cognitive function tests (attention and concentration test and memory recall test by Seshadri, 1996). In phase III, food items were developed and evaluated by hedonic rating scale. Analysis of food items included estimations of protein, fat, total ash, crude fibre, calcium, iron and β carotene using standard methods as described in AOAC, 1984. Disease profile was assessed by checklist method, which included lists of major and minor illnesses. Factors related to mental health through questionnaire and morbidity profile using clinical interview for depression (Amin, 1995) was assessed among institutionalized elderly.

Appropriate statistical tests such as paired 't' test, 'F' test, percentages, mean, standard deviation and anova were used at various places for the analysis of the data using Statistical Package for Social Sciences (SPSS/PC⁺).

Results of the survey on socio-demographic profile of elderly women (aged 60 years and above) belonging to different living arrangements and age groups showed that

51% subjects were married, 36% subjects had studied till primary class and 42.8 % subjects were widowed.

All the subjects belonging to different living arrangements spent most of their time in household and religious activities. Older group women had sedentary lifestyle.

With respect to problems of food related activities, self-purchase was practiced mostly by elderly women living alone. Elderly women living with spouse and younger group women had support of spouse in activity of purchasing of food. The frequency of purchase of food items was influenced by the perishability of the foods. Majority of elderly women used to purchase milk daily, fruits and vegetables 2-3 times/week, sweets and farshan monthly and grocery on yearly basis. All elderly women (n=180) performed the task of storing of foods. For preparation of foods majority of subjects were found independent except few elderly women living alone and young old women who took help from servants. Only women living with family had a support of children in cooking. Eight percent women were not facing any difficulty while eating/serving. Very few old-old elderly were assisted during eating/serving activity.

General dietary information revealed that 55% subjects had normal dietary pattern and 58.3% subjects used to observe fasts. Milk as substitute to major meal was preferred by 24% subjects and bread by 50% subjects. Tiffin services were preferred by 26% subjects and 70% of total subjects (75% women living alone and 77% old-old women) compromised the evening meal by modifications of the leftover food of the day. Elderly women living with spouse consumed fruits and cooked foods more frequently.

Data on dietary intake of elderly women showed that mean nutrient intake was low compared to RDA with respect to protein, iron, β carotene and vitamin C. Mean intake of energy and protein was significantly different ($p < 0.001$) within living arrangements and age groups. Consumption of β carotene was found $\leq 50\%$ of RDA among elderly women.

Mean BMI of subjects from different age groups was found to be 26.6 kg/m² for young-old and 22.9 kg/m² for old-old elderly group. With respect to living arrangement lowest BMI (24 kg/m²) was found among elderly women living alone.

Information on clinical parameters revealed that mean hemoglobin levels of all the elderly women were found below normal levels. Eighty percent of elderly women were found anemic with highest prevalence of anemia amongst women living alone (85%) and old-old women (83%). Majority of elderly had normal blood glucose levels and blood pressure levels.

With regard to general health profile maximum number of elderly women perceived their health as better and right for age.

Data on minor illnesses showed that headache, bodyache and general weakness were very common and frequent complaints were reported by all the elderly irrespective of different living arrangements and age groups. However, problems related to skin, teeth and gastro intestinal tract also appeared to be present amongst young-old and old-old subjects. With regard to major health problems, arthritis and hypertension were found generally prevalent among all the elderly women.

Data on 75 anemic women selected from phase I with respect to dietary intake found that the mean nutrient intake of elderly anemic women with and without IFA supplementation was deficient in energy, protein, iron and β carotene and vitamin C. After intervention with iron folic acid supplementation significant improvement was found in energy intake of women belonging to experimental group ($p < 0.05$). Around 7% of elderly anemic women showed improvement in iron intake and could meet 51-75% of RDA.

Hemoglobin levels of women with and without IFA supplementation were falling in moderate category of anemia before intervention. Significant improvement in hemoglobin levels of women with IFA supplementation after intervention for 6 weeks was found ($p < 0.05$) with shift of 11% of subjects in normal levels.

Significant improvement in physical performance tests and cognitive function tests scores were observed in women with IFA supplementation after intervention for 6 weeks ($p < 0.05$).

Phase III included development of soy based foods such as soy usal, soy sambhar, soy dhokli, soy stuffed paratha, soy roti and quick cooking food items which included carrot kheer and spinach in white sauce. All the items secured ≥ 7.0 score on hedonic rating 9 point scale for sensory evaluation depicting good acceptability. Soy based food items contained 12-15gms of protein per serving. These food items after estimation could supply 21-25% of RDA of protein. Analyzed quick cooking food items supplied 77-99% of RDA of β carotene. On analysis higher values were obtained in case of iron from almost all food items as compared to calculated values.

In case of institutionalized elderly subjects (phase IV), baseline data revealed that majority were found in the age group of 70-79 years. Eighty percent of subjects were living sedentary life style. Most of the elderly subjects were involved in activities like meditation, prayers and listening to bhajans. As compared to past, marked reduction in the addiction pattern was noted except for tea consumption among the institutionalized elderly.

Nutritional status showed that 50% elderly in the institution were under weight. Mean nutrient intake of institutionalized elderly was found deficient in protein, fibre, iron, β carotene and vitamin C. Fifty percent of elderly could meet $>100\%$ RDA for energy whereas 100% elderly met $\leq 50\%$ of RDA for β carotene.

Clinical information revealed that mean hemoglobin levels of institutionalized elderly male and female were 11.2gm% and 11.7gm% respectively. Fifty-eight percent of elderly male and eighty-three percent of elderly female were suffering from mild degree of anemia. Eighty-three percent of elderly were found with normal serum total protein levels. Lipid profile findings showed that though total cholesterol and triglyceride values were falling in the normal ranges, HDL-C and fractions were not found in desirable range. Seventeen percent of subjects were found with undesirable blood glucose levels. The mean blood pressure levels obtained was 154/90mmHg.

Data on disease profile showed highest prevalence of oral cavity problems in institutionalized subjects. Psychological problems were more noticed among institutionalized male subjects compared to female subjects. Persistent feelings of sadness were found among 50% of the elderly population. Bodyache and constipation were the common minor illnesses found in institutionalized elderly.

Post intervention data was collected at 6 weeks and at the end of 3 months on nutritional status, clinical parameters and morbidity profile of the institutionalized elderly after supplementation of soy foods for 3 months. Results of nutritional status showed reduction in the percentage of under weight (16.6%) subjects after intervention with soy foods for 3 months. Weight of elderly male and female after soy food supplementation showed significant increase after intervention ($p<0.05$). Intake of all the nutrients significantly increased at 6 weeks as well as at the end of 3 months of intervention ($p<0.05$). More than hundred percent of RDA of protein was fulfilled by 72% of subjects. Also, all elderly subjects could satisfy 100% RDA of calcium.

With regard to clinical parameters significant improvement in mean hemoglobin levels was recorded among institutionalized male subjects after intervention ($p<0.05$). Ten percent of subjects shifted to normal levels of hemoglobin. All the subjects showed normal levels of serum total protein after intervention. Lipid profile of the subjects showed that there was significant reduction in LDL-Cholesterol and increase in HDL- Cholesterol levels after soy supplementation for 3 months ($p<0.05$). Blood glucose levels improved and all the subjects were found in the normal range after intervention. After soy food intervention for 3 months the mean blood pressure levels of subjects with higher levels (154/90mmHg) reduced to normal (138/84mmHg) after intervention.

With respect to morbidity profile percent prevalence of psychological problems decreased after intervention. Fifty percent of the elderly subjects showed reduction in number and severity of minor illnesses after intervention with soy foods for 3 months.

Thus, the present study shows clearly that living arrangements and nutrient intake are important determinants on overall health of the elderly. The study further suggests that intervention with food or nutrient supplementation can serve as an effective strategy for promoting health for the aged.