SUMMARY AND CONCLUSIONS

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Ageing is an inevitable process that begins with the cessation of growth and development. Changes that occur in body composition, organ function, physical performance and cognition are age related and occur in all humans. These changes however, are profoundly governed by genetic and environmental factors such as lifestyle factors, physical activity, health care, nutrition and diseases. Risk of morbidity is high in old age due to deteriorating health status of the aged. Physical, mental, psychosocial and dietary factors are responsible for poor health and nutritional status of elderly.

The ageing process is often associated with a variety of nutrition related health problems that may impose greater demands for some nutrients.

Despite special needs, many elderly are not able to satisfy their nutritional requirements because of physical problems as they live alone or they have responsibilities of house keeping. With impairment in body functions such as vision, mobility and other diminished physical functions, they are unable to prepare and consume adequate nourishing diets for themselves. Compromising with the foods, which are easily available and readily consumable, or use of leftover foods are the most common coping strategies used by them

Keeping all this in view the present study was designed with a central objective of exploring problems related to diet and health and developing suitable measures for health promotion for the aged. After identifying the problems related to food and subsequently developing suitable foods, two approaches were tried and evaluated for improving health of the elderly. (A) Nutrient supplementation and (B) Food based intervention.

The study was planned and carried out stepwise as described below:

I ASSESSMENT OF ELDERLY WOMEN WITH DIFFERENT LIVING ARRANGEMENTS AND AGE GROUPS ON PROBLEMS CONCERNED WITH FOOD RELATED ACTIVITIES, DIET, NUTRITION AND DISEASE PROFILE OF THE ELDERLY (AGED 60 YEARS AND ABOVE)

For this purpose one hundred and eighty elderly women were selected from free-living population of Vadodara. They were equally categorized according to different living arrangements i.e. women living alone, women living with spouse and women living with family (60 women in each category) and also age wise as young old group and old old group (90 women in each group). For identifying their nutritional status and problems related to food specially designed proforma was used. The information was supplemented by using standard techniques of assessing nutritional status.

II THE IMPACT OF IRON FOLIC ACID SUPPLEMENTATION ON HEALTH OF ANEMIC WOMEN FOR A PERIOD OF SIX WEEKS

Forty-five anemic elderly women were selected from phase I of the study for the intervention with Iron Folic Acid supplementation for the period of six weeks. Their respective controls were selected from the same population. The socio demography of the anemic controls in terms of age, economic status and hemoglobin levels were matched with the cases to the extent possible.

III DEVELOPMENT AND EVALUATION OF SOME NUTRITIOUS FOOD ITEMS FOR GERIATRIC POPULATION

Two sets of food items were developed. First set of items included five soy based food items (soy usal, soy sambhar, soy dhokli, soy stuffed paratha and soy roti). Second set included quick cooking food items i.e. carrot kheer and spinach in white sauce.

IV ASSESSMENT OF THE EFFECT OF SOY FOODS ON HEALTH AND NUTRITIONAL STATUS OF INSTITUTIONALIZED ELDERLY SUBJECTS

Twenty elderly were enrolled from the local Premdas Jalaram vridh ashram, situated in warasia area for the study. Intervention with soy food supplementation was carried for a period of 3 months.

TOOLS AND METHODOLOGY

Tools and techniques used in the study have been briefly summarized as under.

The baseline information was collected from the subjects selected for phase I, II and IV of the study with respect to the following:

1) Socio demography: A detailed questionnaire was used to collect information on age, marital status, education, religion, type of family, source of income and mother tongue.

2) Activity pattern: The data on the activity pattern was assessed by total self reported time spent in activities related to work and leisure along with time spent in sleep. The activity pattern of the subjects was then categorized under sedentary, moderate and heavy activity. Twenty four hour activity recall was also subjected to institutionalized elderly.

3) Addiction pattern: The addiction pattern was evaluated in phase IV subjects with respect to addiction to pan, supari, cigarette, tea, alcohol consumption and tobacco chewing.

4) Problems regarding food related activities: This was obtained using a questionnaire, which included information on activities from purchasing, storing, pre-preparation, cooking and eating/serving of foods. Questions pertaining to the source of help and difficulties faced during carrying out such activities were included. All the information was obtained with respect to living arrangement and age group of the elderly women

5) Nutritional status: Nutritional status was assessed using anthropometric measurements like height, weight, MUAC and body mass index (BMI).

6) Dietary intake: The dietary intake was calculated using 24-hour dietary recall method. The mean nutrient intakes were calculated for energy, protein, fat, fibre, calcium, iron, β carotene and vitamin C. Data on general dietary information included consumption of specific uncooked (raw) and cooked foods was collected on the basis of their frequency of intake (phase I).

7) Clinical status: Levels of hemoglobin, blood glucose, serum total proteins and lipid profile (TC, TG, HDL-C, LDL-C and VLDL-C in phase IV) were estimated. Blood pressure was also measured.

8) Physical performance tests and cognitive function tests: Physical performance test and cognitive function tests were carried out on a sub sample of anemic women along with their controls.

9) Disease profile: Disease profile was assessed by collecting prevalence of major and minor illnesses using checklist method among elderly women and institutionalized elderly. Additionally psychological problems were studied among institutionalized elderly.

Phase III:

In this aspect of the study, development and evaluation of suitability of some nutritious food items for geriatric population was carried out.

1) Sensory evaluation: Sensory evaluation of two sets of food items was carried out. (a) Soy based food items: Four soy items were planned in such a way that one serving contained 10.8gms of soy protein. Items were evaluated by the elderly staying in the institution using hedonic scale test. (b) Quick cooking food items: Two items were developed. The items planned were rich in β carotene, iron and calcium. A panel of 15 judges evaluated these items using hedonic scaling test.

2) Chemical analysis of the foods: Various nutrient analysis of the food items were performed with standard methods. Analyses of soy based food items included components like protein, fat, iron, calcium, total ash and crude fibre. Apart from these components additionally β carotene was estimated from quick cooking food items. Finally analyzed data were compared with the calculated values.

The data collected were appropriately analyzed using percentages, mean and standard deviation, paired 't' was used to study the difference between pre and post intervention data on nutritional status, clinical parameters and disease profile. 'F' test was used to compare differences in three groups of elderly women with different living

arrangements and two age groups. The data was analyzed using Statistical Package for Social Sciences (SPSS/PC+).

Results are summarized below:

PHASE I

The results of this section included general background information, activity pattern, general dietary information, problems in food related activities, diet, nutrition and disease profile of 180 elderly women belonging to different living arrangements and age groups. The obtained results are summarized below.

1) Socio demographic profile:

Majority of the elderly women were found in the age group of 75-80 years. Eighty nine percent of subjects belonged to Hindu religion of which 77.2% were Gujarati. Data on marital status showed that 51% subjects were married and 42.8% of the respondents were widowed. Living arrangement profile revealed that 69.1% of elderly women were residing in nuclear family. Majority of elderly women belonged to middle class families.

2) Activity pattern:

All the subjects belonging to different living arrangements spent most of the time in the household and religious activities. Older subjects had sedentary lifestyle, while younger women were involved in more physical activities.

3) Problems of Food related activities:

This area formed the crux of information for phase I of the study. The problems faced by elderly women had direct influence on their nutritional status and disease profile. The questionnaire included identification of problems faced in carrying out all the activities related to food starting from purchasing to eating/serving of foods.

(i) Purchasing:

In general it was found that self-purchase was more carried out by elderly women living alone, followed by women living with spouse and then women living with family for food items like grocery, sweets and farshan. Majority of subjects from younger group used to do purchasing by themselves compared to older group subjects. Elderly

women living with spouse and younger women had better help of their spouses in purchasing grocery, fruits and vegetables, sweets and farshan, where as majority of children were carrying out the duty of purchasing of almost all food items for women living with family and older group women. Elderly women living alone were found dependent on themselves, without any support or help for purchasing. The frequency of purchase of food items was influenced by the perishability of the foods. In majority of cases the distance from house to shop was <1/2 km. Majority of elderly found counting of money (32%) and improper vision in dim light (38%) as common problems related to purchase of foods.

(ii) Storing:

In most of the subjects irrespective of age and living arrangements storing of food was done by elderly women themselves. Only women living with family had some support of children and servants. With regard to problems during storing and handling of stored foods problems like sitting down and getting up (16.7% in young old), climbing (18.9% in young old and old-old) and inability to reach things at higher level shelves (8.9% in young old and old-old) were observed. No differences were observed within the subjects with different living arrangements.

(iii) Pre preparation of foods:

Larger number of elderly with different living arrangements as well as age groups was independent in carrying out this activity. Only few elderly living alone and women from young old age group took help from servants. With respect to use of electrical appliances very few difficulties were noted like difficulty in handling, gripping and shivering hands in about 3-25% of subjects in total.

(iv) Cooking:

Majority of subjects (age group wise and with different living arrangements) were cooking by themselves except elderly women living with family where activity was assisted / supported by children. Problem while cooking projected problem of sitting down and getting up the most among subjects.

(v) Eating / serving:

More than 80% women irrespective of living arrangements and age groups did not require any help during the activity. Elderly women strongly expressed the feeling of loneliness and depression while eating alone. Around 38% of subjects living alone and from old old group required assistance during eating.

4) Diet, Nutrition and Disease profile:

(i) General diet related information:

Ninety one percent of the elderly women were vegetarian. Around 55% of subjects had a normal dietary pattern irrespective of the age group and living arrangement. Remaining 24.4% and 19% subjects preferred salt and sugar-restricted diet respectively. Fasts were not observed by 58.3% of subjects due to health reasons. Digestion problem was the commonest reason for not fasting among all the elderly women. Milk and bread were the substitutes found against the major meal followed by farshan. At least 26.1% of subjects preferred to have tiffin because of its easy availability and convenience, whereas rest of the subjects found it expensive. Almost 56.6% elderly subjects even showed positive response for eating outside home. When percentage of subjects with living arrangement was calculated based on their adjustments it was found that the commonest adjustment among all the groups of elderly was the use of leftover foods with addition of light food item (70%) followed by use of only leftover foods by 64.4%.

Data on frequency of uncooked (raw) food consumption showed that elderly women living with spouse (50%) and young old (45.5 %) subjects preferred fruits daily, where as milk and milk products were more consumed by elderly women living with their family (66%) on frequent basis. Nuts and oilseeds and salads were not frequently consumed by majority of the subjects.

Higher frequency of daily consumption of cooked foods with elaborate preparation was more noticed in elderly women living with spouse (61.6%) followed by elderly women living alone (55%) and elderly women living with family (46.6%). Subjects belonging to old-old group (58.8%) showed higher consumption of such foods daily compared to young old group (50%).

Thus, distinct differences in dietary habits were found in elderly with different living arrangements and varying age.

(ii) Dietary intake:

Mean nutrient intake of elderly women were low compared to RDA with respect to protein, iron and vitamin C. Consumption of β carotene was <50% of RDA among all the subjects. Energy, fat and calcium were consumed >100% then RDA except elderly women living alone and elderly women from older group. Mean intake of energy and protein was significantly different ($p<0.001$) within all the groups.

(iii) Anthropometric measurements:

Nutritional status of the subjects was assessed by anthropometric measurements. The mean body mass index of subjects from age groups ranged between 22.9 kg/m^2 (old-old group) and 26.6 kg/m^2 (young old group). In case of living arrangement lowest BMI was found among elderly women living alone (24 kg/m^2). All the subjects were falling in the normal healthy category. Prevalence of weight distribution showed that 20-23% and 16-34% subjects were found in under weight category among living arrangements and age group respectively.

5) Clinical parameters:

(a) Hemoglobin levels:

The mean hemoglobin levels of all the subjects were found below the normal cut off value. Lowest hemoglobin levels were found among elderly women living alone and elderly women from older group. Around 65% of total elderly women were showing mild degree of anemia. Severe degree of anemia was also observed in the range of 3 to 5 % of subjects irrespective of groups. Among elderly women living alone only 15% subjects were falling in the normal range of hemoglobin levels.

(b) Blood glucose levels:

Random blood glucose was estimated using glucometer. The mean blood glucose values of all the subjects was found in the normal range, with lowest value amongst older group women (94 mg%) and highest in young old group of women (107mg%). Twenty six to 35% of women with different living arrangements were found with

abnormal blood glucose levels and highest abnormal blood glucose levels (43%) were found among old-old elderly.

(c) Blood pressure levels:

Sphygmomanometer apparatus was used to measure the blood pressure. The mean blood pressure values ranged from 152±14/80±8 mmHg (women living with family and young old group) to 160±16/90±10 mmHg (women living alone and old old group). Abnormal blood pressure levels were found higher (46.6%) in women living with spouse followed by women living alone and with family. With regard to age majority of elderly were found to have normal blood pressure levels.

(d) General health profile:

General health profile of the subjects was collected using a questionnaire. Majority of subjects perceived their health as better and right for age. More than 70% subjects reported of sound sleep. Around 40% subjects had normal vision, whereas about 15% subjects reported presence of cataract. About 91% young and 72% older group subjects had normal hearing ability. Regarding taste sensation only 3% subjects had poor ability and no abnormality was found with respect to smell sensation. More than 70% elderly women could walk normally and only 9% older group subjects required support of stick while walking.

(6) Disease profile:

The disease profile was assessed by presence of major and minor illnesses. The most frequent minor illness prevalent among women with different living arrangements were headache (23%), body ache (28%) and general weakness (37%). Younger group subjects showed the prevalence of dryness of skin (36%), dental problems (29%), body ache (25.6%) and general weakness (23.3%), whereas additional illnesses among older group women were stomach distension (20%), trembling of limbs and slow reflexes.

Major disease profile was more focused on women living alone and with spouse. Number of problems and percent prevalence were found more in these subjects. At least one-third number of elderly were suffering from hypertension. Around 40% of young old and elderly women living with spouse had problem of osteoarthritis.

PHASE II

This phase included assessment of dietary intake, hemoglobin levels, physical performance test and cognitive function test of elderly anemic women. The results are summarized below.

1) Dietary intake:

The mean nutrient intake of anemic elderly subjects belonging to experimental and control group showed deficiency with respect to energy, protein, iron, β carotene and vitamin C before intervention with IFA supplementation. Majority of subjects met 75-100% RDA for energy, protein and vitamin C. Elderly anemic subjects could not meet $1/3^{rd}$ requirement of β carotene and $3/4^{th}$ requirement of iron. After intervention significant improvement ($p<0.05$) was found in the energy intake of experimental group. When nutrient intake as percent RDA was compared, earlier only 20% subjects were able to meet 51-75% of RDA for iron which improved and after intervention 26.6% subjects could satisfy 51-75% of RDA. Similarly in case of vitamin C only 50% of subjects could meet 76-100% RDA before intervention, same subjects showed improvement after intervention i.e. around $3/5^{th}$ number of subjects met 76-100% RDA of vitamin C after intervention.

2) Hemoglobin levels:

The mean hemoglobin levels of experimental and control group subjects were falling in the moderate category of anemia. IFA supplementation showed significant improvement ($p<0.05$) and there was a shift of 10 elderly women from moderate degree to mild degree of anemia (5 elderly women) and in the normal range (5 elderly). There was a decrease in 11% prevalence of anemia decreased among experimental group women after intervention. Among control group deterioration in the percent prevalence of anemia by 7% subjects was observed.

3) Physical performance tests:

Physical test was checked by performance on standing balance, walking speed and rise from a chair. Highly significant differences ($p<0.001$) were observed in the test scores of experimental group with regard to standing balance (2.13 to 2.73, n=30) and

rise from a chair (2.36 to 2.83, n=30). Control group did not show any improvement after intervention.

4) Cognitive function tests:

Attention and concentration test and memory test were used for evaluation of cognitive functions. Experimental group showed highly significant improvement in both the test scores ($p<0.001$).

PHASE III

In this phase of the study selected nutritious food items were developed, evaluated and nutritive composition was analyzed. The results are summarized below.

1) Development of food items:

Two sets of food items were developed. One was based on fresh soy food items and second set included quick cooking food items. Under soy based food items four food items as major meal and one item as a supplement (soy roti) were formulated. Soy based items were: soy usal, soy sambhar, soy dhokli and soy stuffed paratha. All the soy items formulated contained almost equal amounts (10.8gms) of soy protein.

Quick cooking food items namely carrot kheer and spinach in white sauce, which were micronutrient rich were developed. The items thus prepared and cooked served the purpose of ready to eat food.

2) Sensory evaluation of the food items:

Sensory evaluation of soy based food items were carried out in the field by the institutionalized elderly. Evaluation was done using 9-point hedonic rating scale. All the soy food items scored ≥ 7 points. Soy sambhar and soy paratha scored highest (8.5) showing high acceptability among institutionalized elderly.

Quick cooking food items were evaluated by trained panel members. Hedonic rating score showed high acceptability of both the food items.

3) Nutritive composition of cooked food items:

Analysis of food items was carried out using standard methods. Protein, fat, crude fibre, total ash, calcium and iron were estimated from soy based food items. Additionally β carotene was analyzed from quick cooking food items.

The protein content of all the food items ranged from 81.9 – 97% of the reported values. Protein from quick cooking foods and soy roti was highly retained. One serving of all the cooked soy food items (except soy roti) could fulfill 21 – 25% of RDA. Quick cooking foods supplied 8-12% RDA of protein.

The fat content of the cooked food items ranged widely from 68.5 – 99.9% of the reported values. Analyzed fat content of soy sambhar and soy stuffed paratha was found lowest. Soy usal supplied 85% of RDA for fat.

The percent analyzed values of total ash in various food items ranged from 71.2 - 95.3% of reported values.

The crude fibre content of all the food items ranged from 35.4 –165.1% of reported values. Soy stuffed paratha and spinach in white sauce showed higher content (39% and 65% respectively) on analysis.

All the food items analyzed for iron content showed higher content i.e. by 4.2-171.2% than reported. All the foods could satisfy 8 – 28.5% of RDA of iron

The calcium content of various cooked food items ranged from 94.2 – 107.6% of reported values. Analyzed calcium value of soy stuffed paratha showed 58.3% higher value than reported. Nineteen to thirty nine percent of RDA of calcium could be met by consuming one serving of food items.

The analyzed value of β carotene from quick cooking food items could satisfy 77-99% RDA.

The comparison of all the developed food items based on their sensory evaluation and nutritive composition showed that soy stuffed sambhar ranked highest, followed by soy stuffed paratha, soy usal and soy dhokli, whereas under quick cooking food items carrot kheer was evaluated as better product.

PHASE IV

This phase included results of intervention for 3 months with soy foods in institutionalized elderly. Results of assessment of socio-demographic profile, life style factors, nutritional status, dietary intake, clinical profile and morbidity profile are summarized below.

1) Socio demography:

Majority of the institutionalized elderly were in the age group of 70-79 years. There were 14 men and 6 women. Eighty percent of subjects were living sedentary life and ninety-five percent of subjects were presently passing their time in religious activities. Eighty-three percent of women subjects were widow.

2) Lifestyle factors:

(i) Socialization:

Thirty percent of subjects were visited weekly/monthly by their relatives. Only 5% of subjects were visited by friends.

(ii) Activity pattern:

Eighty percent of subjects in the institution were living a sedentary life. Twenty percent of institutionalized elderly were involved in moderate activities like walking, purchasing of vegetables and visiting temple. More number of elderly were involved in activities like meditation, prayers and listening to bhajans.

(iii) Addiction pattern:

Higher number of elderly were addicted to various habits in the past than at present. A marked reduction was noticed in pattern except for tea consumption.

3) Nutritional status:

Nutritional status was assessed in terms of anthropometric measurements and dietary intake. Summary of pre and post intervention data on nutritional status is presented below.

(i) Anthropometric measurements:

The mean anthropometric measurement of institutionalized subjects showed that weight of elderly female was less than required. Half of the elderly in the institution were under weight before intervention, reduced to 16.6% after intervention of 3 months. Number of healthy subjects increased to double after 3 months of intervention. The increase in mean weight of institutionalized males before and after 6 weeks and 3 months of intervention was significantly different ($P<0.05$). The mean increase in weight of female before and after 3 months of intervention was highly significant ($P<0.05$).

(ii) Dietary intake:

The mean nutrient intake of the institutionalized males and females was found to be deficient in protein, fibre, iron, β carotene and vitamin C. Significant improvement in the intake of all the nutrients was found after the intervention with soy food supplementation. Before intervention only 11% of elderly were able to fulfill >100% RDA for protein, improved and after intervention 77.7% elderly could satisfy the same. Calcium intake also increased and after intervention double i.e. 100% elderly could fulfill >100% of RDA. In case of iron 16.7% elderly were able to meet only <50% RDA reduced to none after intervention. Similar type of improvement was observed in case of vitamin C. With regard to fibre 100% elderly could meet <76% of RDA earlier showed little improvement and after intervention 11.1% elderly met 76-100% of RDA.

4) Clinical parameters:

Hemoglobin, serum total protein and lipid profile were estimated using enzymatic kits. The findings are summarized below

(i) Hemoglobin levels:

The mean hemoglobin levels of institutionalized male and female were found below normal levels. Fifty eight percent of male and 83.3% female were suffering from mild degree of anemia. After intervention significant improvement in the hemoglobin levels of elderly male was noticed. Hemoglobin levels increased from 11.20 ± 1.3mg% earlier which increased to 11.58 ± 0.5 mg% after 45 days and further improved to 11.79 ± 0.8 mg% after 3 months ($p<0.05$).

(b) Serum total protein values:

All the elderly were found with mean serum protein levels in the normal range. Seventeen percent of elderly were falling in <6gm% levels before intervention. After supplementation of soy foods 100% of elderly were found with serum total protein levels >6gm%.

(c) Lipid profile:

There was decrease in total cholesterol and LDL-C values found after intervention of 6 weeks and 3 months with soy supplementation. Significant improvement in the HDL-C ($p<0.05$) was noticed after intervention. HDL-C levels were 37.8mg% before increased to 40.2mg% after 45 days and further increased to 41.8mg% at the end of 3 months of soy supplementation. LDL-C and fractions also changed significantly after intervention.

(d) Random blood glucose estimation:

There was significant decrease found in the mean blood glucose levels of the subjects after intervention with soy foods supplementation for 3 months. The mean blood glucose level was 109mg/dl before intervention reduced to 93mg/dl after intervention of 3 months ($p<0.05$).

(e) Blood pressure measurements:

The mean blood pressure levels of institutionalized elderly reduced from higher levels (158/90mmHg) before intervention to normal levels (138/84mmHg) after intervention. Five elderly who were found with abnormal blood pressure levels showed reduction in their levels.

5) Morbidity profile:

Morbidity profile of the elderly included assessment of disease profile, psycholodical problems and minor illnesses. Findings of disease profile showed that 93% elderly male and 100% elderly female had oral cavity problems. Problems of gastrointestinal tract ranked second (80% subjects) followed by respiratory tract problems, central nervous system problems and cardiovascular diseases.

Few elderly mentioned use of prosthetic aids. Seventy-one percent elderly male and 100% female were using spectacles for normal vision. Twenty eight percent elderly male required support of stick for walking and one elderly female was found using artificial dentures.

Factors related to mental health status showed that intolerance to noise in general was felt by 35% of subjects. Thirty percent subjects expressed the feeling of anger by crying. Forty-five percent of subjects showed behavior of forgetfulness

Psychological problems were more found in institutionalized males compared to females. Persistent feeling of sadness was observed by 55% of elderly, followed by avoidance of socialization (80%), low self-esteem by 70% and feeling of being left out by 65%. Thirty percent of the elderly complained of decreased appetite. These problems reduced after intervention with soy supplementation. Twenty percent reduction in feeling of sadness, avoidance of socialization and irritation was found after intervention. Problem of low self-esteem decreased in 50% of elderly. Complaints of disturbed sleep reduced in 30% elderly subjects after intervention with soy supplementation at the end of 3 months.

The commonest minor illnesses experienced by elderly male were body ache (70%) and constipation (64%), which reduced by 27% and 15% respectively after intervention. During post intervention period there was reduction found in number of female subjects also showing minor illnesses such as body ache, constipation and infections.

Thus, soy food supplementation showed its beneficial effect on the nutritional status, hemoglobin levels and morbidity profile of the institutionalized elderly subjects.

Therefore, from the various results of the present study some broad concluding remarks can be made.

a) There seems to be an association between different living arrangements, age, nutritional status and health of the elderly.

b) Various problems related to food procurement, preparation and eating arrangements seem to have a strong bearing on food intake and health of elderly.

c) Low cost, quick cooking and easily digestible food items could be prepared by judicious combination of nutrient dense foods available locally.

d) Food and nutrient based interventions could serve as a useful strategy for improving health and nutritional status of the frail elderly.

e) Changes in the living pattern and nutrient intake are the important contributory factors in improving life of elderly.

Thus, the present study clearly indicates the need for taking concrete steps for promoting and sustaining geriatric health in the country. The goal can be achieved by prevention of nutritional deficiencies and delaying of age related morbidities. In this context, development of foods for improvement of nutritional status of geriatric group is a virgin area to work with. Most of the work in the literature reported revolves around needs of children, pregnant mothers and patients. Development of ready to eat or quick cooking food for geriatric population is particularly useful for older group elderly and for elderly living alone. Accessibility of appropriate food available at low cost and is easy to cook, would be a boon to geriatric world and could contribute a great deal to quality of life of elderly. If efforts are made in these directions present work would prove to be worthy in terms of achieving the goal of "Health promotion for the aged".

RECOMMENDATIONS

The present study doubtlessly indicates an association between living arrangement and nutritional status especially of elderly women. From the conclusions of the present study, following recommendations can be made.

✓ This study provided information on possible difficulties faced by elderly, therefore newer modifications could be encouraged which may reduced minor complaints and improve quality of life of elderly.

✓ Kitchen should be designed appropriately to suit and adjust the elderly, which could provide ease and convenience to work.

✓ Facilities like help or assistance on payment should be made available to very frail elderly for e.g. shopping.

✓ Meals on wheels, congregate dining or tiffin services should be made available & encouraged among elderly for improvement in their nutritional status.

✓ To reduce the prevalence of the diseases and minor health problems among elderly services like mobile medical vans and free medical check-up camps should be emphasized.

✓ Smaller and more frequent meals should be advocated. This would help to reduce GIT problems reported by them.

✓ Better information, education and communication techniques should be utilized improvement of lifestyle, dietary intake, disease profile and other critical issues.

✓ There is a need to develop illustrated guidelines and IEC materials for imparting nutrition health education in simple regional languages for assisting elderly and their care givers.

✓ Compromises should not be made with food intake because of physical or mental health problems but one should bring about behavioral changes and newer approaches of modern living.

✓ Efforts may be made to improve cognitive functions through nutrient supplements.

✓ Specially designed RTE foods and convenient foods should be made available to needy elderly.

✓ Quick cooking foods which are nutritious and possess all qualities essential for geriatric feeding should be made available at low cost by the NGO's or through co-operative societies or ministry of social welfare at the government level.

Healthy geriatric population is the best indicator of development of any nation. Therefore, efforts towards health promotion for the aged should be a never ending process for achieving highest standard of geriatric health in the country.

SUGGESTED AREAS FOR FUTURE RESEARCH

1. Studies on development of specially designed foods suitable for institutions and therapeutic foods, which can be recommended for the use of Geriatric wards of the hospitals.

2. Studies on herbal interventions in relation to geriatric health.

3. Action oriented research leading to empowerment of elderly through integrated approaches and measures.