International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2019; 7(3): 2950-2956

Received: 13-03-2019
Accepted: 16-04-2019

Ajanta Hijam
Assam Down Town University, University in Khankar Gaon, Assam, India

Daisy Sharma
Assam Down Town University, University in Khankar Gaon, Assam, India

Correspondence
Ajanta Hijam
Assam Down Town University, University in Khankar Gaon, Assam, India

Development of functional food multi mix for post-menopausal women

Ajanta Hijam and Daisy Sharma

Abstract
The present study was planned to determine the nutritional status and menopausal symptoms of women under the age of 40-60 years and to develop functional food product for them. A survey was undertaken with a 80 respondents under the age group of 40-60 years and the data was collected from Imphal East District (Manipur) by using a pre-tested questionnaire. The objectives of the study was to screen out post menopausal symptoms and to develop a functional food for post menopausal women. From the survey it was found that most of the women are suffering from menopausal symptoms like fatigue, hot flashes, back pain, constipation, sexual intercourse, mood swings, depressed mood poor concentration, hypertension etc. After getting results from the survey, a food multi mix was developed for improvement of health status of the women. Acceptability trials were conducted by a semi-trained panel consisting 20 judges from the Department of Food, Nutrition and Dietetics. Sensory evaluation was done by using 9 hedonic scales by expert panel. Four formulations were developed using by food multi mix namely F1(Formulation 1 = 40% ragi flour +40% soya beans flour + 5% sesame flour +10% chick pea flour +10% green moong flour), F2 (Formulation 2= 50% ragi flour + 30% soya beans flour + 5% sesame flour + 10% chick pea flour + 10% green moong) and F3 (Formulation 3= 60% ragi flour + 20% soya beans flour + 5% sesame flour + 10% chick pea flour + 10% green moong) and F4 (Formulation 4= 70% ragi flour + 10% soyabean flour + 5% sesame flour + 10% chickpea flour +10% green moong flour). Out of four formulation using by developed food multi mix F4 (Formulation 4) exhibited highest scores among the four formulation in term of colour (8.41), appearance (8.66), taste (8.30), texture (8.16), flavor (8.45), consistency (7.75) and overall acceptability (8.46). Formulation 4 was selected for carrying out further analysis like physico-chemical tests and storage studies. Proximate analysis was done to find out the nutrients content of the developed food multi mix. The calcium content of the developed food multi mix were 352.46 mg/100g, iron content were 12.52 mg/ 100g, phosphorous content were 392.47 mg/100g and protein content were 14.60 g/100g. The shelf life storage of the selected formulation 4 was less affected in all the sensory attributes in terms of colour, taste, texture upto till 60 days storage. The developed food multi mix was distributed to the 20 respondents who were mostly affected by menopause symptoms and feeding trial was conducted for 30 days. After completion of 30 days of supplementation the survey was conducted again and the result shows that 90% of respondents were improved their health after feeding like, fatigue, back pain, legs pain, dizziness, headache, constipation, sleep disturbance, hot flashes, arm pain etc. A Nutrition Education programme was conducted at the end of the study period, to explain the role of food in post menopausal period and the nutrient requirement like calcium, iron, phosphorous, protein and encourage them to consume in their daily diets to improve their overall health problems.

Keywords: functional food multi mix and post-menopausal women

Introduction
Menopause is a natural part of a women's life. It is the permanent cessation of menstruation resulting from the loss of follicular activity of the ovaries and when body begins to produce progressively lesser progesterone and estrogen and eventually her menstrual cycles cease (Shikha Goyal *et al*., 2012) [33]. Estrogens play important role not only in reproductive system but also in the normal functioning of cardiovascular, central nervous, immune, and skeletal systems (Kour *et al.*, 2005). Many physiological changes are associated with menopausal symptoms. These in turn are thought to increase the risk of various chronic disease including heart disease and osteoporosis. Menopause is the permanent cessation of the primary functions of the human ovaries. Worldwide, the estimates for the median age at menopause range from 45 to 55 years (Rania *et al.*, 2012) [23]. It is a difficult time for every women with fluctuating hormones which leads to various emotional and physiological symptoms as well as increases the risk of osteoporosis & coronary heart disease.

In menopause, lower level of estrogen reduces their protective role, and increase incidence of cardiovascular diseases. Persons with reduced secretion of progesterone and an ovulatory have decreased bone density. Decrease in estrogen leads to collagen loss from bone and ultimately decrease in blood supply to skin and dry, thin and in elastic skin. It also leads to brittle nails and loss of hair. The result of low levels of hormones is often manifested by deleterious physical, psychological and sexual changes in menopausal phase. The lower levels of estrogen lead to vaginal atrophy. The vaginal mucosa becomes thinner and drier leading to itching of vagina. Thinning of vaginal epithelium may contribute to inflamed vaginal wall and urinary tract infection. The most common symptoms of menopause in women are sweating, heart palpitations, mood swings, hot flashes, dizziness, fatigue, irritability, anxiety, loss of self-esteem, depression etc. Menopausal symptoms may vary in their strength, so some women may not have problems, while others suffering during this period of life. A well balanced diet is important for good health and to combat some of the complications of menopause to certain extent. The causes may be: hormonal changes, bad eating habits, heredity, lifestyle, frequent use of alcohol, tobacco, etc. An imbalanced diet, low physical activity and emotional stress for women in menopause like changes in physical appearance, fear of aging, weight gain and many others. This can lead to depressive conditions and loss of life energy.

The menopausal changes have an impact on food intake and food choices of menopausal women. Adequate vitamin D levels are important in the prevention of fractures in patients with osteoporosis. Osteoporosis is a late complication of menopause. It is a degenerative bone disorder where there is thinning and weakening of the bone, and a general decrease in bone mass and density. So susceptible to fractures. Treatment guidelines on the management of postmenopausal osteoporosis recommend maintaining adequate vitamin D intake to prevent bone loss. Vitamin D deficiency impairs bone mineralization and calcium absorption, as well as muscle strength and balance, which may consequently increase the risk of falling (Yoon-Sok Chung *et al*., 2016). Vitamin D helps the absorption of calcium from the gut. We need at least 600-800 IU (international units) of vitamin D daily. Nutrition can play a strong role in preventing and managing changes in body composition. The ability of nutrition to prevent or manage other symptoms of menopause is less clear. An essential nutrient is a nutrient that supports human life but is not made by the human body and must be consumed through food and beverages. There are seven essential nutrients: carbohydrate, protein, fat, vitamins, minerals, fiber, and water. The macronutrients carbohydrate, fat, and protein provide calories and are rarely deficient in the diets of menopausal women, with the exception of a specific type of fatty acid. Therefore, there is a need to study the nutritional status of menopausal women and to develop healthy food products which will help to reduce the complications of menopausal women. Hence, a present study was planned to determine the nutritional status of post-menopausal women and their health ailments of Manipur"

Material and Methods

The survey was conducted at Imphal East District of Manipur. A total no. of 80 respondents were selected from the 3 different villages *viz.*Yambem (n=40), Top-chingtha (n=20) and Huikap (n=20) and the respondents were taken under the age group of 40-60 years. Total 80 women were enrolled and were distributed in the following age 40-45 yrs (n=18), 46-50 yrs (n=34), 51-55 yrs (n=16) and 56-60 yrs (n=12).The study was done by interview technique using pre-tested questionnaires. Data were collected on personal history, health history, socio-economic status and, menopausal symptoms.

Procurement of the Products

The formulation of food multi mix prepared by ragi flour, whole soya bean flour, whole sesame flour, whole green moong and whole chick pea at different various products. The present study required products were found from Manipur and Assam.

Processing of the food multi mix products

The ingredients were processed to make ready for product developed of food multi mix flour. All the ingredients i.e. ragi, soya beans, chick pea, sesame and green moong were processed into flour and to developed food multi mix flour.

Processing of whole ragi into flour

Ragi were thoroughly cleaned to remove dirt, dust, insect excreta/ feathers and admixture of other food grains. The clean graded materials were ground in the electric grinder to make fine flour and sieved by 80-100 mesh sieves. The flour samples obtained were kept in airtight container before use by Kumari Rosy *et al*., (2016) [15].

Processing of whole soya beans into flour

Soybean grains were thoroughly cleaned to remove the dust and other foreign materials and roasted with medium flame in 4-5 min. Soybean was then ground to make fine flour and sieved through 80-100 mesh sieves. The flour samples obtained were kept in airtight container before use by Kumari Rosy *et al*., (2016) [15].

Processing of whole chick pea into flour

Chick pea were cleaned and roasted in the pan with medium flame in 4-5 min. Chickpea grains were cleaned to remove the foreign materials and then dehulled in a hand-operated chaki for removal of husk. The dehulled grains were ground in an electric grinder to make fine powder and sieved by 80-100 mesh sieve. The obtained flours were roasted on low flame and then stored in airtight container before use by Salve *et al.*, (2011) [27].

Processing of whole sesame into flour

The whole sesame were thoroughly cleaned to remove the dust and other foreign materials and roasted with low flame in 2-3 min. Sesame was then ground to make flour and sieved through 80-100 mesh sieves. The flour samples obtained were kept in airtight container before use.

Processing of whole green moong into flour

Green moong were thoroughly cleaned to remove the dust and other foreign materials and roasted with medium flame in 4-5 min. Green moong were ground in electric grinder to make fine powder and sieved by 80-100 mesh sieve. The flour sample obtained were kept in airtight container before use.

Formulation and standardization of food multi mix

The different formulations of developed food multi mix were prepared from whole ragi flour, soybean flour, whole chick pea flour, whole sesame flour and whole green moong flour and the formulation level of incorporation is given

Formulation and standardization of food multi mix

Formulation	Level of incorporation				
	Ragi	Soybeans	Sesame	Chick pea	Green moong
F1	40 gm	40 gm	5 gm	10 gm	10 gm
F2	50 gm	30 gm	5 gm	10 gm	10 gm
F3	60 gm	20 gm	5 gm	10 gm	10 gm
F4	70 gm	10 gm	5 gm	10 gm	10 gm

F1 = formulation 1, F2 = formulation 2, F3 = formulation 3 and F4 = formulation 4

Nutrient analysis

Calcium, phosphorous, iron and protein were analyzed by using ICP-MS methods and Kjeldhal methods.

Sensory evaluation

Sensory evaluation has been defined as the sensory attributes of colour, appearance, texture, flavour, taste and overall acceptability by using Nine point hedonic scale score and scientific discipline used to evoke, measure, analyze and interpret those responses to products as perceived through the senses of sight, smell, touch and hearing (Sidel and Stone, 1993).

Acceptability trials was conducted by a semi-trained panel consisting of 20 numbers of the respondents from the Department of Food, Nutrition and Dietetics. Sensory evaluation of the samples was carried out using 9 point Hedonic scale. The degree to which a product was liked expressed as like extremely (9), like very much (8), like moderately (7), like slightly (6), neither like nor dislike (5), dislike slightly (4), dislike moderately (3), dislike very much (2), and dislike extremely (1).

Self life storage studies

The shelf life of the formulated food multi mix flour were studied by storing in the plastic air tight container for a period of 0 days, 30 days and 60 days. The organoleptic evaluation were analyzed at regular intervals.

Result and Discussion

The study area were selected 3 different villages of Imphal East District, Manipur. A total of 80 respondents were taken under the age group of 40-60 years. The study population comprised of menopausal women with 22.5%, 42.5%, 20% and 15% being enrolled in 40-45 years, 45-50 years, 50-55 years and 56-60 years age groups respectively and to screen out the nutritional status and post- menopausal symptoms in women.

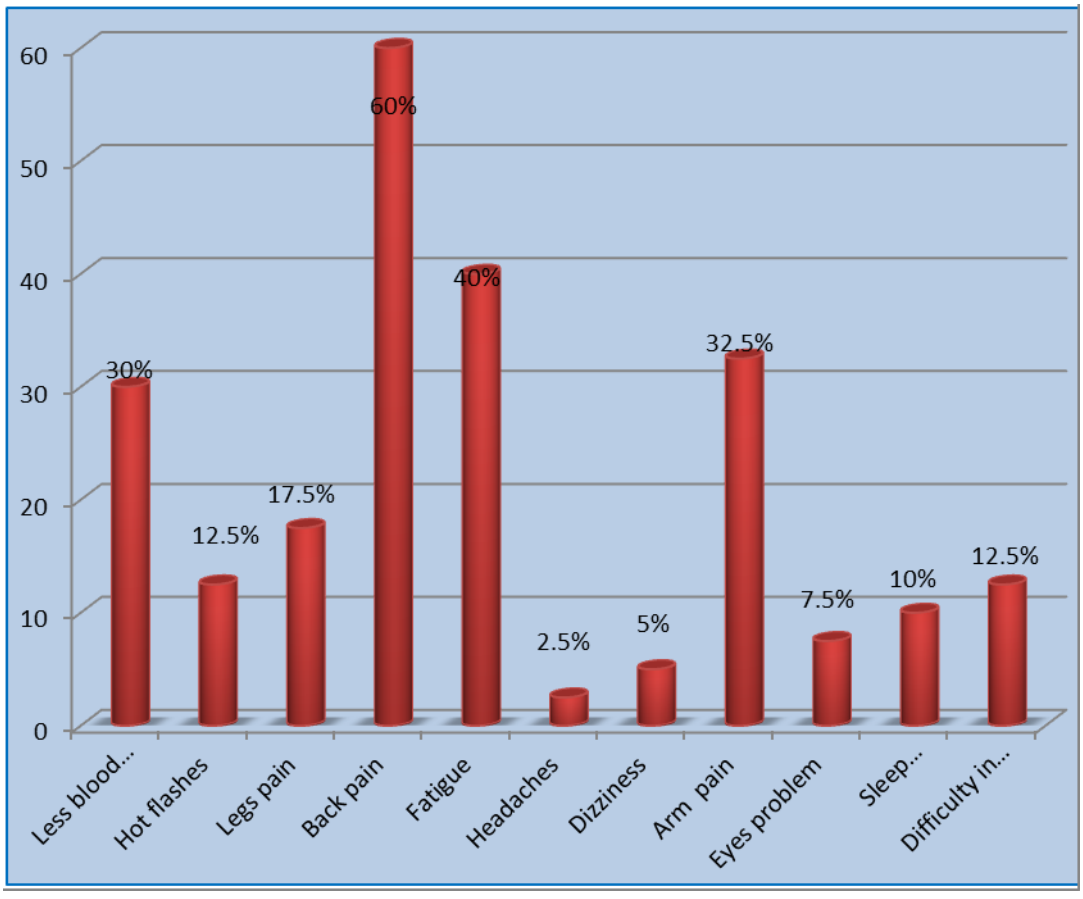

Fig 1: Menopausal symptoms among the respondents

From the present study regarding the physiological changes of the respondents, among 80 respondents 30% of the respondents were interest in sex, and remaining 70% were not interested in sex after menopause. 12.5% of the total respondents were facing difficulty in sexual intercourse and remaining 87.5% were not facing any difficulty in sexual intercourse, where as 32.5% of women were irritate in sex and 67.5% were not irritate in sex, 50% of the respondents were less interest in sex, 2.5% were more interest in sex, 30% of women were feeling same as before during sex and 17.5% have never done sex after menopause. Often sex in a weak 1-2 times were 30%, 3-4 times were 7.5% and never in sex were 17.5% (Table no.3). Regarding the symptoms of the respondents 17.5% were having irregular period whereas normal period were 82.5%, less blood flow were 30%, fatigue were 40%, dizziness were 5%, headache were 2.5%, back pain were 60%, legs pain were 17.5%, arm pain were 32.5%, hot flashes were 12.5%, eyes problem were 7.5%. Similar

study was done by Donald S Christian *et al*., 2012, it was concluded that most of the respondents was suffered from physical symptoms of tiredness (88.4%) and headache (74.8%). It was followed by vasomotor symptoms like hot flushes (40.1%), night sweats (40.8%) and palpitations (37.4%) as well as psychological symptoms like insomnia (57.1%), anxiety (38.1%) and lack of concentration in the work (33.3%) (Fig. 2).

Table 1: Menopausal symptoms (psychological changes)

Psychological changes	Total no.	Percentage %
Poor concentration	46	57.5
Anxiety	10	12.5
About family problem	14	17.5
About health problem	12	15

From the present study (Table no.1) it was revealed that the menopausal symptoms (Psychological changes) of the respondents having poor concentration were 57.5%, anxiety were 12.5%, deep thinking about family problem were 17.5% and about health problem were 15%.

Table 2: Knowledge of women on health care facilities

Consulted doctor:- No. of respondents	Percentage %	
Yes	60	75
No	20	25
Uses of health supplement:-		
Yes	-	-
No	80	100
Sort of medication:-		
Yes	-	-
No	80	100

From the above table (Table no.2) it was found that the respondents who consulted doctor after menopause were 75% and 25% did not consulted doctor. Almost 100% of respondents did not used any health supplement and sort of medication.

Table 3: Food frequency consumption

Items	Daily	Weekly	Monthly	Rarely	Never	Total %
Cereals	100%	-	-	-	-	100
Pulses	-	62.5	17.5	7	1	100
Vegetables	100	-	-	-	-	100
Fruits	2.5	47.5	15	35	-	100
Milk & dairy products	40	25	10	25	-	100
Meat & meat products	7.5	92.5	-	-	-	100
Fats & oils	100	-	-	-	-	100

From the above table (Table no.3) it was revealed that the frequency of food consumption of the respondents 100% of women were consumed cereals in daily. Consumption of pulses daily were 0%, weekly were 62.5%, monthly were 18.5%, rarely were 7% and never were 1%. The respondents of consumed vegetables were almost daily. Fruits consumed of the respondents daily were 2.5%, weekly were 47.5%, monthly were 15%, rarely were 35%, and never were 0%. Consumption of milk & dairy products of the respondents daily were 40%, weekly were 25%, monthly were 10%, rarely were 25% and never were 0%.Meat & meat products consumed daily were 7.5% and weekly were 92.5%.Consumption of fats & oils of the respondents totally used daily were 100%. A contradictory study was done by Samir *et al.* 2014 [25] and it result shows that less than 10% of the respondents consumed olive oil and Sunflower oil consumed almost 90% of respondents.

Since there is a lot of menopausal symptoms prevailing among the respondents, a food multi mix was formulated and fabricated in order to improve their menopausal symptoms.

Table 4: Formulation and standardization of food multi mix

Formulation	Level of incorporation				
	Ragi	Soybeans	Sesame	Chick pea	Green moong
F1	40 gm	40 gm	5 gm	10 gm	10 gm
F2	50 gm	30 gm	5 gm	10 gm	10 gm
F3	60 gm	20 gm	5 gm	10 gm	10 gm
F4	70 gm	10 gm	5 gm	10 gm	10 gm

F1=formulation 1, F2= formulation 2, F3= formulation 3 and F4= formulation 4

Acceptability Trials of the formulation of food multi mix

Sensory evaluation has been defined as the sensory attributes of colours, appearance, texture, flavour, taste and overall acceptability by using Nine point hedonic scale score and scientific discipline used to evoke, measure, analyze and interpret those responses to products as perceived through the senses of sight, smell, touch and hearing (Sidel and Stone, 1993).

Acceptability trials was conducted by a semi-trained panel consisting of 20 numbers of the respondents from the Department of Food, Nutrition and Dietetics. Sensory evaluation of the samples was carried out using 9 point Hedonic scale. The degree to which a product was liked expressed as like extremely (9), like very much (8), like moderately (7), like slightly (6), neither like nor dislike (5), dislike slightly (4), dislike moderately (3), dislike very much (2), and dislike extremely (1).The acceptable level of incorporation of whole soya-beans flour, ragi flour, chickpea flour, green moong flour and sesame were assessed by incorporation these flour in four different level of incorporation (Table 4)

The developed food multi mix was prepared four formulation namely F1 (40% ragi flour + 40% soya beans flour + 5% sesame flour + 10% chick pea flour + 10% green moong flour), F2 (50% ragi flour + 30% soya beans flour + 5% sesame flour + 10% chick pea flour + 10% green moong), F3 (60% ragi flour + 20% soya beans flour + 5% sesame flour + 10% chick pea flour + 10% green moong) and F4 (70% ragi flour + 10% soya beans flour + 5% sesame flour + 10% chick pea flour + 10% green moong flour) and the accepted formulation was formulation 4 - (70% ragi flour + 10% soyabean flour + 5% sesame flour + 10% chickpea flour +10% green moong flour) exhibited highest scores for sensory attributes among the four products and it was found that colour (8.41), appearance (8.66), taste (8.30), texture (8.16), flavour (8.45), consistency (7.75) and overall acceptability (8.46) and the accepted formulation was taken for further studies.

Rosy *et al.,* 2016 had reported that composite flour consisting of 45:5:35:10:5 (wheat flour: ragi flour: soyabean flour: moong dal flour: groundnut flour) was good quality and it also reported that the increasing level of composite flour there were a decrease in the textural quality and overall acceptability of the product.

Table 5: Nutrient Composition of the Developed Food Multi Mix

Sl. no	Nutrient	Unit	Result
1.	Calcium	mg/100g	352.46
2.	Iron	mg/100g	12.52
3.	Phosphorous	mg/100g	392.47
4.	Protein	g/100g	14.60

Determination of nutrient composition of the developed food multi mix Calcium

The calcium content of the developed food multi mix were 352.46 mg/100g (Table no. 5). Similar study was done by Saweide *et al.* 2012 [28] and it was concluded that the calcium content of the blend is high compared to the recommended complementary food standard levels of (41.52 to 84.52mg/100g) was below the recommendation of more than 200mg/100mg dry powder. This study revealed that ready-to-eat complementary food products formulated from locally available food commodities are superior than conventional mix.

Iron

The iron content of the developed food multi mix were 12.52 mg/100g (Table no. 5). Similar study was also done by Ruchita *et al.* in 2013 [24] and it was found that the iron content was 6.0 mg/100 g.

Phosphorous

The phosphorous content of the developed food multi mix were 392.47 mg/100g (Table no. 5). Similar study was done by Salve *et al.*, 2011 [27] and it was revealed that the phosphorus content varied from 111 to 388 mg/100g in different kinds of products. The highest phosphorus content was recorded in TSC2 (354mg/100g) and lowest in T0 (111mg/100g).

Protein

The protein content of the developed food multi mix were 14.60 g/100g (Table no. 5). Similar study was done by Achidi *et al*., 2016 [1] and it was concluded that the recommended protein content (grams of protein per 100 kcal of food) for complementary foods is of 0.7 g/100 kcal, from 5 to 24 months.

Shelf- life studies of the formulated food multi mix

The shelf life of the formulated food multi mix flour were studied by storing in the plastic air tight container for a period of 0 days, 30 days and 60 days. The organoleptic evaluation were analyzed at regular intervals.

Sensory evaluation over storage

Sensory evaluation was an important step during development of new food product and of analyzing the market potential for these foods**.** It was also necessary in the study of processing and storage effects (Sowjanya and Manjula, 2016) [14]. Sensory evaluation was done in the Laboratory of the Department of Food, Nutrition and Dietetics. The developed formulation were evaluated for thrice the sensory qualities by a semi-trained panel consisting of 20 numbers of the respondents from the Department of Food, Nutrition and Dietetics. Sensory attributes of the developed formulation were analyzed across storage for 60 days. The product was evaluated by the sensory evaluation technique with the selected panel members. The quality parameters such as appearance, colour, taste, flavour and texture, consistency and overall acceptability using by 9 point hedonic scale was assessed. The degree to which a product was liked expressed as like extremely (9), like very much (8), like moderately (7), like slightly (6), neither like nor dislike (5), dislike slightly (4), dislike moderately (3), dislike very much (2), and dislike extremely (1). The quality attributes scores are presented in (Table 4.11) for developed formulations.

The developed food multi mix was acceptable even after 60 days of storage. The slight decrease in sensory scores over storage was seen from o day to 60 days, which might be due to storage vessel or storage area. The study showed that the food multi mix can be stored for 60 days without changes in sensory attributes terms of colour, flavor, taste and texture, consistency, overall acceptability.

Impact of supplementation of food multi mix on post menopausal women Experimental on post-menopausal women

This experiment was conducted on the post-menopausal women at Yambem village. They were divided into two groups, namely experimental group and control group. They were divided into two groups, namely experimental group and control group. Experimental group- 20 respondents were taken and 20 respondents were taken in control respectively. The experimental days of group-I and group-II were taken 30 days respectively.

Supplementation of developed food multi mix

The menopausal women were supplemented with developed food multi mix for 30 day. The food multi mix were developed from ragi flour, whole soya beans flour, whole sesame flour, whole chick pea flour and whole green moong flour which are rich in calcium, phosphorous, iron and protein. The developed food multi mix was very helpful and to improve their health status those who are mostly affected in menopause symptoms and required to consumed regularly for to meet their nutrient requirement. The food multi mix flour was distributed to the 20 respondents those who were mostly affected by menopause symptoms and feeding trial was conducted for 30 days. After completion of 30 days of supplementation the survey was conducted again. The results were tabulated and it revealed that 90% of respondents were improved their health after feeding like, fatigue, back pain, legs pain, dizziness, headache, constipation, sleep disturbance, hot flashes, arm pain etc. and 10% of respondents does not improved their health like chest pain etc. For control also kept 30 days after survey, they feed on normal food and after 30 days, again survey was conducted and it shows that 80% of respondents were did not improved their health and it was same as before and 20% of respondents were improved their health like fatigue, legs pain etc.

So, it can be advised to post-menopausal women that consumption of rich in nutrients like phosphorous, protein, calcium, zinc, iron, vitamin c etc. in their daily diet can improve their health.

Table 7: Impact of supplementation on menopausal women

Menopausal symptoms	% before feeding	% after feeding
Hot flashes	12.5	-
Legs pain	17.5	-
Back pain	60	-
Fatigue	40	-
Headache	2.5	-
Arm pain	32.5	-
Eyes pain	7.5	7.5
Sleep disturbance	10	-
Difficulty in passing stool	12.5	-
Dizziness	5	-
Chest pain	2.5	2.5

Conclusion

From the present study it can be concluded that post-menopausal women suffer from various health problem-physical, psychiatric as well as vasomotor, related to menopausal hormonal changes. In rural area there is need to address the women group separately and give nutrition education as there hasn't been a specific health program for those women. They had lack of knowledge regarding the nutritious foods and their benefits. Moreover development of functional food products for post-menopausal women will not only minimize the frequencies and the severity of such symptoms but also improve their overall health status.

Reference

1. Aduni Achidi U, Bernard T, Noel T, Hilaire Womeni M, Marcel Moyeh N, Lucy Ebini T *et al*. Quality Evaluation of Nine Instant Weaning Foods Formulated from Cereal, Legume, Tuber, Vegetable and Crayfish. International ournal of Food Science and Nutrition Engineering. 2016; 6(2):21-31
2. Alina S, Alisha S, Kumananda A, Mithileshwer R, Bharat J. Study of metabolic syndrome in postmenopausal women. Department of Biochemistry, Institute of Medicine. ACCLM. 2015; 1(1):6-11
3. Bharathi, Sindhu. Development of antioxidant rich instant biscuit mix. International Journal of Current Pharmaceutical Research. 2015, 7(2).
4. Perry C, Apple G, Allison LM, Miller, Signorile FJ. Relation between anthropometric measures of fat distribution and cardio vascular risk factors in overweight pre and post-menopausal women. American Journal of Clinical Nutrition. 66:829-836.
5. Donald S Christian, Manish M Kathad, Bharat S Bhavsar. Health problems of post-menopausal women in rural area of vadodara district, Gujarat. National Journal of Medical Research, 2012, 2(4)
6. Doyel D, Subha R. Menopausal Problems among Rural and Urban Women from Eastern India. Journal of Social, Behavioral, and Health Sciences. 2009; 3(1):20-33.
7. Brojeshwor H, Sharat N. Covariates of Women Reproductive Span in Manipur, International Journal of Science and Research (IJSR). 2012, 3(10).
8. Kajal A, Ashika T. "A study to find out the relationship between physical performance and menopause amongst healthy pre and postmenopausal females-cross sectional observational study". International Journal for Research in Health Sciences and Nursing, 2016, 2(3).
9. Ramalingam K, Neeli U. Symptoms in Post-Menopausal Women. The International J Indian Psychology ISSN 2348-5396 (e) / ISSN: 2349- 3429(p). 2015, 3(1).
10. Surya P, Ashalata K, Vijaya B, Kusuma K, Nagamani M. Study of Bone Markers (Calcium, Serum, Phosphorus and Serum Alkaline Phosphatase) In Post Menopausal Women In East Godavari District, Andhra Pradesh, IOSR Journal of Dental and Medical Sciences, 2015, 14(6).
11. Edralin A, Lisa J Hammond, Veronica M, Andrea B Arquitt, Amanda T, Dania A *et al*. Daily consumption of dried plum by Post menopausal women does not cause undesirable changes in bowel function. The Journal of Applied Research, 2004, 4(1).
12. Heesook L, Tae-Hee K, Hae-Hyeog L. Study on Perception and Usage Status on Health Functional Foods in Women according to Menopause Status. Journal of Menopausal Medicine. 2016; 22:20-30.
13. Jalal H, Javad M, Sousan K, Mehrangiz E. Nutritional status among postmenopausal osteoporotic women in North West of Iran. Asia Pac J Clin Nutr. 2009; 18(1):48-53
14. Sowjanya K, Manjula K. Standardization and Development of Instant Ragi Dosa Mix with Dehydrated Green Leafy Vegetables. IOSR Journal of Environmental Science, Toxicology and Food Technology, 2016, 10(5)
15. Kumari R, Gupta A, Sheikh S. Development and sensory optimization of low cost micronutrient rich nutritious product by using locally available food resources. International of Journal Food and Nutritional Science. 2016, 5(1).
16. Lwin A, Mya T, Tint S. Effect of post-menopausal Status on insulin sensitivity. Asian Journal of Medical Science, 2016, 7(5).
17. Madhusudhan R, Sadvimani E. Knowledge of Postmenopausal Women on Importance of Nutrition and Life style in Prevention and Management of Osteoporosis. Journal of Academia and Industrial Research (JAIR), 2014, 2(8).
18. Monika S. Menopausal Symptoms and Problems among Urban Women from Western Odisha. International Journal of Scientific and Research Publications. 2016; 6(3):2250-3153.
19. Jansirani N, Vidya S, Muliira R. Distress during the Menopausal Transition and Their Impact on the Quality Of Life of Women. Journal of Nursing and Health Science (IOSR-JNHS), 2013, 2(4).
20. Sagdeo MM, Dimple A. Menopausal Symptoms: A Comparative Study in Rural and Urban Women. JK science, 2011, 13(1).
21. Ping-chung L, Eerik chun-hay ko, Sammy wing-sum siu, Ellie suet-yee pang, King-faicheng, Yat-heung chan. Developing an Effective Food Supplement for the Prevention of Osteoporosis. Functional Foods in Health and Disease. 2011; 9:379-388

22. Priya B, Anurag C, Soni RK, Pushapindra K. Menopausal problems among rural middle aged women of Punjab. International Journal of Research in Health Sciences. 2013, 1(3).
23. Rania L, Mohamed L, Mohamed K. Nutritional status of Menopausal women. International Journal of Science and Engineering Investigations, 2012, 1(1).
24. Ruchita G, Rajani R, Manisha P, GM Lalitha, Renu R. Menopausal symptoms among post menopausal women of North India, Journal of south Asian Federation of Menopause Societies, 2015, 3(5).
25. Samir T, Midhat J, Azijada B. Food in health and disease, scientific-professional journal of nutrition and dietetics. 2014; 3(2):116-125.
26. Sarkar A, Pithadia P, Goswami K, Bhavsar S, Makwana N, Yadav S *et al*. Study on Health Profile of Post-menopausal Women In Jamnagar district, Gujarat, Journal of Research in Medical and Dental Science. 2014, 2(2).
27. Salve RV, Mehrajfatema ZM, Kadam ML, More SG. Formulation, Nutritional Evaluation and Storage Study of Supplementary Food. J Food Process Technology. 2011, 2(6).
28. Saweide, Ifeoluwapo A. Proximate and mineral content of multi –Mix complementary food formulated from maize, crayfish and sesame seed. Department of Nutrition and Dietetics, Federal University of Agriculture, Abeokuta, Nigeria, 08/1010, 2012.
29. Schoppen S, Carbajal A, Perez-Granados AM, Vivas F, Pilar Vaquero. Food, energy and macronutrient intake of postmenopausal women from a Menopause program. Nutr. Hosp. 2005; XX(2):101-109 ISSN 0212-1611
30. Sekar BH, Sowmya S, Hamsalatha P, Gayathri G, Priyadarsini C, Thiripurasundar M *et al*. Screening the clinical parameters in menopause Women. Research journal of pharmaceutical, biological and chemical science, 2011, 2(3).
31. Shailendra K. Menopausal transition and postmenopausal health Problems. Department of Anthropology. 2011, 3(4).
32. Sheema M. Post-menopausal women and their psycho-physical Changes. Anthropologist. 2011; 13(2):131-135.
33. Shikha G, Usha M, Rama N, Kasturiba B. Menopausal symptoms and nutritional status. Karnataka J Agric. Sci. 2012; 25(4):506-509.
34. Silvina L, Marcio L, Griebeler. The Role of Soy Foods in the Treatment of Menopausal Symptoms. The Journal of Nutrition, doi:10.3945/jn.110.124388, 2010.
35. Somibala T, Manju C. Prevalence for Osteoporosis and Osteopenia in Pre and Post Menopausal Women in India. International Journal of Science and Research (IJSR). 2014, 4(10).
36. Sudhaa S, Vishal R, Annil M. Menopausal symptoms of Urban women, JK science, 2007, 9(1).
37. Swaraj R, Amatya A, Kanti G. Relation of Ethnicity and Menopausal Symptoms in Nepal, Journal of South Asian Federation of Menopause Societies. 2013; 1(2):50-55.
38. Venkateswari P, Parameshwari S. Formulation of wheat - soya bean Biscuits and their quality characteristics. International Journal of Academic Research and Development. 2016; 1(7):04-0.
39. Vijayalakshmi S, Ramesh C, Eilean L. Menopausal transition among northern Indian women. Nitte University Journal of Health Science. 2013, 3(2).