

ASSESSMENT OF NUTRIENT INTAKE AMONG MENOPAUSAL WOMEN

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ABSTRACT

Food the conveyer of nutrient and consumption of adequate diet is required for the maintenance, repair, growth and development of the body. The objective of the present study was to assess nutrient intake among menopausal women. The study was carried out in sangaria district of hanumangarh (Raj). Two hundred women were selected by random purposive sampling method. Diet survey was done by twenty four hour recall method. Total mean intake of energy (2410.76 ± 293.79 g/day) in menopausal women was found to be greater than RDA.

The mean protein intake (28.56 ± 11.39 g/day) of women was less than RDA. Source of protein in the diet of menopausal women was mainly cereals and milk. In the present study mean fat intake by menopausal women was higher i.e. 79.83 ± 66.64 g/day than requirement of RDA. The mean carbohydrate intake of women was 490.22 ± 88.65 gm/day. The mean calcium (386.39 ± 188.50 gm/day) intake of women was less than RDA.

It was observed that mean iron intake of women was 28 percent less than RDA which include mostly vary low consumption of iron rich food. Mean intake of vitamin such as B carotene was very low as compared to RDA because of low intake of green leafy vegetables and fruits. The commonly consumed food which contain a high level of thiamine are unmilled cereals, pulses, fruits and vegetables. The average thiamine intake by the subjects was $.816 \pm 181$ mg/d, which was 74.18 percent of the RDA. Foods source of riboflavin are milk and milk products, eggs, liver and green leafy vegetables. The studied pre menopausal women intake only 1.14 ± 175 mg/day, which was 87.69 percent of the RDA.

Whole cereals, pulses, nuts and meat are good source of niacin. The mean intake of niacin was 9.07 ± 4.64 g/day by subjects thus providing 64.78 of the RDA. Mean intake of folic acid was 30.26 ± 12.34 g/day thus providing 30.26 percent of the RDA. This intake might not be available due to cooking absorptive losses. It is present in high concentration in leafy vegetables and citrus fruits. The result revealed that intake of vitamin C in pre menopausal women was 16.35 ± 4.34 g, which was only 40.87 percent of RDA.

KEYWORDS: Nutrient, Intake, Menopausal, Women

Article History

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INTRODUCTION

Menopause is a natural event in a women's life that closely associated with psychological events of midlife and the aging^[1] Hoga et.al.,2015. After menopause the food choice and food intakes of middle aged women changes as they are more prone to various type of non-communicable and degenerative diseases and to some extent deficiency disease. It has been suggested that functional foods like fruits, vegetable, sprouted grain the good source of various macro and micro nutrient

and non nutrients should be included in the diet (³Sirohi and Gupta, 2017).

Nutrition and lifestyle also have an important role to play in the management of menopausal symptoms. Diet and food intake have a pivotal role in maintain human health (⁴Lambrinouadaki, et.al.,2010).

A healthy diet helps people maintain and improve their general health. It is important to intake the right nutrient daily to obtain a healthy diet. Nutrients can be obtained in many foods and thousands of diet plans. It is important that people watch their intake of diet plans. It is important that people watch their intake of food to maintain a healthy diet (⁵Jmgray, 2019).

Human need a wide range of nutrients to lead a healthy and active life. For providing these nutrients, good nutrition or proper intake of food in relation to the body's dietary needs is required. An adequate, well balanced diet combined with regular physical activity is a cornerstone of good health. A healthy diet consumed throughout the life – course helps in preventing malnutrition in all its forms as well as wide range of non communicable diseases (NCDs) and conditions. But rapid urbanization/globalization, increased consumption of processed foods and changing life style has led to a shift in dietary patterns. A balanced and healthy diet will vary depending on the individuals needs (age, gender, lifestyle, degree of physical activity), cultural context, locally available foods and dietary customs (⁶NHP, 2016).

A healthy diet is a diet that helps to maintain or improve overall health. A healthy diet provides the body with essential nutrition-fluid, macronutrients and adequate calories (⁵Lean, 2015).

There are over 40 different nutrients important to human life different food contains different nutrients depending in amounts and combinations. Nutrients provide three basic functions in the body. Some nutrients provide energy, some provides antibodies and some provide structure. Each nutrient has its own unique way of performing all these functions and all the nutrients together are needed for growth, to maintain and repair the body and to allow us to reproduce (⁶Essays, U.K., 2018).

Nutrition is aim portant role play in human life. Balance diet is for every stage of life. Proper diet maintains growth and development of human body. Nutrition and health both important role play in disease free body for human being. (⁹NIN, 2011).

Food grain production of higher in 2007-2008 comparative to last forty years in India. Now this time per capita availability of food grain is adequate amount for per person. (¹⁰Agriculture-Statistics, 2007).

According to modern life style associated with easy access to food, lack of exercise, sedentary life style, calories dense foods and excessive television viewing contribute to the development of non-communicable diseases. It observed that health of the post-menopausal women and overall wellbeing during the climatic period is highly related to general good health and healthy lifestyles including a balanced diet, nonsmoking habits and regular physical exercise, a positive attitude towards aging and menopause. For menopause management, it is recommended that life styles changes as a primary modality of care including adequate exercise, diet rich in phytoestrogen, calcium, fibre and low in fat, especially saturated fats (¹¹Unni, 2010).

Milk production in India 2006-2007 was lower than other country. Vegetable production also low in same years in India (¹²India milk and vegetable production data, 2010).

Middle age is widely recognized as the time of life when unhealthy eating habits may develop. Similar results has been found among middle aged adults where a shift from cereals, pulses and potatoes to meat, fats, sugar, cheese and desserts was noted (¹³Tyrovolas et.al.,2011)It was also observed that a mixed dietary pattern which includes sweets, solids, fats and meats as well as healthy items such as nuts, seeds and legumes does not lead to an increased BMI due to the possible interaction of the healthy components to compensate for the effect on obesity (¹⁴Hosseini-Esfahani et.al.,2012).

Menopause is understood to be as a universal reproductive phenomenon. Natural menopause takes place between the ages of 49 to 52 years for the women worldwide. The quality of life of the increasing aging female population is now becoming an important issue. (¹⁵Takahashi TA, Johnson KM (May 2015).

Menopause is one of the most challenging periods for every woman. Balanced diet and healthy life style has a great bearing on their future health. Menopause is the time of change in a women life making the end of fertility occurring between the age of 45-55 years. Middle age is the age of health maintenance for a healthy passage of end part of life. Nutrition and lifestyle also has an important role to play in the management of menopausal symptoms (¹⁶Kelly, 2015).

In a survey report shows the daily food intake in India is lower than the RDA. The consumption of pulses is also lower than RDA in India. Green leafy vegetable and other vegetable are lower than RDA. Vitamin A, folic acid, calcium, riboflavin, iron is lower than RDA. Fat intake was less than RDA. (¹⁷NNMB,2006).

Dairy products represents good dietary source of calcium due to their high calcium and nutrients contents, high absorptive rate, availability and relatively low cost, which makes the regular consumption of dairy products feasible (¹⁸Caroli, et.al. 2011).

The nutrients presents in fruit and vegetable are mineral like potassium, sodium, magnesium, iron, phosphorus, zinc, calcium etc. Vitamin like ascorbic acid, folic acid, niacin, vitamin k, B caroteneetc. Complex carbohydrate like soluble and insoluble fibre, pectin etc. vegetable protein etc. Except nutrients the various non nutritional factors present in fruit and vegetable are flavonoids, phytosterol, photochemicals, polyphenols, phytosterols etc. Which together with some nutrients like ascorbic acid, vitamin k etc. Act as antioxidants in the body. Due to the presence of the antioxidants and nutrients they have pharmaceutical and nutritional properties and they are vital to the various age groups of the population but more vital to the menopausal women also attributed the gender differences in food consumption to stronger beliefs of women concerning healthy eating. (¹⁹Missagia et.al., 2012).

Total fat, SAFA and TFA intakes were higher and PUFA, MUFA, fibre, dietary iron and folic acid intakes were lower than the recommendations (²⁰Aggarwal and Varma, 2015).

Proper nutrient is requiring for a healthy person. Nutrient provides physical needs to a person. Every stage of life nutrient requirement is varying their physiological needs. (²¹Bamji, et.al., 2009).

Carbohydrates are a major source of energy for human diet. In India 70-80% of total dietary calories are derived from carbohydrates present in plant foods such as cereals, millets and pulses. They provide energy of 4Kcal. /g. Protein are primary structured and functional components of energy living cell. Animal foods like milk, meat, fish and eggs and plants foods such as pulses and legumes are rich source of proteins. Oils and fats such as butter ghee and vanaspati constitute dietary visible fats (²²ICMR, 2004).

Vitamins are essential for numerous body processes and for maintenance of the structure of skin, bone, nerves, eye, brain, blood and mucous membrane. Iron is an essential mineral for human body. Vitamin a is an important role play in vision and maintains of epithelial tissues in human .Carotene is present in green, yellow and orange fruit and vegetable. Vitamins c is essential mineral for healthy skin and teeth. Vitamin c is abundantly available in fresh amla, citrus fruit, guava, banana and certain vegetables such as tomatoes. Folic acid is a haemopoietic vitamin essential for multiplication and maturation of red cells in our body. Good source of folic acid is Green leafy vegetables, legumes, nuts and liver. Potato, tapioca, yam, sweet potato, banana, avocado, pear and mahua rich in calorie (²³NIN, 2003).

All adult women in India consume cereals every day, their diets tend to be monotonous and there is very little dietary diversity. Foods low in fat but high in fiber content will also help to keep weight under control. Calcium intake in Indian women is generally low. Good food sources include Milk, Cheese and other Milk products. A study conducted among Asians and western population, the participants in our study consumed lower energy, carbohydrates and protein but higher fat intake (²⁴Shay et.al., 2012).

To keep in mind the assess of nutrient intake in menopausal women the present study was conducted.

Objectives:

1. To assess the nutrients consumed by women.
2. To know the dietary habits of the women.

METHODOLOGY

The study was carried out in Sangaria district of Hanumangarh in Rajasthan state. Two hundred women were selected for the present study by random purposive sampling method. Information of the respondents was obtained by interviewing the women with the help of questionnaire schedule. Food consumed was assessed. Detailed information on dietary intake of selected moderately anemic women (30) was gathered with the help of “24 hour recall method” for one day. Raw and cooked amounts were measured. Raw and cooked amount was calculated.

Formula:

$$\frac{\text{Raw amount of particular food stuff consumed by the individual from a given preparation (g)} \times \text{Total raw quantity of food stuff used in preparation (g)}}{\text{Total cooked quantity of the preparation (g)}}$$

The raw amount of food was assessed. The value was multiplied and calculated. Food group intake was calculated and compared with the RDA (NIN, 2003) given for a reference woman.

RESULTS

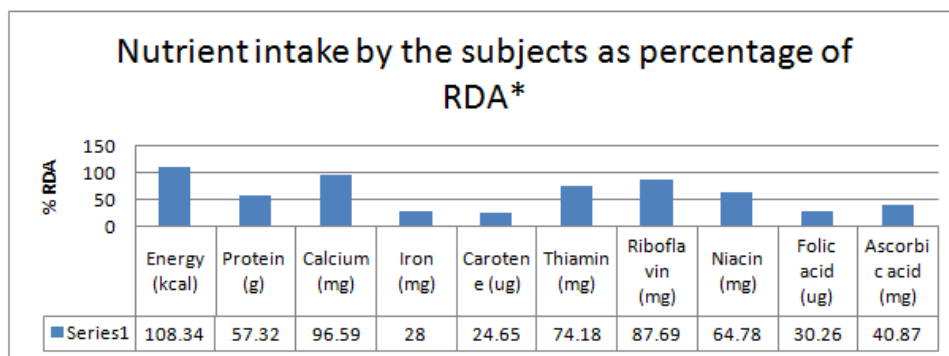
In the present study, the result revealed that the total mean intake of energy in pre-menopausal women was 2410.76±293.79 g/day. It was found to be greater than RDA. The mean protein intake of women was 28.56±11.39, thus providing 57.12 percent of the RDA. Source of protein in the diet of pre-menopausal women was mainly cereals and milk. In the present study mean fat intake by pre-menopausal women was higher i.e. 79.83±6.64 g/d. than requirement of RDA.

The mean intakes of carbohydrate by the subject's was 490.22±88.65gm/d. Carbohydrate provide about sixty percent energy requirements. The mean calcium intake of women was 386.39±188.50 gm/day. It was found to be less than RDA.

It was observed that mean iron intake of women was 28 percent less than RDA. Because low consumption of iron rich food among women. Mean intake of vitamin such as B carotene was very low as compared to RDA because of low intake of green leafy vegetables and fruits The commonly consumed food which contain a high level of thiamine are unmilled cereals, pulses, fruits and vegetables. The average thiamine intake by the subjects was .816±.181 mg/d, which was 74.18 percent of the RDA. Foods source of riboflavin are milk and milk products, eggs, liver and green leafy vegetables. The studied pre-menopausal women intake only 1.14±.175 mg/day, which was 87.69 percent of the RDA. Whole cereals, pulses, nuts and meat are good source of niacin. The mean intake of niacin was 9.07±4.64 g/day by subject's thus providing 64.78 of the RDA. Mean intake of folic acid was 30.26±12.34 g/day thus providing 30.26 percent of the RDA. This intake might not be available due to cooking absorptive losses. It is present in high concentration in leafy vegetables and citrus fruits. The result revealed that intake of vitamin C in pre-menopausal women was 16.35±4.34g, which was only 40.87 percent of RDA.

Table 1: Mean ±SD Value of Food Intake of Selected Premenopausal Women

Nutrients	RDA#	Intake by Women (45-55 years) (n = 30)	
		Intake	% RDA
Energy (kcal)	2225	2410.76 ±293.79	108.34
Protein (g)	50	28.56±11.39	57.32
Total fat (g)	-	79.83±6.64	-
Carbohydrate (g)	-	490.22±88.65	-
Calcium (mg)	400	386.39±188.50	96.59
Iron (mg)	30	8.40±2.73	28
Carotene (ug)	2400	591.78±265.84	24.65
Thiamin (mg)	1.1	.816±.181	74.18
Riboflavin (mg)	1.3	1.14±1.75	87.69
Niacin (mg)	14	9.07 ±4.64	64.78
Folic acid (ug)	100	30.26 ±12.34	30.26
Ascorbic acid (mg)	40	16.35 ±4.34	40.87



*ICMR 2004

Figure 1: Nutrient Intake by the Subjects as Percentage of RDA*.

CONCLUSIONS

It was concluded that the intake of energy, fat and carbohydrates among menopausal women was higher than RDA. The men intake of Iron, B carotene, Folic acid, and Vitamin c was very low. Intake of calcium was good while Thiamin, Riboflavin, Niacin, Protein was moderately low. The means and S.D. of daily total energy and fat in urban and sub urban participants were 1,410 k.cal.(282.8) and 49.8g(14.2) and 1,289.7 k.cal.(265.5) and 38.3 g (12.3) respectively⁽²⁵⁾Hlaing and hiabsuetrakul,2016).The mean intake of fats by post-menopausal Punjabi women was 60.76+0.57g⁽²⁶⁾Kushwaha,2011). A significant decrease in intake of energy, carbohydrate and fat ⁽²⁷⁾Kaur &Chawla, 2015).

²⁸Rink et.al. (2014) revealed that intake of energy and protein was less than RDA among women. Higher level of ascorbic acid, lutein, b carotene and b cryptoxanthin were observed with both 5 a day measurements.

The mean of daily energy, carbohydrates, protein and fat intake was 1535.3+537.2 kcal, 206 g +71.2g , 60.7g+26.2 g and 54.6+30.3 g respectively. Overall intakes of calcium / vitamin D supplements. Vitamin D supplements and Omega-3 supplement were 7.9%, 38.5%,37%respectively.The mean of daily intake vitamin c, B₁ B₂B₁₂iron zinc, phosphorous and chromium were significantly higher than RDA recommendation. The mean daily consumption of vitamin D, E, B₆ B₅folate,calcium, magnesium, potassium and selenium were significantly less than RDAS.⁽²⁹⁾Mansour et.al.,2014).A result show that a low fat diet and reduced carbohydrates diet among postmenopausal women.⁽³⁰⁾Ford et.al., 2017).

³¹Parveena (2015) observed that the mean protein, fat, energy, fibre, calcium and iron intake of the subjects in rural and urban area i.e. 32g&47g.,19g&45.14g.,1478 kcal and 2028 k.cal.,2g &2.89g.,228 mg and 295 mg., 5.64 mg &11.54 mg. Mean intake of carotene ,Thiamine, Riboflavin, folic acid of the subjects was found to be 173ug and 319ug,0.78 mg and 0.8mg, 0.37 mg & 0.58 mg,34 µg&45.77ug.The mean intake of niacin and vitamin c in the diets of subjects were 8 mg and 10.25 mg and 20 mg and 35 mg. Mean daily intake of calcium and saturated fatty acids were significantly higher than recommended dietary allowances (RDA).Mean intake of energy, protein, carbohydrates, mono and poly unsaturated fatty acid, fiber and sodium were significantly lower than RDA. The mean intake of protein, energy, fiber, calcium, iron, carotene, thiamine, Riboflavin, niacin, folic acid and vitamin "C" of rural women less than RDA and mean intake of fats is similar to RDA. Mean intake of protein, thiamine niacin and vitamin c of urban women sufficient to RDA. Mean intake of fats and energy of urban women more than RDA. Mean intake of fibre, calcium, iron, carotene, riboflavin and folic acid of urban women less than RDA.

Mean daily intake of calcium and saturated fatty acids were significantly higher than RDA. Average daily intake of cereals, pulses, roots and tubers, meat and products, fats and oils, green leafy and other vegetable were significantly lower than RDA. Mean intake of energy, protein, carbohydrate, mono and poly unsaturated fatty acids, fiber and sodium were significantly lower than RDA ⁽³²⁾Ranasinghe, et.al., 2017).

The mean of daily iron and vitamins intakes of post-menopausal women were adequate. The mean of folate, vitamins B, calcium, zinc, selenium and calorie intake were less than dietary reference in takes⁽³³⁾Baghi,2008).³⁴Kashyap and Chhabra (2019) findings show that rural postmenopausal women aged 51.65±5.40 years had energy intake 2226±395(1.43%)above the RDA, consisting protein (1.2%),calcium(5.2%)less than RDA and fat (42.8%) above the RDA. Macro and micro nutrients intake of 2.0% for iron, 6.0% for fat and 3.5%for protein were at reference level. Fat (176, 88.0%) and calcium (167,83.5%) levels were above normal level while the iron (141,70.5%) was below normal level.

The mean adequacy of ascorbic acid, iron and carotene was found to be low in menopausal women. The adequacy of macronutrients energy, protein, and fat were found to be high in menopausal women while the mean adequacy of thiamin, riboflavin, niacin, folic acid and the mineral calcium were found to be adequate (³⁵Javor, et.al., 2008).

Both energy and protein intakes were inadequate among subjects. Total fat, SFA and TFA intakes were higher and PUFA, MUFA, fiber, dietary iron and folic acid intakes were lower than the recommendations. It was concluded that diet in high in fat and low in fibre (Agarwal and Varma, 2015).

Protein intake was about 70% of the RDA and intake of fat, iron, calcium were more than 50 % of the RDA. Intake of vitamin-A was only about 45% of the RDA (³⁶Mishra and Singh,2017).³⁷Mittal (2013) also reported that overall quality of food and nutrient intake was poor as the intake of all the food groups was found to be much lower than there RDA. The energy intake was 1811±150kcal./day. Winham et.al (2009) concluded that the total energy and protein intake were similar to RDA and less carbohydrates and fibre than RDA.

A higher intake of pyridoxine and zinc in menopausal women (³⁸Dunneram et.al., 2018).Energy intake was slightly higher in women. Calcium intake was relatively high intake of thiamine; riboflavin and niacin were adequate and also iron. Protein intake was slightly less than RDA (Vatsala et.al.,2017).Subjects consumed more carbohydrates, vitamins c and folate and lower levels of fat, protein, cyanocobalamin and zinc than RDA(³⁹Shridhar et.al.,2014).

⁴⁰Joshi et.al. (2016) revealed that intake of energy, protein and iron was lower than RDA while calcium, β carotene, thiamine, riboflavin, nicotinic acid and ascorbic acid were higher than RDA.

BIBLIOGRAPHY

1. Hoga, L., Rodolpho, J., Goncalves, B. and Quire, B. (2015). Women's experiences of menopause: a systematic review of qualitative evidence. *BMI Database Systematic Rev. Implement Rep.13* (8):250-333. https://journals.lww.com/jbisrir/Abstract/2015/13080/Women_s_experience_of_menopause__a_systematic.18.aspx
2. Sirohi, M. and Gupta, K.(2017). Study on consumption pattern of functional foods among middle aged women of urban area of Varanasi. *Journal of Pharmacognosy and Phytochemistry.* 7(1):1949-1951. <http://www.phytojournal.com/archives/?year=2018&vol=7&issue=1&ArticleId=2820&si=false>
3. Lambrinouadaki, I., Brincat, M., Erel, C T, Gambacciani, M, Moen, Mh, Schenck-Gustfsson, K(2010).EMAS position statement :Managing obese post menopausal women. *Maturitas.*66:323-326. <https://www.ncbi.nlm.nih.gov/pubmed/20434858>
4. www.majortes.com
5. http://www.nhp.gov.in/healthy_living/hhealthy-nutrition
6. Lean, Michael, E.J. (2015).Principles of Human Nutrition Medicine 43(2):61-65. [https://www.medicinejournal.co.uk/article/S1357-3039\(14\)00333-8/abstract](https://www.medicinejournal.co.uk/article/S1357-3039(14)00333-8/abstract)
7. <https://www.ukessays.com>
8. Indian Council of Medical Research. Nutrient Requirements and Recommended Dietary Allowances for Indians, National Institutes of Nutrition, Hyderabad,2011.<http://ninindia.org/DietaryGuidelinesforNINwebsite.pdf>

9. All India area production and yield of food grain from 1950-51 to 2006-2007 along with percentage coverage under irrigation. <https://farmer.gov.in/SucessReport2018-19.pdf> Page 33
10. Unni, J. Third consensus meeting of Indian menopause society (2008): A summary: *J Midlife Health* 2010.1:43-7.
11. <http://www.jmidlifehealth.org/article.asp?issn=0976-7800;year=2010;volume=1;issue=1;spage=43;epage=47;aulast=Unni>
12. Milk production reaches 111 million tons by 2010. <http://ninindia.org/DietaryGuidelinesforNINwebsite.pdf> Page5
13. India's vegetable production falls a short of Demand. <http://ninindia.org/DietaryGuidelinesforNINwebsite.pdf> Page5
14. Tyrovolas, S., and Polychronopoulos, E (2011). Lessons from studies in middle aged and older adults living in Mediterranean Islands: The Role of Dietary Habits and Nutrition Services. *Cardiology Research and Practice*.1:7 https://www.researchgate.net/publication/26718822_The_role_of_Mediterranean_type_of_diet_on_the_development_of_cancer_and_cardiovascular_disease_in_the_elderly_A_systematic_review
15. Hosseini-Esfahani.F., Djazaieri, S. and Mirmiran, P. (2012).which food pattern are predictors of obesity in Tehranian adults. *Journal of Nutrition Education and Behaviors* 44(6):564-573. <https://europepmc.org/abstract/med/21652267>
16. Takahashi TA, Johnson KM (May 2015). "Menopause". *The Medical Clinics of North America*. 99 (3): 521–34. doi:10.1016/j.mcna.2015.01.006
17. Kelly (2015).Nutritional facts in Menopausal women *J of Medical Nutrition*1:1. <https://www.indi.ie/fact-sheets/fact-sheets-on-women-s-health/541-nutrition-and-the-menopause.html>
18. Diet and Nutritional status of population and prevalence of hypertension among adults in rural areas. NNMB Techinal Report No: 24, NNMB, NIN, ICMR, Hyderabad (2006). <http://nnmbindia.org/NNMBReport06Nov20.pdf>
19. Caroli, A., Poli, A., Ricotta, D., Banfi, G., and Cocchi, D. (2012). Invited review: Dairy intake and bone Health: A view point from the state of the art. *J Dairy Sci*.94 (11):5249-5262. <https://www.ncbi.nlm.nih.gov/pubmed/22032348>
20. Missagia, S.V., De Oliverira, R.S. and De, Rezende, C.D. (2012). Food choice motives and healthy eating: Assessing a gender differences *Encontro da ANPAD* 1:13. http://www.anpad.org.br/admin/pdf/2012_MKT922.pdf
21. Agarwal, A. and Varma, K. (2015). Diet and nutrition intake in urban women of Rajasthan state, Northern, India. *Ecology of Food and Nutrition*.55:1. <https://www.tandfonline.com/doi/abs/10.1080/03670244.2015.1056875>
22. Bamji, M.S., Kamala Krishnawamy and Brahman GNV. *Text book of Human Nutrition*, Oxford & IBH publishing co.pvt.Ltd., New Delhi, Third ed.2009.
23. ICMR (2004) *Nutrient requirements and recommended dietary allowances for Indians. A report of the expert group of the Indian Council of Medical Research, NIN, Hyderabad.* <https://www.icmr.nic.in/content/nutrient-requirements-recommended-dietary-allowances-indians-1990-reprinted-2008-2nd-edition>

24. NIN (2003) *Balanced diet for infants, children and adolescents. Dietary guidelines for Indians – A manual of experts of the National Institute of Nutrition.* ICMR. Hyderabad. <http://ninindia.org/DietaryGuidelinesforNINwebsite.pdf>
25. Shay, C.M., Van, H.L., Stanler, J., Dyer A.R., Brown, I.J. and Chan, Q.(2012). *Food and nutrient intakes and their association with lower BMI in middle aged Us adults: The International Study of Macro/Micronutrients and Blood pressure (INTERMAP).* *Am. J Clin Nut.* 96(3):483-491. <https://www.ncbi.nlm.nih.gov/pubmed/22854407>
26. Hlaing, H.H., and Liabsuetrakul, T. (2016). *Dietary intake, food pattern and abnormal blood glucose status of middle aged adults: A cross sectional community based study in MYANMAR.* *Food and Nutrition Research.*60:28898.<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4858500/>
27. Kushwaha, S (2011). *Impact of supplementation of drumstick (Moringa Oleifera) and Amarranth (amaranthus tricolor) leaves of Antioxidants status of postmenopausal women.* PAU Ludhiana. <https://www.ncbi.nlm.nih.gov/pubmed/26396347>
28. Kaur, G. and Chawla, P. (2015). *Impact of nutritional counseling on nutritional status on postmenopausal women.* *Food and Nutrition Sciences,* 6:429-436. https://www.researchgate.net/publication/274007483_Impact_of_Nutritional_Counselling_on_Nutritional_Status_of_Postmenopausal_Women
29. Rink, S. M., Mendola, P. Mumford, S.L., Poudier, J.k., Browne, R.W., Watcawski-wende, J., Prerkans, N.J. and S. chisteritman, E.F. (2014). *Self-report of fruit and vegetable intake that meets the 5A day recommendation each associated with reduced levels of oxidative stress biomarkers and increased levels of antioxidant defense in premenopausal women.* *J Acad Nutr Diet* 11(6):776-785. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3660508/>
30. Mansour, A., Ahadi, Z., Qorbani, M. and Hosseini, S.(2014). *Association between dietary intake and seasonal variation in postmenopausal women.* *Journal of Diabetes and Metabolic Disorder* 13:52. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4030736/>
31. Ford, C., Chang, S., Vitolins, M.Z. and Fenton, J.I. (2017). *Evaluation of diet pattern and weight gain in postmenopausal women enrolled in the women’s health initiative observational study.* *British Journal of Nutrition* 117(8):1189-1197. <https://www.ncbi.nlm.nih.gov/pubmed/28509665>
32. Parveena, D. (2015) *Dietary pattern of post – menopausal women.* *Food Science Research Journal* 6(2): 268-272. <https://academic.oup.com/jn/article/149/9/1565/5512736>
33. Ranasinghe, C., Shettigur, P.G. and Garg, M. (2017). *Dietary intake, Physical activity and body mass index among postmenopausal women.* *Journal of Midlife Health* 8(4):163-169. <https://www.ncbi.nlm.nih.gov/pubmed/29307977>
34. Baghi, A.N. (2008). *Assessment of nutritional status in post menopausal women of Ardebil, Iran.* *Journal of Biological Sciences.*8:1. <https://scialert.net/abstract/?doi=jbs.2008.196.200>
35. Javoor, K. Malagi, U. and Naik, R. (2008). *Nutritional status of menopausal women.* *Agric.Sci.*21 (1):152-154. <http://14.139.155.167/test5/index.php/kjas/article/view/1174/1165>

36. Kashyap, A. and Chhabra, P. (2019). Assessment of Nutritional Intake and Nutritional Knowledge of Rural Post Menopausal Women. *International journal of Science and Healthcare Research*.4:3. https://www.ijshr.com/IJSHR_Vol.4_Issue.3_July2019/IJSHR0012.pdf
37. Mishra, D. and Singh, R. (2017). A study on energy balance of from women.1.1:7-10. <https://www.actascientific.com/ASNH/pdf/ASNH-01-0003.pdf>
38. Mittal, M. (2013). To assess the nutritional status and morbidity patterns among non-pregnant non lactation. *International journal of Scientific and research publications*.3.9:1-47. <http://www.ijsrp.org/research-paper-0913/ijsrp-p2111.pdf>
39. Winham, D.M., Collins, C.B. and Hutchins, A.M. (2009). Dietary intakes, attitudes towards carbohydrates of postmenopausal women following low carbohydrates diet. *Can.J Diet pract.Res*.70 (1):44-7. <https://www.ncbi.nlm.nih.gov/pubmed/19261206>
40. Dunneram, Y., Greenwood, D.C., Burley, V.J. and Cade, J.E. (2014). Dietary intake and age at natural menopause: results from the UK women's cohort study. *Journal of Epidemiology and Community Health*.11. <https://jech.bmj.com/content/72/8/733>
41. Vatsala, L., Prakash, J. and Prabhavathi, S.N. (2017). Food security and nutritional status of women selected from a rural area in south India. *Journal of Food, Nutrition, and Population Health*.1 (2):10. <http://www.imedpub.com/articles/food-security-and-nutritional-status-of-women-selected-from-a-rural-area-in-south-india.php?aid=20451>
42. Shridhar, K., Dhillon, P.K., Bowen, L., Kinra, S., Bhrathi, A.V., Prabhakaran, D., Reddy, K.S. and Ebrahim, S. (2014). Nutritional profile of Indian vegetarian diets the Indian migration study. *Nutrition Journals*.13:55. [https://nutritionj.biomedcentral.com/articles/10.1186/1475-2891-13-55#:~:targetText=Among%20vegetarians%2C%2056.5%25%20were%20men,values%20\(data%20not%20shown\).](https://nutritionj.biomedcentral.com/articles/10.1186/1475-2891-13-55#:~:targetText=Among%20vegetarians%2C%2056.5%25%20were%20men,values%20(data%20not%20shown).)
43. Joshi, P., Sharma, N., Singh, B.k., Dabas, J.P.S., Ahmad, N., Chakravorty, S. and Singh, M. (2016). Health and nutrition issues of rural women in India. *Journal of Agriculture Engineering and Food Technology*.3 (2):87-90. http://www.krishisanskriti.org/vol_image/13Jun20151106522.pdf