**Association between household income, anthropometric and nutrient intake among rural perimenopausal women**

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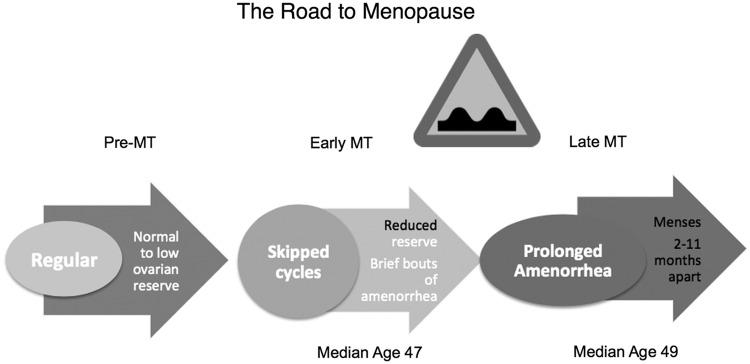
**Abstract**

Midst the numerous aspects of health promotion, well-being and lifestyle adaptation towards the menopausal period, nutritional habits are essential because they concern all women, which can be modified, and impact both longevity and quality of life. The purpose of this community based health study was to examine the relationship between household income, anthropometric measures and nutrient intake among rural perimenopausal women. The present study includes 400 subjects resided in rural area of Coimbatore. A pre-designed questionnaire was used to collect the data on household income, anthropometric measures such as body weight, height, body mass index, waist-hip circumference, and nutrient intake through 24 hour diet recall. Nutrition education was provided to all the subjects. The mean age of the selected perimenopausal women was 47 years. Among the study subjects 37% were overweight and 35% obese. It was awful that only 5% of participated perimenopausal women undergone physical activity regularly. Compared with recommended dietary allowances, the average intake of calories (1705±110 kcal), protein (48±13 g), fiber (10±3.2g), calcium (482±141mg) and iron (10.58±2.5mg) were found to be deficit whereas intake of fat (34±12g) was found to be excess. A well-structured nutrition education intervention was conducted to all the subjects on healthy food choices and importance of physical activity. Food habits of the participants reveals lack of knowledge on nutrition needs and recommendation, which results in the consumption of food with lack of balanced nutrients. Health education with dietary guidance and intensive resistance exercise interventions can optimize the body composition of perimenopausal women, which is worthy of further promotion to a better quality of life.

**Key words:** Anthropometry, Household income, Health education, Perimenopause, Physical activity

**Introduction**

The World Health Organization (WHO) defines perimenopause as a natural physiological occurrence in women that is characterized by a permanent cessation of menstruation and a decline in the levels of the ovarian steroid hormones (oestrogen and progesterone) as a result of the loss of ovarian follicular function. Around the world, the average age at which it happens is 50, with a range of 40 to 60 years.

A woman's life is divided into seven stages based on the Stages of Reproductive Aging Workshop (STRAW) classification developed by the American Society for Reproductive Medicine. These stages range from the beginning of menstruation at menarche and the reproductive age to the perimenopausal and postmenopausal phases (Davis, et al., 2015). Here the figure below show the relevant stages that precede the final menstrual period (FMP) and menopausal transition (MT) through STRAW.

**Figure-1: Road to menopause**

The final years of a woman's reproductive life are surrounded by the ill-defined interval known as the perimenopause or menopausal transition. It defines the final menstrual period (FMP) where the first menstrual irregularity appears and ends when amenorrhea lasts for a year. The perimenopause or menopausal transition has two phases in the early phase- the cycles are generally regular with little disruptions, and in the late phase- amenorrhea becomes more pronounced and persists for at least 60 days up to the FMP (Santoro, 2016).

There are major biopsychosocial changes related to the perimenopause. Most women are able to adapt to these changes and successfully transition from a reproductive to a non-reproductive lifestyle and some women do, however, have debilitating physical and psychological problems throughout the perimenopause. Which is strongly associated with the estradiol and progesterone levels are thought to fluctuate significantly throughout the perimenopause (Fiacco, et al., 2018)

Women may encounter symptoms during the perimenopause, including hot flashes and night sweats, sleeplessness, vaginal dryness, mood disorders, and so on. Even though the majority of symptoms are not life-threatening, perimenopausal women may find that they negatively affect their quality of life as well as their physical and mental health. On the epidemiology of perimenopausal syndrome, however, there have been very few investigations (Chao, et al., 2016). Symptoms that start during the menopausal transition typically persist and lessen compensating during postmenopause (Kinley, et al., 2008).

There is no research to measure the quality of life of perimenopausal women from this part of the subcontinent. So the present study was conducted to examine the relationship between household income, anthropometric measures and nutrient intake among rural perimenopausal women.

**Materials and methods**

A community-based survey was carried out among 400 perimenopausal women between 35 to 55 years of age in the rural area of Coimbatore. Subjects were randomly selected. Inclusion: Perimenopausal women (35-55 years) in rural areas. Exclusion: Postmenopausal women, Perimenopausal women resident in urban area, women underwent hormone replacement therapy and with severe disease conditions like diabetic, hypertension, heart diseases, HIV/AIDS, Cancer and Renal disorder etc.

The study was approved by the Institutional Human Ethics Committee, PSG Hospital. A pre-designed questionnaire was used to collect the data on socio-demographics, anthropometric measures such as body weight, height, body mass index, waist-hip circumference, dietary intake through 24 hour diet recall and physical activity level. Body mass index was interpreted according to the World Health Organization (2012) recommendations. Waist circumference was considered high when waist circumference >80 cm (Kelishadi, et al., 2008). Face to face interview method was used to collect the data from the participants. The questionnaire was in English and it was orally translated to the local language Tamil.

The statistical software for social sciences (SPSS) version 16 for Windows was used to conduct the statistical analysis. For categorical variables, a) descriptive data were given as percentages and frequencies and b) continuous variables, the mean and standard deviation were applied to analyze the data. The demographic details, anthropometric parameters and diet habits were reported as frequencies with percentages. The mean intake of macro and micro nutrient intake was calculated and compared with RDA. Chi-square was performed to determine association between monthly family income and nutrient intake, association between physical activity and body mass index was done. The p-value less than 0.01 were considered as statistically significant.

**Results and discussion**

**Socio-demographic characteristics of study population:**

The demographic characteristic of the study group was shown in table-1. Among the perimenopausal women (35-55 years) of age the majority 46.4% (n=185) were between 45- 50 years of age. The mean age of the selected perimenopausal women was 47 years. A study in 2016 conducted by [Ahuja](https://pubmed.ncbi.nlm.nih.gov/?term=Ahuja%20M%5BAuthor%5D) reveals the perimenopausal age in Indian women is 44.69 ± 3.79 years. About 93.4% (n=374) were married and 25.8% (n=103) of women were uneducated. It was awful that only 5% of participating perimenopausal women underwent physical activity regularly. While observing the socio economic status most of them monthly household income is low. According to the dietary habits there were 95.5% nonvegetarian and 4.5% vegetarian. Many of the study participants skipped their meal due to lack of time and appetite.

**Table-1: General characteristics of study population**

|  |  |  |
| --- | --- | --- |
| **Parameters** | **Category** | **Frequency n (%)** |
| **Age** | 36-40  41-45  46-50  51-55 | 15 (3.8)  61(15.3)  185 (46.4)  139 (34.6) |
| **Marital status** | Single  Married  Widow  Separated | 11 (2.8)  374 (93.5)  13 (3.2)  2 (0.5) |
| **Household income** | **<**10K  10K – 15K  15K-20K  20K-25K  >25K | 210 (52.5)  92 (23)  80 (20)  18 (4.5)  0 (0) |
| **Education level** | Uneducated  Primary  Secondary  Higher secondary  Graduate  Post graduate | 103 (25.8)  67 (16.8)  131 (32.8)  61 (15.2)  25 (6.2)  13 (3.2) |
| **Occupation** | Working  House wife | 133 (33.3)  267 (66.7) |
| **Physical activity** | Yes  No | 20 (5)  380 (95) |
| **Food habit** | Vegetarian  Non-vegetarian | 18 (4.5)  382 (95.5) |
| **Skipping meal** | Yes  No | 111 (27.7)  289 (72.2) |
| **Type of milk** | Full fat  Low fat  Skim milk  No milk | 178 (44.5)  133 (33.2)  0 (0)  89 (22.3) |
| **Type of cooking oil** | Coconut oil  Groundnut oil  Combination oil | 97 (24.2)  194 (48.5)  109 (27.3) |

**Anthropometric measurement among the study population:**

The mean average height, weight and waist circumference of the total participants were 152.2±6.5, 63.7±12.4 and 107±11 respectively. Table-2 shows frequencies of body mass index and waist-hip circumference of the perimenopausal women. Among the study subjects 37% were overweight and 35 % were in obese category. In this study 86.2% (n=345) of women had increased waist circumference. The mean weight, body mass index and waist circumference were 63.7±12.4, 27.3±4.9, 107.7±11.1 respectively. The waist-hip ratio observation shows that 87.7% of the perimenopausal women were at the risk of obesity. In 2022 a study conducted by Divya et al., in Mangalore town with 364 women between age 40-60 years reported that among the study participants 7 (1.9%) were underweight, only 115 (31.6%) had normal weight, 96 (26.4%) were overweight, and 146 (40.1%) were obese. Another study by Karunakaran and Urooj in 2016 reported that the mean weight of the participants showed a gradual increase with increase in age which act as an indicator of overweight and obesity. BMI, WHR and WC also showed an increasing trend with increase in age. It was of interest to note that according to standards for Asians viz; (BMI > 23, waist circumference >80cm,) all women more than 30 years of age had higher mean BMI and WC (25.3 ±3.9 and 80.3 ± 15.5).

**Table-2: Anthropometric measurement among the study population**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameters** | **Category** | **Reference Range** | **Frequency n (%)** |
| **Body mass index\*** | Underweight  Normal  Overweight  Obese | <18.5  18.5-24.9  25-29.9  ≥30 | 24 (6)  88 (22)  148 (37)  140 (35) |
| **Waist circumference\*\*** | Normal  High | <80 cm  ≥80 cm | 55 (13.7)  345 (86.2) |
| **Waist-Hip ratio\*\*\*** | Normal  High | <0.85 cm  ≥0.85 cm | 49 (12.2)  351 (87.7) |

\* WHO 2004 \*\* WHO 2008 \*\*\* WHO 2008

**Macro and Micro nutrients intake of study population**:

Table-3 reveals the mean daily intake of calories, protein, fat, fiber, calcium and iron of the participants which were measured using 24 hour's recall method. Compared with Recommended Dietary Allowance, the average intake of calories (1505±110 kcal), protein (48±13 g), fiber (10±3.2g), calcium (482±141 mg) and iron (10.58±2.5mg) were found to be deficit whereas intake of fat (34±12g) was found to be excess. Similarly [Ranasinghe](https://www.jmidlifehealth.org/searchresult.asp?search=&author=Chaya+Ranasinghe&journal=Y&but_search=Search&entries=10&pg=1&s=0), et al., 2017 conducted a study among postmenopausal women, as result the mean daily intake of calcium and saturated fatty acids were significantly higher than recommended dietary allowance (RDA) (*P* < 0.001). Mean intakes of sodium, fiber, mono- and polyunsaturated fatty acids, energy, protein, and carbohydrates were all significantly lower than RDAs (P 0.001).

**Table-3: Macro and Micro nutrients intake of study population**

|  |  |  |  |
| --- | --- | --- | --- |
| **Nutrients** | **Mean intake** | **RDA\* for moderate activity** | **Excess/Deficit** |
| Energy (kcal) | 1505±110 | 1900 | Inadequate |
| Protein (g) | 48±13 | 55 | Inadequate |
| Fat (g) | 34±12 | 20 | Excess |
| Fiber (g) | 10±3.2 | 22 | Inadequate |
| Calcium (mg) | 482±141 | 1000 | Inadequate |
| Iron (mg) | 10.58±2.5 | 29 | Inadequate |

\* Recommended Dietary Allowance

**Association between monthly family income and macro nutrients intake**:

Table-4 reveals the association between the monthly family income and daily intake of macro and micronutrients of the study participants. It was observed that there was a direct relationship between the family income and macro nutrient intake but week association with micro nutrient intake of the study participants. As a result the majority of perimenopausal women consume marginally adequate energy, excess fat and inadequate protein, calcium, iron. Similar research in postmenopausal women also reported that the macronutrient sufficiency levels across all household income groups shown most of the women were eating marginally adequate of the macronutrients such as energy, proteins, fats, and carbohydrates. In that fat consumption was found to be excessive across all household income classes, which suggests that postmenopausal women had poor dietary practices (Ranasinghe, et al., 2017).

**Table-4: Association between monthly household income and nutrients intake**

| **Household income \* Energy cross tabulation** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Energy | | | | Total |  |
|  |  | Inadequate | Adequate | Marginal adequate | Excess | Chi-Square  Sig |
| Household income | I | 51 | 88 | 58 | 15 | 212 | 0.000\* |
| II | 0 | 0 | 58 | 34 | 92 |
| III | 0 | 0 | 35 | 45 | 80 |
| IV | 0 | 0 | 0 | 16 | 16 |
| Total | | 51 | 88 | 151 | 110 | 400 |  |

| **Household income \* Protein Cross tabulation** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Protein | | | | Total |  |
|  |  | Inadequate | Adequate | Marginal adequate | Excess | Chi-Square  Sig |
| Household income | I | 212 | 0 | 0 | 0 | 212 | 0.000\* |
| II | 92 | 0 | 0 | 0 | 92 |
| III | 4 | 52 | 12 | 12 | 80 |
| IV | 0 | 0 | 0 | 16 | 16 |
| Total | | 308 | 52 | 12 | 28 | 400 |  |

| **Household income \* Fat cross tabulation** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | Fat | | | | Total |  |
|  |  | Inadequate | Adequate | Marginal adequate | Excess | Chi-Square  Sig |
| Household income | I | 20 | 44 | 48 | 100 | 212 | 0.000\* |
| II | 0 | 0 | 0 | 92 | 92 |
| III | 0 | 0 | 0 | 80 | 80 |
| IV | 0 | 0 | 0 | 16 | 16 |
| Total | | 20 | 44 | 48 | 288 | 400 |  |

| **Household income \* Calcium Cross tabulation** | | | | | |
| --- | --- | --- | --- | --- | --- |
|  |  | D.CALCIUM | | Total | Chi-Square  Sig |
|  |  | <600 | 600-800 |
| Household income | I | 198 | 14 | 212 | 0.641NS |
| II | 88 | 4 | 92 |
| III | 75 | 5 | 80 |
| IV | 14 | 2 | 16 |
| Total | | 375 | 25 | 400 |  |

| **Household income \* Iron Cross tabulation** | | | | | |
| --- | --- | --- | --- | --- | --- |
|  |  | D.IRON | | Total | Chi-Square  Sig |
|  |  | <10 | 10-20 |
| Household income | I | 83 | 129 | 212 | 0.290NS |
| II | 30 | 62 | 92 |
| III | 37 | 43 | 80 |
| IV | 5 | 11 | 16 |
| Total | | 155 | 245 | 400 |  |

\*Significance at 1%. NS: Not significant

**Association between activity level and body mass index:**

Association between activity level and body mass index was shown in table-5. The majority of the women lacked outdoor activity. According to data on physical activity levels 59.7% perimenopausal women led a sedentary lifestyle similar study revealed comparable findings, including higher WHR and waist circumference, which may raise the risk for cardiovascular disease and a number of health issues, including diabetes. The quality of life may be improved by engaging in moderate physical activity, such as brisk walking (Mahajan, et al., 2012) (Dasgupta, et al., 2012).

**Table-5: Association between activity level and body mass index**

| **Activity \* BMI Cross tabulation** | | | | | |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  | BMI | | | Total |  |
|  |  | Normal | Overweight | Obese | Chi-Square  Sig |
| Activity | Sedentary | 112 | 127 | 0 | 239 | 0.000 |
| Moderate | 0 | 21 | 81 | 102 |
| Heavy | 0 | 0 | 59 | 59 |
| Total | | 112 | 148 | 140 | 400 |  |

Significance at 1%. NS: Not significant

**Conclusion**

Based on the observed results among the perimenopausal women participants, the majority of them had a high BMI and waist circumference. According to their physical activity level assessment most of them lead a sedentary lifestyle. The study found that there was a poor intake of energy, protein, fiber, calcium, iron and excess intake of fat than the Recommended Dietary Allowance. And the study highlights there was a direct association between the household income, nutrient intake and physical activity, body mass index. So a well-structured nutrition education intervention was conducted to all the subjects on healthy food choices and importance of physical activity. Food habits of the participants reveals lack of knowledge on nutrition needs and recommendations, which results in the consumption of food with lack of balanced nutrients. Health education with dietary guidance and intensive resistance exercise interventions can optimize the body composition of perimenopausal women, which is worthy of further promotion to a better quality of life.

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