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THE IMPACT OF DIETARY INTERVENTION ON VASOMOTOR SYMPTOMS OF POST-MENOPAUSAL WOMEN

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ABSTRACT

Background: Menopause is a significant event for women and in significant proportion it is accompanied by a wide range of symptoms, the most common of which are vasomotor symptoms generally bothersome, with a negative impact on women's health and wellbeing ***Objectives:*** To assess the impact of dietary intervention program regarding vasomotor symptoms of post-menopausal women, and to find out if there is any association between intervention program and study variable. ***Subjects and methods:*** The study was a quasi-experimental study design that was applied on 50 postmenopausal women, with nine months duration, the study used dietary intervention program (which include Adoption of a Mediterranean-style diet) was adopted by participants, with a follow up period of three months, and by using The Menopause Rating Scale for assessment of menopausal symptoms, the impact of dietary program was measured before and after the intervention. Paired t-test and fisher exact test were used for inferential statistics *P value* $\leq$0.05 was considered significant ***Results:*** about half of the participants were between (53-57) of age, 88% of them married with 44% secondary school education, 92% were house wives and 52% had moderate socioeconomic status, there was a significant decrease of severity of vasomotor, physical, psychological, urogenital symptoms and total menopause rating scale after the intervention. ***Conclusions:*** The dietary intervention program has a positive impact on decreasing the severity of postmenopausal symptoms, this may offer new non- pharmacological option for management of post-menopausal symptoms when other options like hormonal therapy is contra indicated.

KEYWORDS: Menopause rating scale (MRS), Dietary program, vasomotor symptoms.

INTRODUCTION

Menopause is the natural and irreversible end of menstruation caused by an estrogen depletion that is not linked to medical condition. It is diagnosed after twelve months of amenorrhea, in which a woman's reproductive and childbearing years are over.[1] For most women, this happens between the ages of 45 and 56 years. In the United States, the mean age at which women naturally go through menopause is 51 years. Most women have vasomotor symptoms, however urogenital, psychogenic, and cardiovascular organ systems can also be affected by menopause.[2] Menopausal physiologic processes can be influenced by a variety of circumstances. Diet, smoking, ethnicity, health issues, physical activity, socioeconomic status, body mass index, and general gynecologic health are some of these. The most prevalent symptoms during the menopausal transition years are vasomotor symptoms, which can range in intensity: Palpitations, hot flushes, and nocturnal sweats are some examples of these symptoms. In addition to VMS being generally bothersome, they have also been observed to have a negative impact on women's mental health and wellbeing.[3, 4] The World Health Organization (WHO) has reported that in 2030, the total number of menopausal women in the world will reach one billion, with a total of 47 million women going through menopause every year.[5] The prevalence of menopause-related VMS appears to vary greatly by geography, criteria chosen, and symptom diagnosis technique. Prevalence rates ranged from 22% to 63% in Asia, 36%

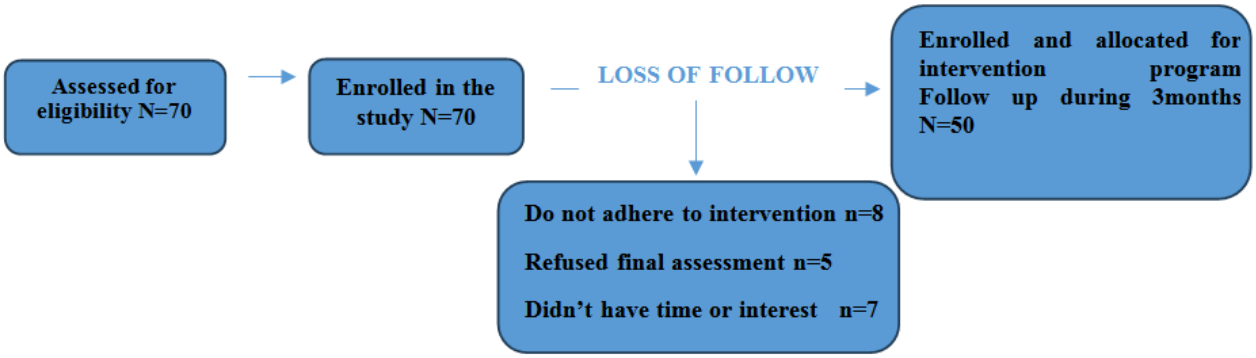
to 50% in North America, and 74% in Europe; however, cross-cultural studies have typically been limited to one nation or continent and have only included a small number of participants.[6] The most effective treatment for menopause is still hormone replacement therapy (HRT), but worries about its long-term safety, such as increased risks of cardiovascular and cancer events, have spurred interest in alternate treatments.[7] Studies have indicated that the menopausal transition is linked to impacts on the heart, bones, and mood and could impact postmenopausal women's future health risks.[8, 9] Optimizing lifestyle is a key component of comprehensive care for postmenopausal women.[10] Nutritional therapies have demonstrated potential in the management of symptoms associated with post menopause.[11] Dietary changes may help postmenopausal women experience fewer and milder vasomotor symptoms (VMS), according to recent research. Hot flashes were reduced by 78% after 12 weeks of a low-fat vegan diet supplemented with soy, compared to 39% in the control group, according to a recent randomized controlled research, It has been proven that a low-fat vegan diet enhanced with soybeans can effectively lower body weight and postmenopausal hot flashes,[12,13] Access to menopause care varies greatly and is especially limited in low-income and middle-income countries (LMICs), where there is limited availability of medical professionals with specialized knowledge of menopause, despite the serious implications of menopause for women's long-term health, LMIC health systems are often under-resourced and prioritize high-mortality, acute, or communicable conditions and maternal/child health. Non-fatal, long-term conditions like menopause are labeled "lower priority" for funding, policy[14] furthermore, in certain areas, cultural and societal barriers may discourage people from seeking medical attention, which makes managing menopause-related health problems even more difficult.[15]

AIMS OF THE STUDY: To assess the impact of dietary intervention program regarding vasomotor symptoms of post-menopausal women and to find out if there is any association between intervention program and study variable.

Subject and Method

Study design, Settings, Duration: This was a quasi-experimental study design. The study was conducted at outpatient gynecological clinic of Al-Elwiya teaching hospital and Baghdad medical city hospital, this study was extended from 1st of February to 30th of October 2025. Collection of samples was extended to two months.

Sample size and sampling techniques: A convenience sampling technique was used to select 70 postmenopausal women.



Inclusion criteria: Women who are menopause within first two years and willing to participate.
Exclusion criteria: Any cause of vasomotor symptoms other than natural menopause, including Use of hormonal medications in the preceding 2 months, Smoking, Substance abuse, eating disorder history, Weight-reducing medication use during the last 6 months; A current effort for weight loss.

Data collection methods

- ***Studied variables*** were collected by direct interview using self-administered questionnaire.

Including: Age, Marital status, Education level, Occupation, and Socioeconomic status (SES) was calculated using the following formula".

Socioeconomic status (SES): SES = Education + Occupation + House ownership * 0.5 + Car ownership * 0.1 + (age-20)/100 – Retired/unemployed/deceased.[16]

According to the equation the maximum possible score of SES is classified into.
Low = 0.85 - 3.35, Middle = 3.36 - 5.85, High = 5.86 - 8.6.

- ***Anthropometric measurements:*** Weight and height were measured for all participants using standardized techniques. Height was measured with a stadiometer to the nearest centimeter. Weight was measured with a digital weighing scale (SECA 876 flat scale) that was kept on a firm horizontal surface. The Body Mass Index (BMI) was calculated using the following formula.[17]

BMI = Weight (kg) / Height (m) 2 and was classified into.
Underweight: Below 18.5 kg/m², Healthy/Normal Weight: 18.5 to 24.9 kg/m², Overweight: 25.0 to 29.9 kg/m², Obesity: 30.0 kg/m² or greater.

- ***Assessment of Menopausal Symptoms:*** The Menopausal Rating Scale (MRS) is a reliable, standard, validated, and consistent tool was used for assessing the severity of menopausal symptoms.[18] The MRS was translated to the regional language, and the symptoms were explained to all the participants individually, the scale evaluated and approved by two specialist family physician and nutrition specialist. The menopausal symptoms were graded from 0 to 4 based on their severity perceived by the women so the symptoms assessed using the Menopause Rating Scale (MRS) at base line and after 12 weeks of dietary intervention program. The MRS asses severity of hot flashes and heart discomforts on a 5-point Likert scale (0 = none, 1=mild, 2=moderate, 3=sever, 4 = very severe), consist of 11 items classified into four subdomain which are(vasomotor, psychological, physical, urogenital).

Scoring Method: All items are summed for a total MSS score.
Total possible score depends on the number of items (e.g., for 11 symptoms → max score =44).Scores can also be sub-divided by domain. The absolute change and percent change between scores of Menopause Rating Scale (MRS) for total and subdomain scores from the baseline and after 12 weeks will be measured by the following formula.
Absolute change = baseline score minus score after intervention. Percent (%) change = (absolute change / baseline score)* 100
Rating and scoring of MRS

Each item, subdomain and the total score in the MRS were scored and rated into four groups: no, mild, moderate, and severe. Using the cut of point's formula as following.
1. For each item in the scale, the maximum point was 4 and minimum point was zero, scored into four groups using cut of point's formula.
Cut of point = (maximum value - minimum value)/ (number of grades) = (4-0)/4 = 4/4=1
Thus, for each item scores will be.
No = (0 – 1), Mild = (1.01- 2), Moderate = (2.01 – 3), Severe = (3.01-4)

2. For vasomotor domain (which include two items), the maximum point was 8 and minimum point was zero, scored into four groups using cut of point's formula.
Cut of point = (maximum value - minimum value)/ (number of grades) = (8-0)/4 = 8/4 = 2 Thus, for each item scores will be.
No = (0 – 2), Mild = (2.01- 4), Moderate = (4.01 – 6), Severe = (6.01-8)

3. For physical, psychological and urogenital subdomains (which include three items for each subdomain), the maximum point was 12 and minimum point was zero, scored into four groups using cut of point's formula.
Cut of point = (maximum value - minimum value)/(number of grades) = (12-0)/4 = 12/4=3

Thus, for each item scores will be.
No = (0 – 3), Mild = (3.01- 6), Moderate = (6.01 – 9), Severe = (9.01-12)

4. For Total MRS Scores (which include 11 items), the maximum point was 44 and minimum point was zero, scored into four groups using cut of point's formula:
Cut of point = (maximum value - minimum value)/ (number of grades) = (44-0)/4 = 44/4 = 11
Thus, for each item scores will be:
No = (0 – 11), Mild = (11.01- 22), Moderate = (22.01 – 33), severe = (33.01-44)

- **Dietary Intervention Program**

The researchers developed a dietary intervention program (which include Adoption of a Mediterranean-style diet, rich in fruits, vegetables, whole grains, olive oil, and fish, limitation of saturated fat, processed sugar, and refined grains[19,12], added daily food source of phytoestrogens, lingams) cooked as soup or broth or salad[20], Added Cruciferous Vegetables like cabbage or broccoli or garlic[21], added grains rich in estrogen (oats, barely, brown bread) one serving / day, with fruits rich in estrogen (peaches, apples, plums, strawberries, dried apricots) two to three serving / day) also nuts (almond or walnuts or cashew or hazelnuts or pistachios) about half cup per day[22,23] in addition to decrease consumption of hot spices and caffeine and drink a lot of water to maintain hydration.[24]

For external validity, the dietary program was evaluated by two nutrition specialists and family physicians and approved after few modification to be easy to apply by the participants.

Implementation of dietary program was conducted by each participant with a follow up period of three months and by using MRS, the post-menopausal symptoms were measured before and after dietary intervention. Weekly follow-ups were carried out during the intervention period through establishment of a social media application (What's App.), in addition a health education lectures was delivered to participants regarding the knowledge about the research intervention program including Introduction to menopause, the effect of menopause on health, and the dietary effect on menopausal symptoms.[25, 26, 27]

Ethical consideration

- Informed consent was obtained before performing the intervention to ensure that the participants have fully agreed about the nature of the intervention,

- Approval from the scientific committee of community and family medicine department /Al-Kindy teaching center of Family and community medicine / University of Baghdad
- A letter of facilitation was directed to both Baghdad teaching hospital (No. 2893in 23/4/2025) and Al – Elwiya maternity teaching hospital to facilitate the researcher collection of data

Statistical analysis

Data was submitted to *Statistical Package of Social Sciences* (SPSS) version 25.

Descriptive statistics: Categorical data analysis was conducted by using frequency & percentage distributions, while Continuous data analysis: by using mean & standard deviation.

Inferential statistics: Chi-square test is an inferential test used to evaluate the statistical significance of relationship between two categorical attributes in one sample. Fisher's exact test was used to measure the relationship between categorical variables when the sample size do not met the criteria. Paired t-test is a statistical method for comparing the means of two dependent groups, such as pre- and post-treatment scores from the same individuals or measurements from two different conditions on the same subject. *P value* < 0.05 is considered significant.

RESULTS

Nearly half of participants were of the age of 53 years or older (52%), most of them were married (88%). Regarding their educational level (44%) were secondary school graduates. (58%) of participants were assessed as low socioeconomic status, and 34% of them were moderate socioeconomic status.

Data showed an obvious decrease in the severity of vasomotor symptoms before and after the intervention, as it shows that participants with severe symptoms decreased from 34% before the intervention to only 2% after the intervention as shown in (fig 1)

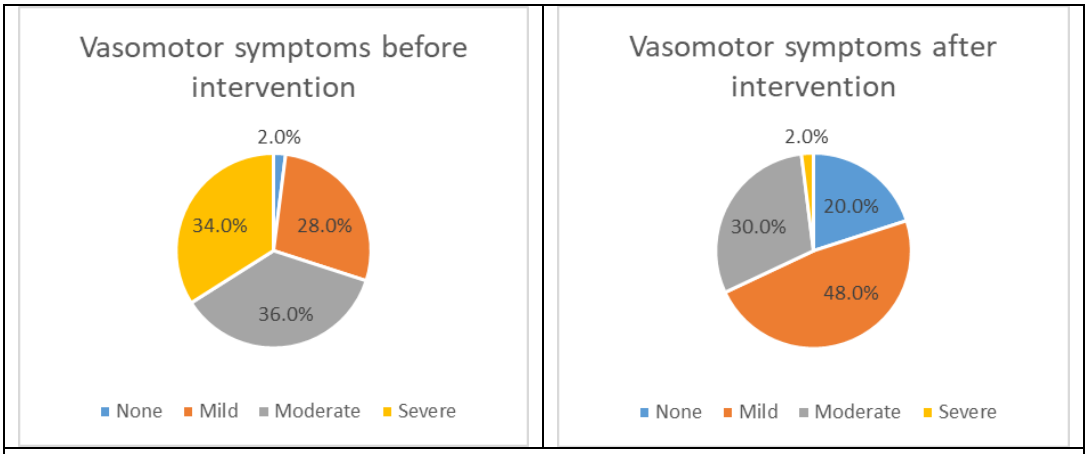


Figure 1: Vasomotor symptoms before and after intervention.

A similar result was shown regarding the severity of physical symptoms before and after the intervention, as it shows that participants with severe, symptoms decreased from 32% before the intervention to only 14% after the intervention (Fig 2)

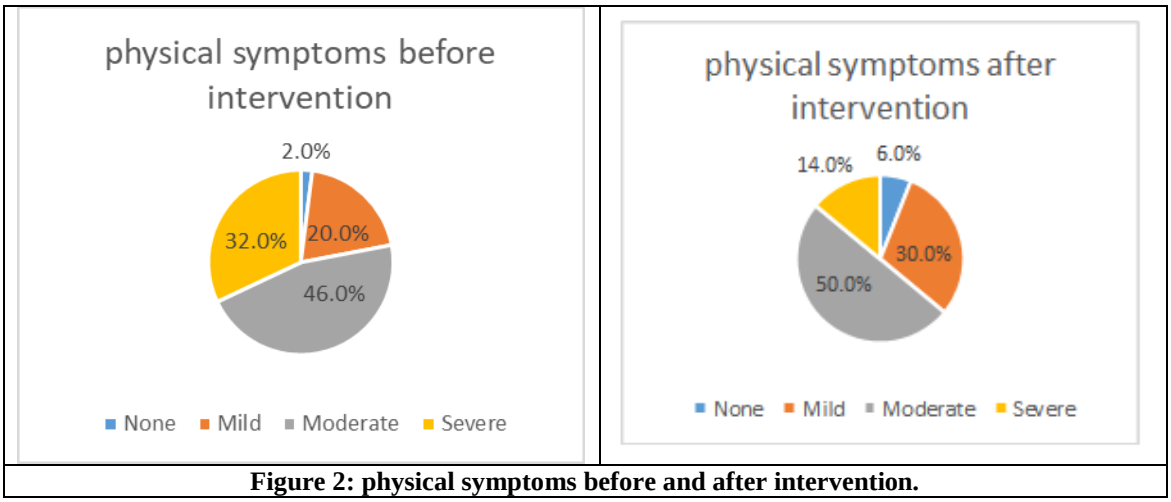


Figure 2: physical symptoms before and after intervention.

Regarding the psychological symptoms, a decline in severity of psychological symptoms was clear before and after the intervention, as it shows that percentage of participants with moderate and severe symptoms decreased after the intervention, while number of participants without symptoms or had mild symptoms increased after the intervention.(fig 3)

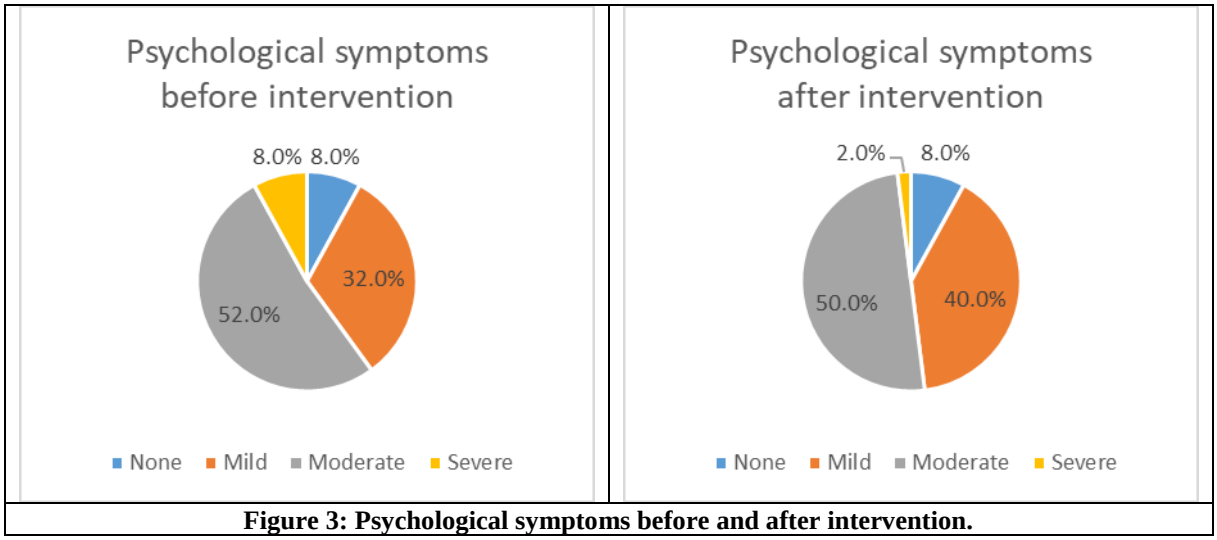


Figure 3: Psychological symptoms before and after intervention.

on the other hand, there was an obvious reduction in the severity of urogenital symptoms before and after the intervention, as it shows that percentage of participants with no symptoms increased from 48% before intervention to 58% after the intervention.(fig.4)

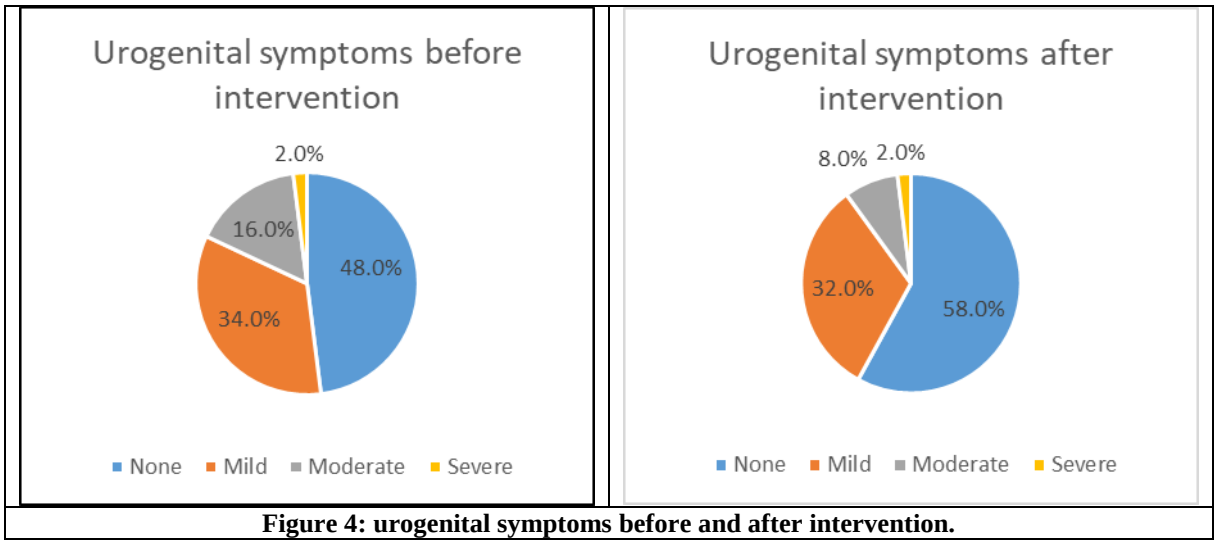


Figure 4: urogenital symptoms before and after intervention.

There was a decrease in the severity of MRS total symptoms before and after the intervention, as it shows that percentage of participants with none or mild symptoms increased from 4% (none) and 62% (mild) before intervention to 8% (none) and 80% (mild) after the intervention, while women with moderate MRS symptoms decreased from 32% before the intervention to 12% after the intervention. (Fig 5)

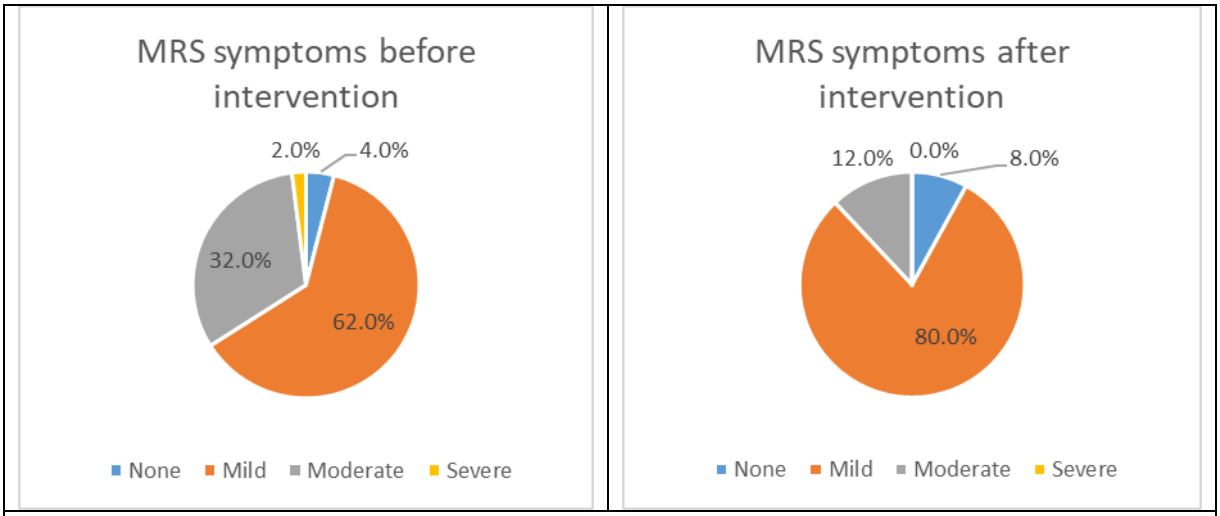


Figure 5: MRS symptoms before and after intervention.

Only age group variable participant's demographical data showed a significant relationship (p-value 0.041) with the severity of vasomotor symptoms after dietary intervention Table (1)

Table 1: Relationship between severity of vasomotor symptoms after intervention and the demographical data of participants.

Variable		Vasomotor symptoms after intervention				p-value
		none	mild	moderate	severe	
Age groups	45-48	3	1	4	1	**0.041**
	49-52	1	8	6	0	
	53-57	6	15	5	0	
Marital status	single	0	1	1	0	0.906
	married	10	20	13	1	
	divorced	0	0	0	0	
	widowed	0	3	1	0	
Education	Illiterate	0	3	0	0	0.342
	Primary level	3	7	6	1	
	Secondary level	3	12	7	0	
	University level	4	2	2	0	
Occupation	housewife	8	23	14	1	0.314
	management employee	1	1	0	0	
	teacher	1	0	1	0	
BMI before intervention	Underweight	0	0	0	0	0.143
	Health weight	0	2	0	0	
	Overweight	5	6	2	1	
	Obese	5	16	13	0	
BMI After intervention	Underweight	0	0	0	0	0.305
	Health weight	0	2	0	0	
	Overweight	5	9	3	1	
	Obese	5	13	12	0	
SES	Low	3	11	5	1	.595
	middle	5	12	9	0	
	high	2	1	1	0	

There was no meaningful relationship between the severity of Total MRS Symptoms after dietary intervention and participant's demographical data (Table 2).

Table 2: Relationship between severity of total MRS symptoms after intervention and the demographical data of participants./

Variable		Total MRS after intervention				p-value
		none	mild	moderate	severe	
Age groups	45-48	2	5	2	0	0.073
	49-52	1	11	3	0	
	53-57	1	24	1	0	
Marital status	single	0	1	1	0	0.482
	married	4	35	5	0	
	divorced	0	0	0	0	
	widowed	0	4	0	0	
Education	Illiterate	1	2	0	0	0.395
	Primary level	1	12	4	0	
	Secondary level	2	18	2	0	
	University level	0	8	0	0	
Occupation	housewife	4	36	6	0	1.000
	management employee	0	2	0	0	
	teacher	0	2	0	0	
BMI before intervention	Underweight	0	0	0	0	0.905
	Health weight	0	2	0	0	
	Overweight	1	12	1	0	
	Obese	3	26	5	0	
BMI After intervention	Underweight	0	0	0	0	0.671
	Health weight	0	2	0	0	
	Overweight	1	16	1	0	
	Obese	3	22	5	0	
SES	low	2	14	4	0	0.576
	middle	2	22	2	0	
	high	0	4	0	0	

Table 3 shows the statistical difference between the scores of menopausal symptoms before and after the dietary intervention. All the subdomains (vasomotor, somatic, psychological, and urogenital), and the total MRS score showed a statistically significant change after participants received the dietary intervention at p-value less than 0.05.

Table 3: Statistical difference in MRS scores before and after intervention

Variables	Before	After	Absolute change	Percent (%) change	p-value
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	
Total Menopause rating scale scores	20.16 (6.13)	16.34 (5.43)	3.82 (3.30)	16.85 (22.23)	**0.0001**
Vasomotor symptoms scores	4.56 (1.88)	2.72 (1.47)	1.84 (1.68)	29.76 (80.98)	**0.0001**
physical symptoms scores	7.52 (2.32)	6.32 (2.07)	1.20 (1.40)	14.56 (21.22)	**0.0001**
Psychologic symptom scores	5.32 (2.17)	4.98 (1.90)	0.34 (1.02)	3.52 (18.14)	**0.024**
Urogenital symptoms scores	2.76 (2.38)	2.32 (2.09)	0.44 (0.97)	18.68 (30.22)	**0.005**

SD= standard deviation, P-value = probability value (significant less than 0.05)

DISCUSSION

The current study assessed how a three-month dietary intervention affected women's menopausal vasomotor symptoms (VMS) and found that the intensity of the symptoms significantly decreased after the intervention.

Vasomotor symptoms: In this study, the percentage of women with severe vasomotor symptoms dropped from 34% at baseline to 2% following the intervention period; which suggest that the degree of menopausal vasomotor symptoms may be significantly influenced by dietary changes, a similar results were obtained by Rotolo[28] were significant decrease of hot flush severity (p= 0.04)

and by Barnard 2023 significant decline of sever hot flush by 88% ($P < 0.001$)[12] and by Hana 2023 , total hot flashes decreased by 95 % during the dietary intervention ($p = 0.007$).[29] The substantial reduction in symptom severity seen in the current study could be explained by several biological processes. Phytoestrogens, especially Isoflavones, are produced by diets high in plant-based foods. These phytoestrogens have mild estrogenic effects and may somewhat offset the drop in endogenous estrogen levels that occur after menopause. It is believed that these substances affect hypothalamic thermoregulatory centers, which lowers vasomotor instability.[30]

Physical symptoms: This includes sleep, physical and mental and musculoskeletal problems. The current study showed significant improvement of severe symptoms, these results are in line with similar studies by Barnard 2023, Women in the diet group showed significant reductions in both the physical domain and vasomotor scores of menopausal symptom questionnaires over a 12-week period ($P = 0.01$) when compared to controls in a noteworthy randomized trial of a plant-based, low-fat diet supplemented with soybeans.[12] Mahshid on the other hand had conducted a cross-sectional study showed a dietary patterns that is high in fats, sweets, and processed foods are associated with increased physical symptom severity, while patterns rich in fruits and vegetables are inversely associated with menopausal physical symptoms.[31] These advantages may be physiologically mediated by a variety of routes Antioxidants and anti-inflammatory substances included in nutrient-rich diets that prioritize whole plant foods may lessen systemic inflammation, which could alleviate musculoskeletal discomfort and fatigue. Additionally, plant-based diets can promote improved energy metabolism and sleep quality, both of which are frequently disturbed during menopause.[20]

Psychological symptoms: Anxiety, depression, irritability, and emotional discomfort, can coexist with vasomotor symptoms and are significant factors in determining quality of life, research indicates that healthy eating habits and nutritional therapies may lessen the intensity of these psychological symptoms[32],the current study showed an obvious reduction of severity of psychological symptoms, this in similar with studies by Grigolon During the menopausal transition and postmenopausal years, women who received nutritional interventions (such as dietary modifications and specific food-based techniques) experienced statistically significant decreases in the severity of their anxiety and depression symptoms ($P < 0.05$)[11], other study that adapted, Mediterranean diet adherence over 12 weeks has been shown to reduce symptoms of depression and anxiety p value =0.001.[33] There are probably several contributing factors to the improvement in psychological symptoms seen following the dietary modification. Anti-inflammatory substances found in nutrient-rich diets, lower systemic inflammation linked to mood disorders.[34]

Urogenital symptoms: The current study show improvement of only moderate symptoms after the dietary intervention, this in similar with studies by Noll 2021 and Abdi 2021 and Barnard 2023 which found diet high in fruits, vegetables and whole grains and soy product reduce severity of urogenital[35,36] while in contrast, a study by Mckinney 2021 When compared to a soy-free control diet, a randomized cross-over trial of a soy-rich diet (25 g soy protein containing >50 mg isoflavones daily for 12 weeks) did not significantly enhance vaginal health indices or lessen urogenital symptoms in perimenopausal and postmenopausal women.[37] this difference may attribute to differences in menopausal stage, baseline severity of urogenital symptoms, and duration of intervention, duration of menopause more prolong menopause more severe symptoms may need long duration for improvement and different assessment tools (e.g., Menopause rating scale versus Genitourinary syndrome of menopause GSM-specific indices or vaginal cytology measures) may capture distinct aspects of urogenital health, contributing to inconsistent results across studies.

Total menopause rating scale: The current study shows significant effect of dietary program after 3 months demonstrating that the total load of menopausal symptoms has dropped down in the physical, mental, and urogenital components. This in similar with studies by Mahshid 2019, A cross-sectional study assessing menopausal symptoms using the MRS reported that adherence to a vegetable-and-fruits dietary pattern was inversely associated with general, physical, and mental menopausal symptoms, while diets rich in fats, sweets, and processed foods were associated with increased symptom severity.[37], another study by Elibol 2025, had declared that dietary quality and carbohydrate patterns have also been linked to disparities in MRS scores and quality-of-life indices among postmenopausal women.[38] in addition to a pilot study conducted 2017 that evaluated soy isoflavones discovered that after 12 weeks, there was a considerable improvement in total MRS scores, with decreases of about 12.6% in postmenopausal women and 19.5% in peri-menopausal women.[39]

Relationship between severity of vasomotor and physical symptoms with demographical variables: only age had significant relationship after the dietary intervention. Women age group more than 49 years demonstrated higher decreases in hot flashes, nocturnal sweats, fatigue, and musculoskeletal symptoms compared with younger individuals, suggesting that age may alter responsiveness to dietary interventions during menopause. These results are in line with recent epidemiological data showing that somatic (physical and vasomotor symptoms) significantly worsen after age 44, peaking at age 52 and reaching their maximum intensity by age 56.[40] while a study conducted 2025 reviled that Consuming nutrient-

rich foods including fish, milk, and soy is linked to a reduction in the intensity of somatic symptoms in midlife women across all age groups, according to extensive observational data.[41], this occurs as a result to estrogen loss and thermoregulatory instability, vasomotor and physical symptoms usually worsen in late perimenopause and early post menopause. By enhancing vascular function, lowering inflammation, and modifying endocrine responses, dietary interventions high in plant-based foods, soy products, and micronutrients may target these pathways, hence the improvement in symptom severity may be more noticeable for women in this age.[9]

Limitations

There was a difficulty in gathering the whole participants, to deliver the dietary educational program, therefore, it was repeated several times into groups of participants, to facilitate data collection, in addition there was non - adherence of participants to the dietary intervention program because most of participants were low and moderate socioeconomic status and low education level(primary and secondary school)

CONCLUSIONS

The dietary intervention was having a positive effect on decreasing severity of postmenopausal symptoms including vasomotor symptoms, physical, psychological, urogenital and total menopause rating scale which has disturbing effect on quality of life of postmenopausal women. There was a significant association between age of participants and severity of post- menopausal vasomotor and physical symptoms.

Authors' Declaration

We confirm that all the Figures and Tables in the manuscript belong to the current study.

Conflict of Insert: there is no conflict of interest.

Funding: there was no institutional or other type of external funding.

Authors' Contributions

Dhuha Mahmood Nafea: Collection of data, statistical analysis, writing of the research

Lujain Anwar Alkhazrajy: identification of research topic, structuring research methodology, reviewing, editing.

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