EFFECT OF DASH DIET AND AEROBIC EXERCISES ON PREMENSTRUAL SYNDROME

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Abstract

Background: *Premenstrual syndrome (PMS) is a common disorder characterized by physical, mental and behavioral changes in the luteal phase of the menstrual cycle in the reproductive age women .DASH diet which emphasize fruit, vegetable, low fat dairy food and whole grain is one of the most widely prescribed dietary modification to reduce premenstrual symptoms.* ***Purpose:*** *of the study was to determine the effect of DASH diet and aerobic exercises on premenstrual syndrome (PMS).* ***Subjects & Methods:*** *Fifty adolescent females diagnosed with premenstrual syndrome aged from 15 to 25 years and their BMI was less than 30 kg/m^2 were selected from Technical Secondary School for Girls In DE-Lengat Beheira, Egypt. They were divided randomly into two groups equal in number: group (A)(control group) (n=25) received multivitamin and minerals (vitatron) capsule once daily for 12 weeks and group(B)(study group)(n=25) followed DASH diet and performed program of aerobic exercise in the form of walking on electronic treadmill with moderate intensity(60-75%)of MHR for 30 minutes,3 days/week, for 12 weeks in addition to multivitamin and minerals as in group (A).Visual analogue scale (VAS) and Menstrual distress questionnaire (MDQ) were performed before the beginning and at the end of the study for participants in both groups for assessment of pain intensity and severity of premenstrual symptoms.* ***Results****: showed that there was a statistical significant decrease in the mean values of pain intensity and severity of premenstrual symptoms in both groups (A and B). Also, it showed non statistical significant difference between both groups (A&B) pre-treatment (P=0.57) and (P=0.61) respectively, while it showed a statistical significant decrease between both groups post-treatment in favor of group (B) with (P<0.001).* ***Conclusion:*** *It could be concluded that aerobic exercises in addition to DASH dietary pattern had significant effect in decreasing pain intensity and severity of premenstrual symptoms in adolescent females suffering from premenstrual syndrome.*

Key words: Aerobic exercise, DASH diet, premenstrual syndrome, Quality of life, pain intensity, adolescent females.

INTRODUCTION

Premenstrual syndrome (PMS) is a common disorder characterized by physical, mental and behavioral changes in the luteal phase of the menstrual cycle in the reproductive age women (between menarche and menopause) [1]. It starts 7-14 days before menses and persists for two days (maximum four days) after the onset of menses [2].

Premenstrual syndrome is a combination of symptoms that many women get about a week or two before their period [3].These symptoms range from emotional such as depression, irritability, anxiety and confusion to physical symptoms including breast tenderness, weight gain, headache , swelling of hands or feet and aches or pain [4].

The cause of PMS is unclear, though an underlying neurobiological vulnerability to normal fluctuations in the circulating sex hormones levels during the menstrual cycle is thought to contribute. Hormonal fluctuations may also alter brain neurotransmitter or neuropeptide function, contributing to both physical and emotional symptoms [5].Some girls are diets conscious and eat less, resulting in less mineral and vitamin intake which may be a cause of PMS .Too many salty foods , alcohol or caffeine may increase symptoms such as water retention and abdominal bloating [6].

Aerobic exercise is a physical activity of varying intensities that depends mainly on aerobic energy generating process. It improves blood flow thus helps in alleviating cramps, relaxes abdominal muscles, reduces pelvic pain and relieves pressure on nerve centers, pelvic organs and the alimentary canal [7].Physical activity affects the mechanisms of brain endorphins and improves mood symptoms. It increase endorphins and reduce the symptoms of adrenal cortisol leading to the improvement of PMS (increased pain tolerance, decrease anxiety and depression) [8].

DASH (Dietary approach to stop hypertension) diet is rich in some of bioactive compounds such as fiber, trace elements, minerals, vitamins, and is found in vegetables, fruits and whole grains that have anti- inflammatory and anti-proliferative effects [9].

Adherence to DASH dietary pattern was reported to be inversely related to depression score and could improve mood in women [10].Renin-angiotensin-aldosterone system dysfunctional alter the regulation of sodium balance, blood volume, and arterial constriction. Also appears to be involved in symptoms of premenstrual edema, including abdominal bloating, swelling of extremities, and breast tenderness [11].

This study was conducted to investigate the effect of DASH diet and aerobic exercises on premenstrual syndrome.

MATERIALS AND METHODS

Study design

This was a pre-post two groups study conducted at randomly by using a computer-generated randomized table created in advance of data collection using SPSS program ‘‘version 20 for windows, software, from Technical Secondary School for Girls in DE-Lengat Beheira, Egypt. Duration of the study was 9 months from July 2022 to March 2023. prior to data collection, the protocol of the study was approved by the ethical committee of Faculty of Physical Therapy, Cairo University in April 2022 (NO=P.T.REC/012/003692).

Participants:

Fifty adolescent females participants who diagnosed with premenstrual syndrome aged from 15 to 25 years and their BMI was less than 30 kg/m2.They were selected from Technical Secondary School for Girls In DE-Lengat Beheira, Egypt and were randomized into two equivalent groups (A&B).

Measurement procedures:

Evaluative procedures:

History talking:

A full history was taken from each participant before starting the study and data was recorded in a data sheet.

Weight and height measurements:

Weight and height were measured for participants in both groups (A&B) before starting the study. Each participant was asked to stand up on the center of the scale in upright position after removing all heavy clothes and shoes. The therapist wait until figure was displayed and then recorded the weight showed on the scale .Then the therapist put the ruler of the scale straight against the top of the participants head and marked the top of the ruler and measured the distance from the head mark to the floor with the tape measure . Then BMI was calculated by dividing the weight in (kg) on the height in (m2).BMI =weight / height square (kg/m2) [12].

Assessment of pain intensity:

Pain intensity was assessed for each participant in both groups before and after treatment through Visual analogue scale (VAS), in order to determine the severity of pain .Participants were asked to mark a suitable point on a horizontal line with a length of 10 cm. (0) Indicates no pain, (10) indicates excruciating pain.

Assessment of severity of symptoms of premenstrual syndrome:

Severity of premenstrual symptoms were assessed for each participant in both groups before and after treatment using the Menstrual Distress Questionnaire (MDQ).Each participant examined eight symptoms categories (pain, concentration, water retention, behavior changes, negative effect, autonomic reaction, arousal and control) .Participants were asked to report the symptoms experienced during their most recent menstrual period, using a rating scale. Responses ranged from (0) No experience of the symptom, (1) mild, (2) moderate, (3) severe and (4) very severe disabling symptoms. Overall scores were interpreted as follows: < 50- mild, 50 to 70 – moderate and > 70 severe [13].

Treatment procedure:

Group (A) :-(control group)

Consisted of 25 virgin adolescent females suffering from PMS received multivitamin and minerals (vitatron) capsule once daily, for 12 weeks.

Group (B) :-(study group)

Consisted of 25virgin adolescent females suffering from PMS received the same multivitamin and minerals as in group (A) in addition to DASH diet and performed aerobic exercise program for 30 minutes, 3times/week, for 12 weeks.

Before starting the first treatment session, verbal explanation about the treatment program was explained for each participant in group (B) to gain her cooperation.

Each participant was asked to wear comfortable clothes and flat light shoes to avoid hurting from the friction of the plat form.

DASH diet: A healthy dietary plan contains: a diversity of vegetables from all of the subgroups as red, orange, and dark green vegetables, proteins (peas and beans), starchy, etc. Fruits: particularly whole fruits .Grains with at least hall of which are whole grains. Dairy products (low fat or fat free), including cheese, yogurt, milk and fortified soy drinks .Various protein foods such as fish, eggs, lean meat and poultry, nuts, seeds and soy products.

The customized DASH diet targets were recommended with respect to high intake of vegetables (4–5 serves daily) , fruits (3–5 serves daily) fish, lean meats and poultry (≤6 serves daily), fat free and low fat dairy products (2–3 serves daily), and legumes ,nuts and seeds (4–5 serves per week). The targets also included the achievement of limited intake of added sugars and sweets (≤5 serves per week), oils and fat (2–3 serves per day) ,maximum amount of saturated fatty acids (SFA) ≤7% of total fat, total fat ≤ 27% of energy and total sodium consumption of 2300 mg daily. It requires 2000 calories during luteal phase [14].

Exercise program: All participants in group (B) received a program of aerobic exercises in the form of walking on treadmill for 30 minutes, through 3 phases, Warm up phase: included walking on treadmill with light intensity (40% of MHR) for 5 minutes, Actual phase: included walking on the treadmill with moderate intensity (60-75% of MHR) for 20 minutes and Cool down phase: included walking on the treadmill with light intensity (40% of MHR) for 5 minutes. MHR was calculated according to (220-age).The frequency of exercise was 3 times/week for 12 weeks [15].

Data analysis:

Unpaired t-test was conducted for comparison of subject characteristics between groups. Normal distribution of data was checked using the Shapiro-Wilk test. Levene's test for homogeneity of variances was conducted to test the homogeneity between groups. Mixed MANOVA was conducted to investigate the effect of treatment on VAS and MDQ. Post-hoc tests using the Bonferroni correction were carried out for subsequent multiple comparison. The level of significance for all statistical tests was set at $p < 0.05$. All statistical analysis was conducted through the statistical package for social studies (SPSS) version 25 for windows (IBM SPSS, Chicago, IL, USA).

RESULTS

Subject characteristics:

Table (1) showed the subject characteristics of group A and B. There was no statistical significant difference between both groups (A&B) in age, weight, height and BMI ($p > 0.05$).

Table 1. Basic characteristics of participants .

	Group A	Group B			
	Mean ± SD	**Mean ± SD**	**MD**	**t- value**	**p-value**
Age (years)	20.2 ± 3.35	19.22 ± 2.68	0.98	1.13	0.26
Weight (kg)	58.4 ± 4.61	58.96 ± 3.35	-0.56	-0.49	0.62
Height (cm)	158.62 ± 3.32	160.37 ± 5.47	-1.75	-1.36	0.17
BMI (kg/m²)	23.19 ± 1.47	22.98 ± 1.79	0.21	0.45	0.65

SD, standard deviation; p-value, level of significance

Effect of treatment on VAS and MDQ:

Mixed MANOVA revealed a significant interaction effect of treatment and time ($F = 15.02$, $p = 0.001$). There was a significant main effect of treatment ($F = 3.73$, $p = 0.03$). There was a significant main effect time ($F = 132.08$, $p = 0.001$).

Within group comparison: There was a significant decrease in VAS and MDQ post treatment in both groups compared with that pre treatment ($p < 0.001$). The percent of decrease in VAS and MDQ of group A was 25 and 11.45% respectively while that in group B was 44.24 and 23.67% respectively. (Table 2)

Between group comparison: There was no significant difference between groups pre treatment ($p > 0.05$). Comparison between groups post treatment revealed a significant decrease in VAS and MDQ of group B compared with that of group A ($p < 0.001$). (Table 2 , figure 1-2).

Table 2. Mean VAS and MDQ pre and post treatment of group A and B:

	Pre treatment	Post treatment			
	Mean ±SD	**Mean ±SD**	**MD**	**% of change**	**p value**
VAS					
Group A	6.4 ± 1.22	4.8 ± 0.82	1.6	25.00	0.001
Group B	6.6 ± 1.29	3.68 ± 0.74	2.92	44.24	0.001
MD	-0.2	1.12			
	p = 0.57	***p = 0.001***			
MDQ					
Group A	62.48 ± 5.76	55.32 ± 3.19	7.16	11.45	0.001

Group B	63.36 ± 6.34	48.36 ± 2.76	15	23.67	0.00^
MD	-0.88	6.96			
	p = 0.61	***p = 0.001***			

SD, Standard deviation; MD, Mean difference; p value, Probability value

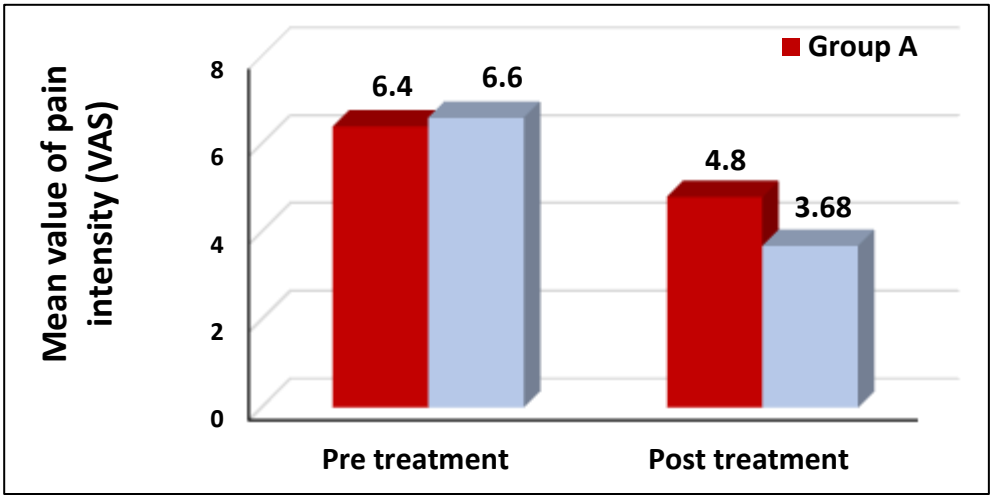
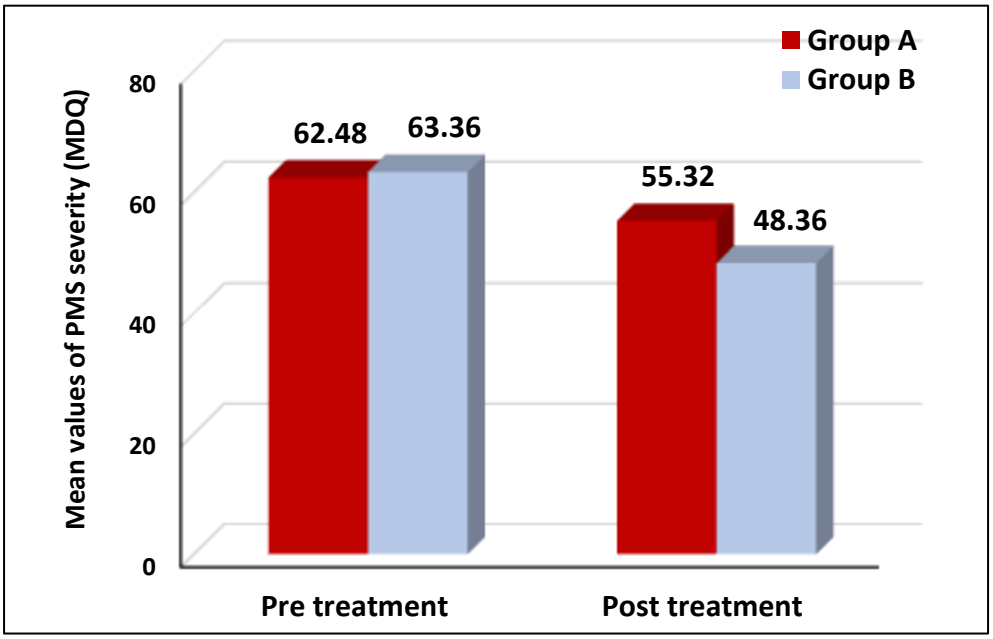


Fig.(1):Mean values of pain intensity measured pre and post treatment in both groups (A and B).



Fig(2): Mean values of PMS severity measured pre and post treatment in both groups (_A and B).

DISCUSSION

Premenstrual syndrome is a disorder that is frequently seen in young adult females .It has a negative influence on young females lives, as it can lead to reduced work efficiency and quality of work .Also, it affect neuro-psychological function in young females with lack of school attendance [16].

Also, PMS is called premenstrual tension and is considered as a psychosomatic reproductive health problem with a group of symptoms associated with female menstrual cycle which begins during the fertility years and ceases at menopausal period [17].This syndrome manifests itself during the luteal stage in every monthly period in the form of a complex of physical, psychological and behavioral disorders. About 75% to 90 % of women experience this syndrome before their menstrual period [18].

Therefore, the current study was conducted to determine the effect of DASH diet and aerobic exercises on pre-menstrual syndrome.

Fifty virgin adolescent females diagnosed as having premenstrual syndrome participated in this study. They were divided randomly into two groups equal in number (A and B): Group (A) (n=25) received multivitamin and minerals (vitatron) capsule once daily, for 12 weeks, group (B) (n=25) received DASH diet and supervised aerobic exercise program, for 30 minutes, 3 times/week, for 12 weeks, in addition to the same multivitamin and minerals as in group (A).

The finding of the present study revealed that there was a statistical significant decrease in the mean value of pain intensity in both groups (A & B) post-treatment. Also, it showed a non-statistical significant difference between both groups (A & B) pre-treatment (p=0.57), while it showed a statistical significant decrease between both groups post treatment in favor of group (B) where p value (P=0.001).

Also, there was a statistical significant decrease in the mean value of severity of premenstrual symptoms in both groups (A & B) post-treatment and a non-statistical significant difference between both groups pretreatment with (P=0.06),while there was a statistical significant decrease between both groups post treatment in favor of group (B) where p value (P=0.001).

The significant improvement in pain intensity and premenstrual symptoms with DASH diet is due to several mechanisms. DASH diet contains folate and B group vitamins, which have a beneficial effect on inflammation and oxidative stress .So ,they are necessary for neuronal function ,as their deficiency is associated with depression and anxiety [19].Also DASH diet contains high amount of magnesium, fiber , potassium and Ca, accompanied by higher intake of vegetables ,fruits , whole grains , low fat dairy products, legumes and nuts .This dietary pattern have anti-inflammatory and anti-oxidant effects [9].

Vinson et al, 2012 reported that the consumption of nuts, legumes and seeds is associated with a higher quality of life (QoL) as it contain substantial amount of polyphenol anti-oxidants and other bioactive compounds [20].

The results of the current study agreed with that of Torres and Nowson 2012 who reported that adherence to DASH diet was associated with improvement in mood ,including anxiety, depression ,insomnia and sleep disturbance in post postmenopausal woman [21].

Also, the results of the current study agreed with that of Saharkhiz et al ,2021 who reported that adherence to DASH dietary pattern ,which is characterized by low intake of red and processed meat ,sugar containing beverages and sweets was associated with lower odds of stress and sleep disturbance in young women [22]..

Also, the results of the current study were supported by the findings of Grandner et al,2013 who reported that low dietary fiber consumption altered sleep duration which is probably due to changes in the secretion of appetite related hormones [23].

Also the results of the current study were in line with that of Banas et al ,2009 who reported that the higher fat diet was associated with a reduction in serotonin release in the hypothalamus. There is a high likelihood that the consumption of vitamins, minerals and fibers may improve sleep quality. Tryptophan is an essential precursor to serotonin syntheses, a neurotransmitter known for controlling the sleep cycle and inducing feeling of sleepiness [24].

In the other hand ,the results of this study disagreed ,with that of Tanaka et al,2013 who reported that low protein intake were associated with insomnia ,while greater intake of protein and carbohydrate was associated with higher quality of sleep [25].

Kulshreshtha et al 2013 ,reported that practicing aerobic exercises improve autonomic function by altering parasympathetic and sympathetic activities [26].

Regarding the significant improvement in pain intensity and premenstrual symptoms after performing aerobic exercises, could be explained by several mechanism as, physical exercise affects the mechanism of brain endorphins and improves mood symptoms .It increases endorphins and reduces symptoms of adrenal cortisol leading to the improvement of PMS (increased pain tolerance, decrease anxiety and depression) [8].

Kanosue et al , 2015 reported that regular physical activity affect blood leptin levels in women with PMS. This hormone exerts its metabolic and neuroendocrinology effects through its receptors in the hypothalamus area of emotional control , as it reduces the amount of leptin in the blood to 30-34 % resulting in reduction of psychological symptoms of PMS [27].

The results of the current study were in agreement with that of Samadi et al 2013, Rapkin and Akopians 2012 , who reported that there were of significant improvement in physical symptoms ,anxiety and depression in females suffering from PMS ,after practicing aerobic exercises[28] [29].

The results of the current study were supported by that of Abbaspour et al 2006, who reported that aerobic exercises such as walking, reduces physical and psychological symptoms of PMS ,by increasing estrogen ,dopamine ,progesterone and endogenous opiate and suppresses prostaglandin from being release [30].

The results of the current study were also supported by that of kumbhar et al 2011, who obtained similar results and outlined the benefits of aerobic exercises such as walking on treadmill as it improve blood flow ,relax abdominal muscles ,reduce pelvic pain ,and relieve pressure on pelvic organs[31].

The results of the current study were also in agreement with that of Chaudhuri et al 2013, who reported that Exercise may act as a distraction from intrusive thoughts and promote positive thoughts, decreasing short-term depression. Also, it may increase concentration and improve mood and behavior [32].

In the other hand , the results of this study were in disagreement with that of Govindaraj et al, 2016 who reported that aerobic exercises wasn't effective in reducing symptoms of PMS [33].

Also, the results of the present study were in disagreement with that of Meeusun et al 2016 who reported that aerobic exercise have some harmful side effects as decreased performance, fatigue, altered hormonal states, poor sleeping patterns, and mood disturbances [34].

Also, the results of the present study were in disagreement with that of Gleeson et al 2014 who reported that aerobic exercise may cause harmful effects such as muscle cramps, reduced peripheral vascular resistance and stress [35].

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