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Do dietary habits affect the premenstrual syndrome severity among a cohort of Egyptian females? A cross-sectional study

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Abstract

Background Premenstrual syndrome (PMS) is considered a common recurring emotional as well as physical disorder which has an effect on the women's quality of life. Results of previous studies about the relationship between PMS and food intake are contradicted. The purpose of this study was to investigate the relationship between the PMS and food consumption in menstrual females. The study was carried out in the Outpatient Physiotherapy Department Clinic in Cairo University, Giza, Egypt. The study was carried out from October 2021 to March 2022. One-hundred participants that were having PMS enrolled into this study ($n = 100$) with a mean age of 27.1 ± 4.98 and a mean BMI of 26.4 ± 4.5. The PMS scale was used to assess the degree of PMS, and a food frequency questionnaire (FFQ) was applied to evaluate the food consumption.

Results A total of 16% of females had mild PMS, 60% had moderate, and 24% had severe PMS. There was a significant relationship between PMS severity and specific food consumption as consumption of tubers as well as fish and seafood ($p = 0.03$ & $p = 0.008$, respectively). There was a significant inverse correlation between PMS severity and the fish and seafood consumption, while there was no significant correlation between the PMS severity and tuber consumption. However, there was no significant relationship between PMS and grains, dairy products, caffeine intake, fat intake, sweets, vegetables, fruits, seasonings, and pickles.

Conclusion The present study suggested that severity of PMS might be affected by specific dietary habits. Therefore, further studies are needed to investigate the relationship between PMS and amount of food consumption.

Keywords Dietary habits, Egyptian females, Food intake, Premenstrual syndrome

Background

Premenstrual syndrome (PMS) is consider a common disorder marked by the occurrence of emotional, physical, and also behavioral signs and symptoms on a regular basis which occur through the menstrual cycle's luteal phase [1] and also may interfere with the quality of life of women [2]. It is associated with poor concentration, social withdrawal, confusion, irritability, and depression [3]. PMS has been diagnosed in 47.8% of women [4]; approximately, 85% of women with menstrual cycle are having one or more premenstrual symptoms [3].

Although the cause of PMS is unknown, factors like nutritional intake/dietary habits, hormonal imbalance as increased estrogen levels, changes in the estrogen-progesterone ratio, and excessive prolactin secretion, biological factors, and psychological issues may play a role in its occurrence [5]. Dietary habits are considered the most influential among the suggested factors [6], and it is

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the most adjustable factor that can be considered in PMS management strategy [7]. It was found that an excess or deficit of particular nutrients may cause neurotransmitter and hormonal imbalance, which provokes PMS [6].

Considering the food intake as a factor of PMS occurrence, previous study in Taiwan concluded that excess consumption of junk food, sweets, fried meat, alcohol, and coffee and also decreased consumption of vegetables and fruits are associated with higher risk of PMS [8]. In addition, a study showed that high consumption of fat may be connected to PMS occurrence [9]. In addition, a study in Tehran showed that high-fiber, low-fat, and vegetarian diet are related to reduced levels of estrogen and the duration of premenstrual symptoms [6]. Furthermore, low intakes of dairy products, fruits, and vegetables were connected to PMS development among Iranian adolescent girls [10].

Up to our knowledge, this considers the first study assessing the association between food consumption and severity of PMS among Egyptian females. The evidences suggest a link between PMS and ethnicity/cultural setting, with different cultural backgrounds considered to have varying impacts on PMS symptoms and outcomes [11]. So, the purpose of this study was to investigate the relationship between the PMS and dietary habits in menstrual females.

Methods

Study design and setting

The study was designed as cross-sectional study, which was carried out at the Outpatient Physiotherapy Department Clinic in Cairo University, Giza, Egypt. The study was carried out from October 2021 to March 2022.

Participants

An appropriate sample of one-hundred females was inducted from Outpatient Clinic of the Faculty of Physical Therapy, Cairo University, Egypt. They were registered and evaluated to see if they were eligible to take part in the study. Females who ought to suffer from PMS as determined by premenstrual syndrome scale were recruited to take part in the study. The females' ages ranged from 20 to 35 years and had a regular menstrual cycle. The females were excluded if they were smoking, taking any medications that may affect their menstruation, having a history of chronic disease, or having any psychiatric or gynecological problems.

Procedures

Assessment of PMS

It was done through PMS scale (PMSS). It is a valid questionnaire with sensitivity ranges from 83 to 100% and specificity ranges from 64 to 90% [12]. The inter-rater reliability is between 0.81 and 0.97. The PMSS consists of 40 items with 5-point Likert-type scale (never, rarely, sometimes, very often, always). It consists of three subscales: physical symptoms, psychological symptoms, and behavioral symptoms. The lowest scale score is 40, and the highest score is 200. A total score of 80 points or above indicates PMS. The increase in the scores indicates increase in PMS severity [12].

Assessment of dietary habits

A food frequency questionnaire (FFQ) was utilized to assess food consumption. The FFQ includes foods that have reasonable effects on PMS [8, 13]. They include the following: food from different food groups with different examples in each category. The consumption is divided into the following: no, one-two times per day, two-four times per week, and two-four times per month [11]. The validity of the questionnaire has been established in the previous studies [8, 11, 13].

Sample size calculation

G*Power statistical software (version 3.1.9.2; Franz Faul, Universitat Kiel, Germany) was used to calculate sample size expecting moderate correlation between PMS, and food frequency showed that the minimum sample size for this study is $N = 84$. The number increases to 100 for possible dropout. Calculation was done by using $\alpha = 0.05$, $\beta = 0.2$, and moderate effect size = 0.3.

Statistical analysis

The form of descriptive statistics is mean, standard deviation, minimum, and maximum; for presenting the measured variables, frequency was carried out. Non-parametric statistics were used since the data was not normally distributed. Chi-squared (Fisher exact test) test was conducted to investigate the relationship between PMS severity and consumptions of foods. Spearman's rank correlation coefficient was used to assess the correlation between PMS severity and consumption of food. For all statistical tests, the significance level was fixed at $p < 0.05$. The Statistical Package for Social Studies (SPSS) version 25 for Windows (IBM SPSS, Chicago, IL, USA) was used for all statistical analysis.

Results

Subject characteristics

One-hundred females who are having PMS took part in this study. A total of 60% of participants were single, and 40% were married; the other subject characteristics were presented in Table 1.

For the PMS severity, there were 16% reported mild severity, while 60% and 24% reported moderate and severe PMS respectively. FFQ showed the highest

Table 1 Demographic characteristics of study participants

	Mean ± SD	Maximum	Minimum
Age (years)	27.1 ± 4.98	35	20
Weight (kg)	69.63 ± 12.21	100	39
Height (cm)	162.41 ± 5.57	174	137
BMI (kg/m^2)	26.4 ± 4.5	36.33	15.23
Age of menarche (years)	12.34 ± 1.33	19	10
Frequency of menstrual cycle (days)	27.5 ± 2.52	35	15
Duration of menstrual cycle (days)	5.33 ± 1.24	10	3
Marital status %	Single 60%	Married 40%	

SD, standard deviation

consumptions for the meat (97%), followed by dark green leafy vegetables and pulses (95%), and then consumption of other vegetables and fruits (94%), while the lowest consumptions of foods were consumption of tea or coffee if not sweetened (47%), followed by consumption of pickles, olives, and similar (63%) (Table 2, Fig. 1).

Relationship between PMS severity and consumption of foods

There was a significant relationship between PMS severity and consumption of tubers ($p = 0.03$). There was non-significant correlation (rho = 0.17, $P = 0.08$) between the PMS severity and consumption of tuber.

There was a significant relationship between PMS severity and consumption of fish and seafood ($P = 0.008$). There was an inverse correlation (rho = −0.35, P

Table 2 The frequency distribution of food consumption

	Consumption of foods (%)			
	One-two times per day	**Two-four times per month**	**Two-four times per week**	**None**
Consumption of foods made from grains as rice, bread, pasta, and noodles	54	3	35	8
Consumption of tubers as white roots (white radish), sweet potatoes, and potatoes	8	29	29	34
Consumption of pulses (beans, peas, hummus, and lentils)	11	47	37	5
Consumption of nuts and seeds	8	58	21	13
Consumption of milk products as milk, cheese, yogurt	54	4	35	7
Consumption of organ meat like liver, heart, and kidney	2	60	6	32
Consumption of meat	35	8	54	3
Consumption of fish and seafood	1	45	45	9
Consumption of eggs from poultry	30	23	38	9
Consumption of dark green leafy vegetables	35	13	47	5
Consumption of vitamin A-rich vegetables like pumpkin, carrots, and sweet potato	14	34	31	21
Consumption of vitamin A-rich fruits as mango and papaya	3	56	20	21
Consumption of other vegetables and fruits	38	15	41	6
Consumption of oils and fats or butter (oils from nuts, seeds, and all animal fat)	39	10	44	7
Consumption of fried snacks as chips and crisps	19	16	44	21
Consumption of sweets like chocolate, cakes, candies, cookies, sweet biscuits, or ice cream	28	20	43	9
Consumption of sweetened fruit juices, chocolate drinks, yogurt drinks, sweet tea, or coffee with sugar	27	12	40	21
Consumption of pickles, olives, and similar	11	21	31	37
Consumption of seasonings as chilies, spices, and herbs	11	20	40	29
Consumption of tea or coffee if not sweetened	22	7	18	53

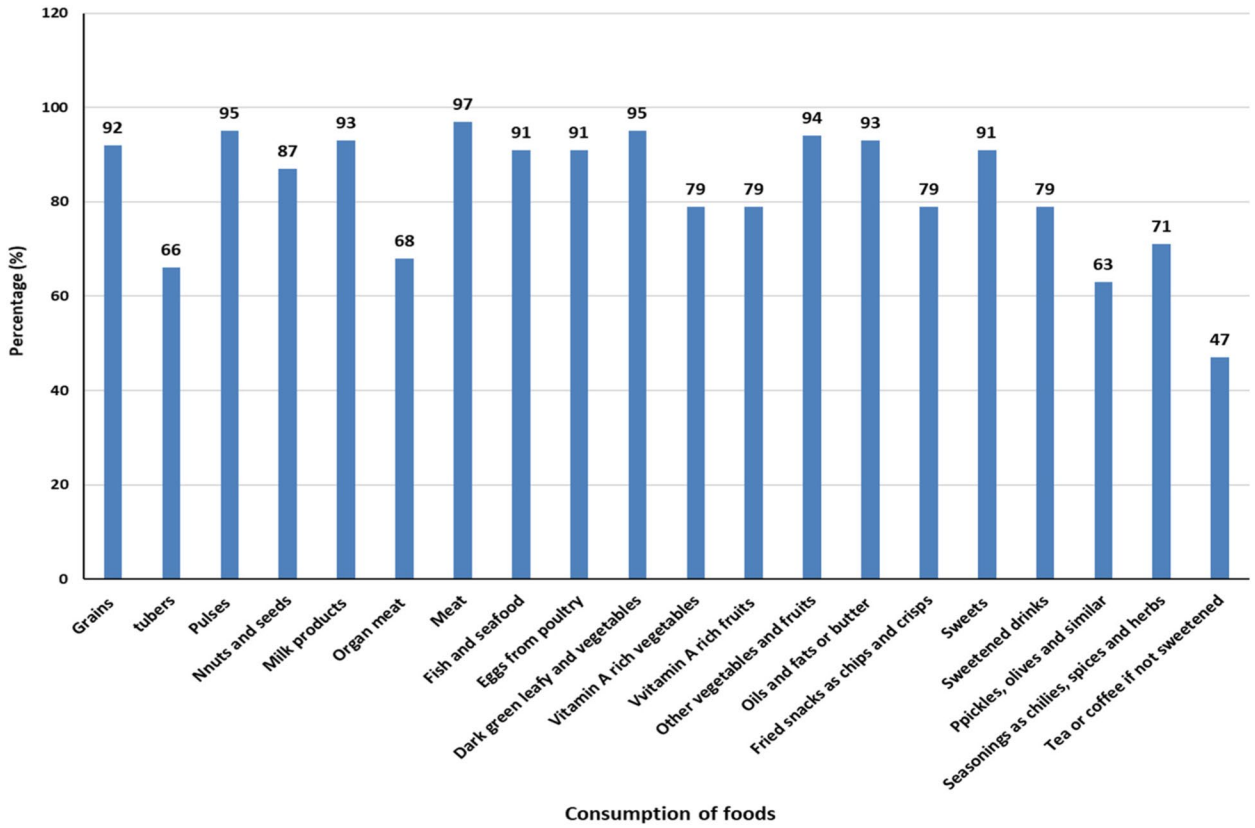

Fig. 1 Percentage of consumption of different food items among participants

= 0.0001); this means higher percentage of females with severe PMS has lower consumption of fish.

There was no significant association ($P < 0.05$) between PMS severity and the other food items in the FFQ (Table 3).

Discussion

Nutritional factors may have a major role in the development of PMS, according to prior studies [14, 15]. So, the purpose of this research was to look into the relation between the PMS severity and food consumption among a group of healthy Egyptian females. The present results revealed that there was a significant relationship between PMS severity and consumption of tubers and fish ($p = 0.03$, $p = 0.008$), respectively. There was a significant inverse correlation between PMS severity and the fish and seafood consumption, while there was no significant correlation between the PMS severity and tuber consumption, while there was no significant relationship ($p > 0.05$) between PMS severity and consumption of food items in the FFQ.

The present findings showed that there was a significant relationship between PMS severity and consumption of tubers (such as radish, potato, and sweet potato) but with no significant correlation.

Basically, radish contains diverse water-soluble vitamins (B1, B2, B5, B3, B9, B6, and C) and minerals (calcium, magnesium, iron, zinc, manganese, potassium, and phosphorus). Furthermore, it has anti-inflammatory effect and enhances the antioxidant defense system and decreases the free radicals buildup [16, 17]. Fruits and vegetables intake collectively have a protective effect against the PMS [11]. Despite the aforementioned nutritional values, tubers contain higher content of dietary fiber which is significantly associated with lower concentrations of reproductive hormones and prevent the reabsorption of estrogen from the intestine which decreases the estrogen level in the body and consequently PMS severity [18]. Furthermore, tubers' effect on the PMS is still unclear due to methodological limitations [17], and there is a lack of specific food items assessment as was done in the current study.

The inverse correlation between consumption of fish and severity of PMS can be attributed to the omega 3 fatty acids content in fish, which reduces of the psychiatric PMS symptoms as depression, anxiety, and nervousness. Also, omega 3 plays role in the reduction of

Table 3 The relationship between premenstrual syndrome severity and consumption of foods

Consumption of foods		Premenstrual syndrome				
		Mild ($N = 16$)	Moderate ($N = 60$)	Severe ($N = 24$)	χ^2 value	*p*-value
Consumption of foods made from grains as rice, bread, pasta, and noodles	One-two times per day	11 (68.8%)	33 (55%)	10 (41.7%)	4.167	0.641
	Two-four times per month	0 (0%)	2 (3.3%)	1 (4.2%)		
	Two-four times per week	5 (31.3%)	19 (31.7%)	11 (45.8%)		
	No	0 (0%)	6 (10%)	2 (8.3%)		
Consumption of tubers as white roots (white radish), sweet potatoes, and potatoes	One-two times per day	4 (25%)	1 (1.7%)	3 (12.5%)	13.131	**0.03***
	Two-four times per month	2 (12.5%)	17 (28.3%)	10 (41.7%)		
	Two-four times per week	4 (25%)	20 (33.3%)	5 (20.8%)		
	No	6 (37.5%)	22 (36.7%)	6 (25%)		
Consumption of pulses (beans, peas, hummus, and lentils)	One-two times per day	3 (18.8%)	6 (10%)	2 (8.3%)	7.649	0.219
	Two-four times per month	11 (68.8%)	25 (41.7%)	11 (45.8%)		
	Two-four times per week	2 (12.5%)	26 (43.3%)	9 (37.5%)		
	No	0 (0%)	3 (5%)	2 (8.3%)		
Consumption of nuts and seeds	One-two times per day	2 (12.5%)	5 (8.3%)	1 (4.2%)	4.307	0.644
	Two-four times per month	11 (68.8%)	33 (55%)	14 (58.3%)		
	Two-four times per week	1 (6.3%)	13 (21.7%)	7 (29.2%)		
	No	2 (12.5%)	9 (15%)	2 (8.3%)		
Consumption of dairy products as milk, cheese, yogurt	One-two times per day	10 (62.5%)	33 (55%)	11 (45.8%)	6.831	0.270
	Two-four times per month	1 (6.3%)	2 (3.3%)	1 (4.2%)		
	Two-four times per week	5 (31.3%)	18 (30%)	12 (50%)		
	No	0 (0%)	7 (11.7%)	0 (0%)		
Consumption of organ meat like liver, heart, and kidney	One-two times per day	1 (6.3%)	0 (0%)	1 (4.2%)	8.065	0.165
	Two-four times per month	11 (68.8%)	36 (60%)	13 (54.2%)		
	Two-four times per week	2 (12.5%)	3 (5%)	1 (4.2%)		
	No	2 (12.5%)	21 (35%)	9 (37.5%)		
Consumption of meat	One-two times per day	7 (43.8%)	24 (40%)	4 (16.7%)	7.148	0.246
	Two-four times per month	2 (12.5%)	3 (5%)	3 (12.5%)		
	Two-four times per week	7 (43.8%)	31 (51.7%)	16 (66.7%)		
	No	0 (0%)	2 (3.3%)	1 (4.2%)		
Consumption of fish and seafood	One-two times per day	0 (0%)	1 (1.7%)	0 (0%)	15.070	**0.008***
	Two-four times per month	13 (81.3%)	27 (45%)	5 (20.8%)		
	Two-four times per week	3 (18.8%)	26 (43.3%)	16 (66.7%)		
	No	0 (0%)	6 (10%)	3 (12.5%)		
Consumption of eggs from poultry	One-two times per day	4 (25%)	17 (28.3%)	9 (37.5%)	7.218	0.282
	Two-four times per month	4 (25%)	17 (28.3%)	2 (8.3%)		
	Two-four times per week	8 (50%)	21 (35%)	9 (37.5%)		
	No	0 (0%)	5 (8.3%)	4 (16.7%)		
Consumption of dark green leafy vegetables	One-two times per day	5 (31.3%)	21 (35%)	9 (37.5%)	7.480	0.236
	Two-four times per month	2 (12.5%)	9 (15%)	2 (8.3%)		
	Two-four times per week	9 (56.3%)	29 (48.3%)	9 (37.5%)		
	No	0 (0%)	1 (1.7%)	4 (16.7%)		
Consumption of vitamin A-rich vegetables like pumpkin, carrots, and sweet potatoes	One-two times per day	4 (25%)	8 (13.3%)	2 (8.3%)	7.634	0.256
	Two-four times per month	7 (43.8%)	21 (35%)	6 (25%)		
	Two-four times per week	4 (25%)	20 (33.3%)	7 (29.2%)		
	No	1 (6.3%)	11 (18.3%)	9 (37.5%)		
Consumption of vitamin A-rich fruits as mango and papaya	One-two times per day	0 (0%)	0 (0%)	3 (12.5%)	7.949	0.199
	Two-four times per month	10 (62.5%)	34 (56.7%)	12 (50%)		
	Two-four times per week	3 (18.8%)	14 (23.3%)	3 (12.5%)		
	No	3 (18.8%)	12 (20%)	6 (25%)		

Table 3 (continued)

Consumption of foods		Premenstrual syndrome				
		Mild ($N = 16$)	Moderate ($N = 60$)	Severe ($N = 24$)	χ^2 value	*p*-value
Consumption of other vegetables and fruits	One-two times per day	7 (43.8%)	22 (36.7%)	9 (37.5%)	6.179	0.377
	Two-four times per month	1 (6.3%)	9 (15%)	5 (20.8%)		
	Two-four times per week	5 (31.3%)	27 (45%)	9 (37.5%)		
	No	3 (18.8%)	2 (3.3%)	1 (4.2%)		
Consumption of oils and fats or butter (oils from nuts, seeds, and all animal fat)	One-two times per day	6 (37.5%)	26 (43.3%)	7 (29.2%)	4.503	0.611
	Two-four times per month	3 (18.8%)	5 (8.3%)	2 (8.3%)		
	Two-four times per week	7 (43.8%)	25 (41.7%)	12 (50%)		
	No	0 (0%)	4 (6.7%)	3 (12.5%)		
Consumption of fried snacks as chips and crisps	One-two times per day	2 (12.5%)	9 (15%)	8 (33.3%)	7.995	0.227
	Two-four times per month	5 (31.3%)	10 (16.7%)	1 (4.2%)		
	Two-four times per week	7 (43.8%)	27 (45%)	10 (41.7%)		
	No	2 (12.5%)	14 (23.3%)	5 (20.8%)		
Consumption of sweets like chocolate, cakes, candies, cookies, sweet biscuits, or ice cream	One-two times per day	3 (18.8%)	19 (31.7%)	6 (25%)	5.358	0.493
	Two-four times per month	5 (31.3%)	12 (20%)	3 (12.5%)		
	Two-four times per week	8 (50%)	22 (36.7%)	13 (54.2%)		
	No	0 (0%)	7 (11.7%)	2 (8.3%)		
Consumption of sweetened fruit juices, chocolate drinks, yogurt drinks, sweet tea, or coffee with sugar	One-two times per day	2 (12.5%)	19 (31.7%)	6 (25%)	5.517	0.479
	Two-four times per month	4 (25%)	6 (10%)	2 (8.3%)		
	Two-four times per week	7 (43.8%)	21 (35%)	12 (50%)		
	No	3 (18.8%)	14 (23.3%)	4 (16.7%)		
Consumption of pickles, olives, and similar	One-two times per day	0 (0%)	6 (10%)	5 (20.8%)	7.391	0.272
	Two-four times per month	5 (31.3%)	13 (21.7%)	3 (12.5%)		
	Two-four times per week	7 (43.8%)	16 (26.7%)	8 (33.3%)		
	No	4 (25%)	25 (41.7%)	8 (33.3%)		
Consumption of seasonings as chilies, spices, and herbs	One-two times per day	0 (0%)	11 (18.3%)	0 (0%)	11.874	0.051
	Two-four times per month	6 (37.5%)	8 (13.3%)	6 (25%)		
	Two-four times per week	6 (37.5%)	22 (36.7%)	12 (50%)		
	No	4 (25%)	19 (31.7%)	6 (25%)		
Consumption of tea or coffee if not sweetened	One-two times per day	5 (31.3%)	16 (26.7%)	1 (4.2%)	9.365	0.126
	Two-four times per month	1 (6.3%)	3 (5%)	3 (12.5%)		
	Two-four times per week	3 (18.8%)	12 (20%)	3 (12.5%)		
	No	7 (43.8%)	29 (48.3%)	17 (70.8%)		

χ^2 Fisher exact test. *p*-value probability value. *Significant

the somatic PMS symptoms which includes bloating, breast tenderness, and headache [19]. Furthermore, Takeda et al. [20] found fish consumption was related to decreased risk of poor performance in athletes with PMS while there is no effect in nonathletes, as it alleviates the symptoms of PMS.

Our findings came in agreement with previous studies that showed that caffeine intake [8, 21], fat intake, starchy foods rich in complex carbohydrates, and fiber consumption were not associated with PMS [22]. Moreover, Bazyar et al. [23] showed that there is no significant association between consumption of oils, sweets, vegetables, and dairy products and PMS.

On the other hand, Farasati et al. [6] concluded that there was a significant relation between PMS and western dietary patterns which include meals high in meat, fat, salt, and sugar while low in vegetables and fruit. They concluded that there was no significant relation between PMS and healthy and traditional dietary patterns. This contradiction can be attributed to the methodological differences, as the current study assessed

every food item separately, while Farasati et al. collectively assessed food categories.

Moreover, [23] reported that PMS females consume higher amounts of fast food and protein from animal sources than females without PMS while consuming a lower amount of high carbohydrate food. This comes in line with our results as we found 97% of PMS subjects consume meat and 92% consume grains, but there was no significant association with PMS severity noted.

In addition, it was showed that caffeine intake was associated with PMS related breast discomfort [24]. This difference with the current study may be because they assessed the relation of caffeine intake with one symptom of PMS (breast discomfort) and not the total PMS symptoms.

Our findings agree with Hashim et al., who concluded the intake of starchy meals which is high in complex carbohydrates did not reveal a significant association with symptoms of PMS [11]. In addition, Houghton and colleagues (2018) revealed no association between fiber intake, carbohydrates, and risk of PMS development [22].

On the other hand, there is a contradiction between previous studies as Mahmoodi et al. reported that PMS and its symptoms (mental, emotional, behavioral, and physical) were considerably decreased when diets rich in carbohydrates were consumed [25], while Hussein et al. showed premenstrual symptoms such as behavioral change, decreased focus, water retention and autonomic response were accompanied with high carbohydrate intakes [26].

These inconsistent results may be due to the differences in social contexts, environments, and different populations. In addition, assessing the association of food consumption with the prevalence and not the severity.

Limitations and strengths

The assessment was not timed to a certain menstrual phase. So, the psychological and physical status of each female might affect the assessment of PMS severity.

Also, the socio-economic level may affect the food consumption, additionally not including a non-PMS group as a control group, while the strength of this study is considered as the first trial to highlight this relationship among the Egyptian females.

Conclusion

This study showed that the severity of PMS is associated with dietary habits as increase consumption of fish is related to decrease the severity of PMS. Despite the statistical nonsignificant correlation, but there was higher consumption of tubers related to increased severity of PMS. So, females with PMS should consume more fish and seafood to reduce the severity of their symptoms. Additionally, reduced consumption of tubers may help in controlling PMS symptoms. Further studies are needed to validate those results and include females for different economic and social backgrounds as Egypt is a very big country with different social contexts.

Abbreviations

PMS	Premenstrual syndrome
PMSS	Premenstrual Syndrome Scale
FFQ	Food Frequency Questionnaire
ACOG	American College of Obstetricians and Gynecologist
PMDD	The premenstrual dysphoric disorder
SPSS	Statistical Package for Social Studies
BMI	Body mass index

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Authors' contributions

NH, contribution to the concept or design of the study. DK, MS, and NH, acquisition, analysis, or interpretation of data for the article. DK and MS drafted the article or revised it critically for important intellectual content. The authors read and approved the final manuscript.

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Availability of data and materials

The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Before beginning the study, ethical approval was given by Ethical Committee of the Faculty of Physical Therapy, Cairo University (No.: P.T.REC/012/003220). After all participants were given full explanation of the study protocol, before taking part in the study, they were given an informed consent form to sign.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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