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The Relationship Between Premenstrual Syndrome and Dietary Habits and Nutrients Intake: Descriptive and Analytical Cross-Sectional Study

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ABSTRACT

Objective: This study aimed to examine the relationship between premenstrual syndrome (PMS) and nutrition in nursing students.

Method: This is a descriptive and analytical cross-sectional study evaluating the relationship between premenstrual syndrome and nutrition in nursing students. In this descriptive and cross-sectional study, relationship between nutrient and PMS was examined by 219 nursing students using personal information form, 24-hour food consumption record and Premenstrual Syndrome Scale (PMSS). The macro and micronutrients consumed by the participants were determined through the analysis of their food consumption records in the Nutrition Information System (BEBIS) program. T test, chi-square test and Pearson correlation analysis test were used in analysis of data.

Results: It was determined that 53.4% of the students had PMS and dietary habits are important in the appearance of PMS symptoms. Breakfast and lunch consumption affected the presence of PMS, but there was no difference between the groups with and without PMS in terms of coffee, salt consumption and skipping meals. The total energy taken daily by the female students with PMS were higher, percentage of energy from protein was lower and difference was statistically significant ($p<.05$). There were significant correlations between PMSS score and daily energy intake, percentage of energy from protein, vitamin E, vitamin B6, magnesium, iron and zinc.

Conclusion: Results of this study was indicated that dietary habits, macro and micronutrient intake are important in increasing premenstrual symptom severity. In female students with PMS, it is recommended to raise awareness about the importance of nutrition in reducing or eliminating symptoms, inform experts about nutrition, and perform further research on this issue.

Keywords: Nursing; nutrition; premenstrual syndrome; university student.

1. INTRODUCTION

Premenstrual Syndrome (PMS) is a situation that causes physical, emotional and behavioral disorders in women. This happens in the late luteal phase of the menstrual cycle (1). Psychological, behavioral and physical symptoms of PMS have been reported (2). Physical symptoms include pain, swelling, breast tenderness, appetite change, nausea-vomiting, fatigue, and insomnia; behavioral symptoms include dizziness, fatigue, decrease in daily activities and reluctance; while psychological symptoms can be listed as emotional fluctuations, crying crises, anxiety and irritability (3). These symptoms negatively affect social life and reduce quality of life (4). It is also reported that nurses are the most affected by PMS among different occupational groups (5). In studies conducted with university students, the prevalence of PMS was between 35.3% and 58.1% (4, 6, 7).

Although the etiology of premenstrual syndrome is not known exactly, it has been stated in many studies that changes in estrogen and progesterone levels trigger these symptoms (8). In addition to hormones, neural, genetic, psychosocial factors and nutritional habits are thought to be effective in the formation of PMS (9). Studies examining the relationship between PMS and nutritional status show that high energy and simple carbohydrate consumption are positively associated with PMS (5). Protein intake was not found to be associated with PMS (10). It was reported that the duration of symptoms is shortened in individuals with PMS fed a low-fat diet (11). Caffeine and alcohol consumption were also reported to be associated with PMS, and a decrease in PMS severity was observed by reducing the consumption of these foods (12). Studies show that there are positive correlation between iron, zinc, calcium, magnesium, potassium, vitamin A, thiamine (B_1), riboflavin (B_2), pyridoxine (B_6), vitamin D deficiencies and PMS (13,14). In a study by Rad et al., it was a significant relationship reported between body mass index (BMI) and PMS, with BMI having a direct or indirect effect on hormone balance and therefore a significant relationship

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with PMS (14). In other studies, it was stated that PMS is more common in obese women than in non-obese women (6, 14, 15).

Although the relation between PMS and different dietary components has been studied, the number of studies examining the role of nutrition as a whole in PMS among university students is limited. In addition, it is reported that nurses in different occupational groups are more affected by PMS (5). For this reason, this study was planned to determine the relationship between nutrition and premenstrual syndrome in nursing students.

2. METHODS

Institutional permit was obtained to conduct the research at the Ordu University where the research was conducted (March 7, 2019.477.38962-663.08/339048). All procedures involving research study participants were approved by the Ordu University Clinical Research Ethics Committee (April 25, 2019-2019/64). Written informed consent was obtained from participants. In this study, the principles of the Declaration of Helsinki were followed.

The population of this descriptive and analytical study consists of female students studying in the nursing department of a university. At the time of the research, there were 261 female students in the nursing department. It was planned to reach the entire universe without selecting a sample. However, 16 students did not meet the inclusion criteria and 26 students refused to participate in the study. The sample of the study consisted of 219 female students who agreed to participate in the research and met the inclusion criteria. The rate of participation was 84%. The criteria for inclusion in the study were volunteering to participate in the study, having a regular menstrual cycle, not using oral contraceptives, and being 18 years or older. Exclusion criteria were dieting in the last 3 months, having a chronic illness, using oral contraceptives, being pregnant or lactating, and consuming any medication or nutritional supplement. Those who scored 111 and above on the PMSS were taken to the pms (+) group, and those who scored 110 and below were taken to the pms (-) group.

The data of the study were collected between June 3 and June 10, 2019. A questionnaire form prepared by the researcher and premenstrual syndrome scale were used while collecting the research data (16). The questionnaire and scale were filled in by the participants themselves, outside of the class hours, under the supervision of the researchers.

Demographic information, physical activity level, smoking status and nutritional habits were questioned in the questionnaire form applied to the participants. Later, the PMS scale was applied. Those who smoked at least 1 cigarette were defined as “smokers”. Those who exercised for 30 minutes at least 3 times a week were defined as “exercising regularly.”

Body weight, height, waist and hip circumference measurements were taken. The weight (kg) was measured with a portable digital scale without shoes and with light clothing, and height was measured (cm) with the help of a wall-hung tape measure. The feet were side by side and the head was in the frankfort plane while measuring the height. While measuring waist circumference (cm), the midpoint between the lowest rib and the crista iliaca was determined; this circumference was measured with an inelastic tape measure. In the measurement of hip circumference (cm), the participant was asked to stand sideways and the measurement was taken from the point where the hip circumference is highest with the help of an inelastic tape measure (17). BMI was calculated by dividing body weight (kg) by the square of height (m^2). BMI classification: <18.5 kg/m^2 underweight, 18.5–24.9 kg/m^2 normal, 25.0–29.9 kg/m^2 overweight, and >30.0 kg/m^2 obesity (18).

The Premenstrual Syndrome Scale (PMSS) was developed by Gençdoğan. DSM-III and DSM-IVR criteria were used in the development of the scale. This scale consists of 44 items (16). PMSS is a Likert type scale and the items of the scale are scored between 1 and 5. The lowest 44, the highest 220 points can be obtained from PMSS with 9 subscales. The subscales of PMSS are depressive feelings, anxiety, fatigue, irritability, depressive thoughts, pain, changes in appetite, changes in sleeping habits and swelling. The higher the score obtained from the scale indicates that the severity of the premenstrual syndrome is intense. If the total score from the PMS scale is 111 and above, it is considered as PMS. In addition, if the subscale scores are more than half of the maximum score that can be obtained from that subscale, the existence of that subscale is accepted (16). Gençdoğan found Cronbach alpha reliability coefficient was between 0.75 for total PMSS and 0.75-0.91 for subscales (16), in this study was found between 0.96 for PMSS and 0.61-0.91 for its subscales. The PMSS asks for last month.

The records obtained from the food consumed in the last 24 hours of the participants through the questionnaire were evaluated with the Nutrition Information System 8.1 (BEBIS 8.1) program, and the amount of macro and micronutrients consumed was determined. The analysis of the data was done on the computer and using a statistical package program (statistical package program for social sciences-SPSS 20.0). In the analysis, descriptive statistical methods, t test, chi-square test and Pearson correlation analysis test were used. Significance level was accepted as $p < .05$.

Normality test was used to determine the normality distribution of the data. The mean ± standard deviation was used for normally distributed data, and median (min-max) values were used for non-normally distributed data. Student t test was used for normally distributed quantitative data in comparison of two independent groups. The Mann Whitney U test was used to compare two independent groups that were not normally distributed. Pearson chi-square test was used to compare qualitative data. Pearson correlation analysis was used to determine the relationship between normally distributed quantitative data. Spearman correlation analysis was used to evaluate the relationship between non-normally distributed quantitative data. The level of significance was accepted as $p<.05$ in all statistical analyses.

3. RESULTS

The data on the general characteristics of the participants are shown in Table 1. Age, anthropometric measurements, smoking status, exercise status, place of residence, daily coffee consumption, salt consumption, meal consumption, and meal skipping status of the groups were compared. It was found that breakfast consumption was higher in the group with PMS. In addition, it was determined that the reason for skipping meals in students with PMS was mostly the absence of ready meals (Table 1).

Table 1. *Distribution of individuals according to their general characteristics*

FEATURES	PMS (+) (n=117)		PMS (-) (n=102)		Total (n=219)		
	Mean ± SD		Mean ± SD		Mean ± SD		p[a]
Age (years)	20.26 ± 1.41		20.42 ± 1.56		20.33 ± 1.48		.412[a]
Body weight (kg)	58.4 ± 10.03		56.96 ± 9.18		57.73 ± 9.65		.271[a]
Height (m)	1.63 ± 0.06		1.62 ± 0.05		1.63 ± 0.06		.092[a]
BMI (kg/m^2)	21.89 ± 3.63		21.68 ± 3.36		21.79 ± 3.5		.654[a]
Waist circumference (cm)	73.01 ± 7.9		72.99 ± 8.47		73.0 ± 8.15		.987[a]
Hip circumference (cm)	98.3 ± 7.56		97.16 ± 6.93		97.77 ± 7.28		.248[a]
Waist:hip ratio	0.73 ± 0.43		0.75 ± 0.49		0.74 ± 0.47		.055[a]
	n	%	n	%	n	%	p[b]
Smokers	11	9.4	6	5.9	17	7,8	.332[b]
Exercising regularly	50	42.7	46	45.1	96	43,8	.725[b]
Place of residence							
Dormitory	91	77.8	73	71.6	164	74,9	
Family home	15	12.8	17	16.7	32	14,6	.656[b]
Home alone	2	1.7	1	0.9	3	1,4	
With friends at home	9	7.7	11	10.8	20	9,1	
Daily coffee consumption more than 1 cup	22	18.8	15	14.7	37	16.9	.421[b]
Used salt without tasting the food	25	21.4	16	15.7	41	18.7	.283[b]
Meal consumption status							
Breakfast	111	94.9	87	85.3	198	90.4	**.017**[b*]
Lunch	79	67.5	82	80.4	161	73.5	.922[b]
Dinner	117	100	102	100	219	100	.922[b]
Snack	77	65.8	67	65.7	144	65.7	.984[b]
Skipped meal status							
Always	56	47.9	41	40.1	97	44.3	.456[b]
Sometimes	58	49.6	53	51.9	111	50.7	
Reasons for skiped meal*							
Lack of time	44	37.6	47	46.1	91	41.6	.204[b]
Lack of appetite	45	38.5	39	38.2	84	38.4	.973[b]
No ready meals	32	27.4	21	20.5	53	24.2	**.009**[b*]
Not a habit	24	20.5	17	16.6	41	18.7	.312[b]
To lose weight	16	13.7	9	8.8	25	11.4	.361[b]

PMS, premenstrual syndrome; BMI, Body Mass Index; cm, centimeter; SD, standard deviation. a Student t-test, b Chisquare test

The average scores obtained from PMSS and its subscales, the ratio and number of female students who scored above 50% according to the highest possible score are given in Table 2. The PMSS total score averages for the university students were 117.18±33.05. PMSS subscale mean scores of the participants were; 19.8±6.54 for depressive feelings, 18.09±5.62 for fatigue, 16.34±6.84 for depressive thoughts, 14.85±5.17 for irritability, 14.42±6.08 for anxiety, 9.24±3.63 for swelling, 8.45±3.23 for pain, 8.37±2.93 for changes in appetite and 7.61±3.17 for changes in sleeping habits (Table 2). The rate of PMS among female students was found to be 53.4%; according to PMSS subscales, 67.6% of the students had swelling, 66.7% had fatigue, 64.8% had depressive feelings, 63.0% had irritability, 61.2% had pain, 59.8% had changes in appetite, 47.5% had changes in sleeping habits, 40.2% had depressive thoughts and 28.8% had anxiety (Table 2).

Table 2. *PMSS subscales scores and total scores of all students (n=219)*

PMSS subscales	Cronbach Alpha	PMSS Min-Max Values	Marked Min-Max Values	Mean	SD	Received a score of over 50% from subscales and total PMSS n (%)
Depressive feelings	0.91	7-35	7 – 35	19.8	6.54	142 (64.8)
Anxiety	0.86	7-35	7 – 35	14.42	6.08	63 (28.8)
Fatigue	0.89	6-30	6 – 30	18.09	5.62	146 (66.7)
Irritability	0.91	5-25	5 – 25	14.85	5.17	138 (63.0)
Depressive thoughts	0.91	7-35	7 – 35	16.34	6.84	88 (40.2)
Pain	0.81	3-15	3 – 15	8.45	3.23	134 (61.2)
Changes in appetite	0.61	3-15	3 – 15	8.37	2.93	131 (59.8)
Changes in sleeping habits	0.81	3-15	3 – 15	7.61	3.17	104 (47.5)
Swelling	0.86	3-15	3 – 15	9.24	3.63	148 (67.6)
PMSS Total	0.96	44-220	51 – 220	117.18	33.05	117 (53.4)

PMSS, premenstraul syndrome scale; SD, standard deviation

The daily intake of energy and nutrients according to PMS groups is presented in Table 3. In the group of female students with PMS, daily total energy intake was higher ($p<.001$) and the percentage of energy from protein was lower ($p<.05$). Other nutrient intakes of the groups were similar ($p>.05$) (Table 3).

The correlations between PMS total score and daily diet energy, macro and micronutrients are shown in Table 4. Accordingly, PMS total score and daily energy intake (r=0.30) had a very weak positive correlation. PMS total score and daily intake of vitamin E (r=0.18), vitamin B_6 (r=0.19), magnesium (r=0.17), iron (r=0.14) and zinc (r=0.14) had a weak positive correlation. There was a very weak negative correlation between the PMS total score and the percentage of energy coming from protein (r=0.15) (Table 4).

Table 3. *Comparison of energy, macro and micronutrients intake according to the presence of PMS among students*

	PMS (+) (n=117)	PMS (-) (n=102)	Total (n=219)	
Energy and Nutrients	**Mean±SD Med (min-max)**	**Mean±SD Med (min-max)**	**Mean±SD Med (min-max)**	**p**
Energy (kcal)	1660.85 ± 1637.52	1446.16 ± 362.72	1560.4 ± 384.86	**< .001**[a*]
Protein (%) [†]	14 (8-24)	15 (8-24)	14 (8-24)	**.012**[b*]
Fat (%) [†]	37.5 (16-63)	38 (11-54)	37.5 (11-63)	.748[b]
Carbohydrate (%) [†]	49 (28-62)	46 (27-67)	48 (27-67)	.185[b]
Fiber (gr)	17.18 (3.23-34.31)	17.26 (6.91-48.8)	17.24 (3.23 – 48.8)	.296[b]
Vitamin E (mg)	11.66 (1.64-36.46)	10.34 (2.05-29.02)	10.94 (1.64 – 36.46)	.296[b]
Vitamin B_1 (mg)	0.77 (0.2-1.43)	0.8 (0.25-2.95)	0.78 (0.2 – 2.95)	.157[b]
Vitamin B_2 (mg)	0.99 (0.26-3.17)	0.98 (0.33-2.24)	0.98 (0.26 – 3.17)	.249[b]
Vitamin B_6 (mg)	1.12 (0.24-2.52)	1.19 (0.34-2.65)	1.15 (0.24 – 2.65)	.252[b]
Calcium (mg)	643.45 ± 245.32	716.81 ± 336.18	677.77 ± 292.99	.071[a]
Magnesium (mg)	242.1 (48.16-410.33)	241.5 (129.4-700.49)	241.5 (48.16 – 700.49)	.498[b]
İron (mg)	9.19 (2.38-19.25)	9.54 (3.21-28.16)	9.35 (2.38 – 28.16)	.547[b]
Zinc (mg)	7.66 (3.13-20.1)	8.64 (3.18-21.49)	8.15 (3.13 – 21.49)	.268[b]

PMS, premenstrual syndrome; SD, Standard deviation

[†] Its contribution to total energy is incicated in %

[a] Independent two-sample t-test, data is normally distributed

[b] Mann Whitney U test, data is not normally distributed

Table 4. *Correlations between PMSS and energy, macro and micronutrient intake scores of students*

Energy and Nutrients	PMSS r	p*
Energy (kcal)	0.30	**<.001***
Water (ml)	0.13	.059
Protein (%)†	-0.15	**.022***
Fat (%)†	-0.11	.116
Carbohydrate (%)†	-0.03	.605
Fiber (gr)	-0.08	.252
Vitamin A (mg)	0.05	.457
Carotene (mg)	-0.02	.762
Vitamin E (mg)	0.18	**.009***
Vitamin B_1 (mg)	-0.09	.165
Vitamin B_2 (mg)	0.11	.114
Vitamin B_6 (mg)	-0.19	**.004***
Folate (mg)	0.09	.179
Sodium (mg)	-0.07	.309
Calsium (mg)	-0.06	.355
Magnesium (mg)	0.17	**.014***
Phosphorus (mg)	0.10	.146
Iron (mg)	-0.14	**.042***
Zinc (mg)	-0.14	**.042***

PMSS, premenstrual syndrome scale

[†] Its contribution to total energy is incicated in %

4. DISCUSSION

PMS, which causes increases in health expenditures, deterioration in social relations, decreases in quality of life and loss of labor in women of reproductive age, is an important public health problem (19). Some studies revealed the relationship between PMS and nutrition (20, 21), but there are also studies that could not find a relationship between nutrition and PMS (10). In this study, the relationship between the frequency of PMS, which affects the majority of women, among nursing students with high health awareness and the relationship between PMS and nutrition was investigated.

In a study by Yoshimi et al., it was found that individuals with PMS skip breakfast more than individuals without PMS (22). In this study, it was found that individuals with PMS eat breakfast more often. However, when the food consumption records of these individuals were examined, they had breakfast with packaged foods such as pastry, bagel, biscuits, instant cake and instant fruit juice (data not shown). It is thought that this result was obtained in the group with PMS as the consumption of these foods that are not included in healthy diets increases the risk of PMS. The dinner and snack consumptions of the groups were similar.

Foods high in caffeine are known to increase PMS symptoms (23). In a study examining the relationship of sociodemographic, diet, and lifestyle factors with PMS among undergraduate medical students, it was stated that caffeine consumption was positively associated with moderate and severe PMS (7, 24). There are also studies stating that caffeine intake is not associated with PMS. In the study of Hashim et al., it was found that there was no relationship between PMS symptoms and caffeine consumption (7). In the study of Desrosiers et al. in young adult women, no significant difference was found between the daily caffeine consumption of women with and without PMS (24). In this study, although it was determined in this study that coffee, a beverage with high caffeine content, was consumed more by students with PMS, this difference was not statistically significant. There is no definite information about the

relationship between caffeine and PMS in the literature. In this study, no relationship was found between PMS and caffeine.

It is reported that excessive salty food consumption is a strong risk factor for PMS (7). Consumption of unprocessed and fresh foods is recommended for the prevention and treatment of PMS. It is emphasized that a diet high in refined carbohydrates, fat and salt increases PMS symptoms (25). In this study, the students' habits of adding salt without tasting the food were examined, and and groups were similar. The difference between the groups may be due to the inability to clearly determine the amount of salt consumed per day. Evaluation of participants' daily salt consumption would have been a better measurement method.

In this study, the total energy intake of the groups and the percentage of energy from carbohydrates are low, the percentage of energy from protein is normal, and the percentage of energy from fat is high (26). However, there is only a difference between energy and protein intakes of students with PMS compared to students in the healthy control group. The total energy intake of students with PMS is higher, and the percentage of energy from protein is lower. It is stated that consumption of foods with high energy, carbohydrate and fat content is a strong risk factor for PMS (7). Looking at the studies conducted, there was a positive relationship between high total energy intake and PMS (6, 7, 27). It was reported that food consumption with high sugar content is significantly higher among those with PMS (27). In a study conducted with university students, high total energy intake was reported to be a strong risk factor for PMS (7). Similar to the literature, in this study, the total energy intake of individuals with PMS was found to be significantly higher than those without PMS. In addition, a positive significant relationship was found between the total energy intake with diet and PMSS total score. Protein intake was not associated with PMS (10). The difference observed between the groups for protein intake in this study is thought to be due to the fact that the 24-hour food consumption record shows only one daily food intake.

Although it has been reported that the amount of dietary fiber should be increased to reduce the symptoms of premenstrual syndrome, studies supporting this information are limited. The role of fiber in the treatment of PMS is unclear. In a study examining the relationship between fiber intake and PMS risk, it was revealed that there was no relationship between fiber consumption and PMS (9). A similar study found no association of different types of carbohydrates and total dietary fiber with PMS (28). However, there are also studies showing a significant relationship between fiber consumption and PMS (29, 30). Since only a 24-hour food consumption record was taken in this study, no clear information could be obtained about the fiber intake of the participants, and therefore, a relationship between the amount of dietary fiber and PMS may not have been found. Studies examining fiber consumption in individuals with PMS in more detail may reveal this relationship more clearly.

It is stated that another reason for the emergence of PMS symptoms is vitamin (especially vitamin B1, B2, B6 and E) deficiencies (31). It is estimated that the deficiency or insufficiency of B group vitamins (vitamins B1, B2, B6) required for the synthesis of neurotransmitters, which play an important role in the pathogenesis of premenstrual syndrome, cause more severe PMS symptoms (31). It is reported that the combined use of magnesium and vitamin B6 reduces premenstrual anxiety (32). However, the relationship between PMS and vitamins is not certain. It was determined that the level of vitamin E in the body was associated only with hand / foot swelling, and no relationship was found between other symptoms of PMS (33). However, these studies do not measure dietary vitamin levels. In the studies, either the levels of vitamins in the blood or the use of supplements were evaluated. In this study, the dietary vitamin levels of the groups were found to be similar. However, there is a weak positive relationship between PMS and dietary vitamin E, and a negative relationship between vitamin B6. Since this investigation is one of the rare nutrition studies that examines the relationship between dietary vitamin levels and PMS, it makes a significant contribution to the literature.

It has been reported that the lack of dietary intake of minerals such as calcium, magnesium, iron and zinc causes premenstrual syndrome (34). In a study by Fujiana et al., individuals whose diets were enriched with calcium, magnesium and iron had improved premenstrual symptoms (35). However, there are studies that claim the opposite of this situation (36, 37). In a study comparing trace elements in the serum of individuals with and without premenstrual syndrome, serum calcium, magnesium, iron and zinc levels of the groups were found to be similar (36). Based on the results of a systematic review and meta-analysis, no significant relationship was found between serum magnesium levels and PMS (37). In this study, as with vitamins, The dietary mineral levels of the groups were similar. However, there is a weak negative correlation between PMS and dietary magnesium, iron and zinc. Since this study is one of the rare nutrition investigations that examines the relationship with PMS by determining the dietary mineral levels of individuals, it makes a significant contribution to the literature.

5. CONCLUSION

In coclusion, it was determined that more than half of the university students had PMS. There was no difference in anthropometric measurements between female students with and without PMS. Breakfast consumption affected the presence of PMS, but there was no difference between the groups with and without PMS in terms of coffee, salt consumption and skipping meals. PMS is affected by energy and nutrient intake. In addition, nutrition is an effective factor in the occurrence of PMS. In female students with PMS, it is recommended to raise awareness about the importance of nutrition in reducing or eliminating symptoms, inform

experts about nutrition, and perform further research on this issue.

This study has some limitations. The first of these is that data on both premenstrual symptoms and nutritional status are based on students' self-reports. No examination or laboratory tests were performed to evaluate premenstrual symptoms and nutritional status. Another limitation is that a 24-hour food consumption record is taken from individuals. Additionally, only students from the nursing department of one university were included in the research. As a result, the data in this study can only be generalized to this sample.

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