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The Relationship Between Macro-Micro Nutrients and Physical Activity and Premenstrual Syndrome

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ABSTRACT

The aim of this study is to examine the relationship between macro and micronutrient intakes and physical activity levels of women between the ages of 18-45 and symptoms of Premenstrual Syndrome. The study was conducted on a total of 404 women who were admitted to The Center for Nutrition and Diet Consultancy. Participants were asked questions to assess their socio-demographic characteristics, nutritional status, and a survey including the "Premenstrual Syndrome Scale (PMSS)", "International Physical Activity Questionnaire (IPAQ)", and "3-Day Food Consumption Registration Chart" was administered." Total score of Premenstrual Syndrome Scale the averages: 133.11±38.15, total score of International Physical Activity Questionnaire the averages: 1830.25±1347.62. As the total score of Premenstrual Syndrome Scale increased, energy and macronutrients; "Protein", "Fat", "Saturated Fat" ,"Monounsaturated Fat", "Polyunsaturated Fat", "Omega-3", "Omega-6" and micronutrients; "Vitamin E", "Thiamine", "Riboflavin", "Vitamin B_5", "Vitamin B_6", "Biotin", "Total Folate", "Potassium", "Calcium", "Magnesium", "Phosphorus", "Zinc", "Copper" values decreased ($p < 0.05$). As the total scores of the International Physical Activity Questionnaire increased, so did the total scores of the Premenstrual Syndrome Scale's 'Depressive Affect', 'Fatigue', 'Irritability', 'Depressive Thoughts', 'Pain', 'Sleep Changes', and 'Abdominal Bloating' symptoms of PMS ($p<0.05$). As the Premenstrual Syndrome Scale score increases, macro- and micronutrient intake decreases, and as the International Physical Activity Questionnaire total scores increase, the Premenstrual Syndrome Scale total scores also increase. While the PMSS affects macro- and micronutrient intakes, physical activity influences PMSS scores. The results of this study suggest that symptom-dependent nutritional problems might be reduced by promoting healthy nutrition.

Makro-Mikro Besin Ögeleri ile Fiziksel Aktivite Düzeylerinin Premenstrüel Sendrom ile İlişkisi

Makale Bilgisi

Makale Geçmişi

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Anahtar Kelimeler
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Premenstrüel Sendrom.

ÖZET

18-45 Yaş arası kadınların makro ve mikro besin ögeleri alımları ile fiziksel aktivite düzeylerinin premenstruel sendrom semptomları ile ilişkisinin incelenmesidir. Beslenme ve Diyet Danışmanlık Merkezine başvuran 404 kadına sosyodemografik özelliklerini, "Premenstruel Sendrom Ölçeği (PMSÖ)", "Uluslararası Fiziksel Aktivite Anketi (IPAQ)", "3 Günlük Besin Tüketim Kayıt Formu" içeren anket uygulanmıştır. Katılımcıların; Premenstruel Sendrom Ölçeği toplam puan ortalamaları: 133.11±38.15, Uluslararası Fiziksel Aktivite Anketi toplam puanı ortalamaları: 1830.25±1347.62, Premenstruel Sendrom Ölçeği toplam puan arttıkça, "Protein", "Yağ", "Doymuş Yağ","Tekli Doymamış Yağ", "Çoklu Doymamış Yağ", "Omega-3", "Omega-6", "E Vitamini", "Tiamin", "Riboflavin", "B_5 Vitamini", "B_6 Vitamini", "Biotin", "Toplam Folat", "Potasyum", "Kalsiyum", " Magnezyum", "Fosfor", "Çinko", "Bakır" değerleri azalmıştır ($p<0.05$). Uluslararası Fiziksel Aktivite Anketi toplam puanları arttıkça, Premenstruel Sendrom Ölçeği toplam puanları artmıştır ($p<0.05$). Premenstrüel Sendrom Ölçeği puanı arttıkça makro ve mikro besin alımı azalmakta ve Uluslararası Fiziksel Aktivite Anketi toplam puanları arttıkça Premenstrüel Sendrom Ölçeği toplam puanları da artmaktadır. PMSS makro ve mikro besin alımlarını etkilerken, fiziksel aktivite de PMSS puanlarını etkilemektedir. Bu çalışmanın sonuçları, sağlıklı beslenmenin teşvik edilmesiyle semptomlara bağlı beslenme sorunlarının azaltılabileceğini göstermektedir.

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INTRODUCTION

Premenstrual Syndrome (PMS) may include clinically important somatic and psychological symptoms that can develop in the luteal phase of the menstrual cycle and lead to impairment in functional capacity. These symptoms terminate within a few days after the onset of menstruation (Gudipally & Sharma, 2023). PMS is frequently seen in many women of reproductive age, The American College of Obstetrics and Gynecology (ACOG) defines PMS as a complex set of physical and emotional symptoms that recur cyclically one to two weeks before menstruation and disappear with the menstrual cycle (Jaber et al., 2022). There is a wide spectrum of behavioral, mental and physical symptoms such as head and back pain, breast tenderness, depression, fatigue, poor sleep, anxiety and food cravings that could impair the daily comfort of women (Esmaeilpour et al., 2019; Labots-Vogelesang et al., 2021). Symptoms are both physical and psychological in nature; PMS is fundamentally a neuroendocrine disorder with biological, social, and psychological parameters (Shah & Christian, 2020). The exact etiology of PMS is not fully understood; however, hypotheses like hormonal changes, hypoglycemia and nutritional insufficiencies are considered (Esmaeilpour et al., 2019). Treatment options are varied and non-pharmacological treatment includes lifestyle changes and psychological therapies, while pharmacological treatment is also available for both somatic and psychological symptoms. Lifestyle changes can improve some symptoms for affected women, but are often inadequate as a treatment for patients with severe symptoms; patients should be encouraged to try lifestyle changes while on pharmacologic treatment (Appleton, 2018). Many treatment modalities like pharmacotherapy, lifestyle changes, diet regulations and exercise have been evaluated (Yilmaz-Akyuz & Aydin-Kartal, 2019). Since PMS symptoms or severity of symptoms are influenced by food intake, PMS can also have an impact on symptoms by affecting food preferences (Altun, 2021). Fruit intake has been associated with a decreased risk of reporting behavioral PMS symptoms, while consumption of high-calorie/fatty/sugary food is a high risk factor for PMS (Hashim et al., 2019). Increased intake of whole grains and vitamins helps to maintain a healthy weight. Leptin, which is synthesized by the adipose tissues, plays a role in the regulation of gonadotropins. Overweight/obese women may have a higher level of leptin because of the greater number of fat cells, which could explain the role of adiposity in PMS (Thakur et al., 2022). In terms of diet, increasing complex carbohydrates, and decreasing alcohol, caffeine and sugar intake might decrease PMS symptoms (Appleton, 2018). There have been some studies showing that regular exercise is also effective in alleviating PMS symptoms (Çitil & Kaya, 2021; Yesildere Saglam & Orsal, 2020).

This study has utmost importance for women to get through this process in a better way and for the improvement of female health by demonstrating the modes of dietary patterns and levels of physical activity that may influence symptoms before menstrual cycles. In addition, it might support further studies on this subject in the literature. The research was planned as a cross-sectional study. It is in descriptive and relational survey model.

Hypotheses:

- H0: There is no relationship between premenstrual syndrome and nutrition.
- H1: There is a relationship between premenstrual syndrome and nutrition.
- H0: There is no relationship between premenstrual syndrome and physical activity.
- H1: There is a relationship between premenstrual syndrome and physical activity.
- H0: There is no relationship between macro and micronutrients and premenstrual syndrome.
- H1: There is a relationship between macro and micronutrients and premenstrual syndrome.

METHODS

Research Design

The aim of this study is to examine the relationship between macro and micronutrient intakes and physical activity levels among women between the ages of 18-45 and symptoms of Premenstrual Syndrome. The research was planned as a cross-sectional study. Utilizing a descriptive and relational survey model. After the G-power analysis, as a general recommendation, Cohen suggested that the effect size can be defined as weak if the d value is less than 0.2, moderate if it is 0.5 and strong if it is greater than 0.8. However, it should be noted that there may be special cases where even a d value of 0.2 can be considered to have a strong effect (Cohen, 1988; Yıldırım & Yıldırım, 2011).

Cohen's calculation of effect size (r);

$$d = \frac{M_1 - M_2}{\sqrt{SD_1^2 - SD_2^2}}$$

$$r = \frac{d}{\sqrt{((D^2) + 4)}}$$

is calculated as follows. For the study, Cohen's effect size was calculated as r=0.395. The R v3.6.1 program was used for Power analysis in the study, alpha error set at 5%, beta error set at 10%, and it was calculated that a minimum of 136 samples would be sufficient, considering the anticipated differences between the variables as a result of the study process (Champely, 2020; Süt, 2011).

Participants were asked about their socio-demographic characteristics and nutritional status, and a survey including "Premenstrual Syndrome Scale (PMSS)", "International Physical Activity Questionnaire (IPAQ)", "3 Day Food Consumption Registration Chart" was administered. Data were collected through face-to-face interviews by examiners.

Inclusion Criteria: Participants needed to be women aged 18-45, have applied to the DİYETSENİNLE Clinic, volunteering to participate in the study, have regular menstruation, no congenital or acquired half palate, tongue or dental problems that prevent food intake, no physical or mental problems, not having any disease diagnosed by a psychiatrist, not taking any medication prescribed by a psychiatrist, not being pregnant, puerperal or lactating.

Exclusion Criteria: Excluded were individuals younger than 18 or older than 45 years, males, those who had not applied to the clinic, and non-volunteers.

Participants

The study was conducted between January 1 and May 1, involving 404 women between the ages of 18 and 45 who were admitted to "DİYETSENİNLE The Center for Nutrition and Diet Consultancy" in Balıkesir province and voluntarily to participated in the study in order to evaluate it with a larger population.

Research Instruments and Processes

Premenstrual Syndrome Scale (PMSS)

Developed by Gençdoğan, this scale measures the severity of premenstrual symptoms (Gençdoğan, 2006). It consists of 44 items of 5-point Likert (Never, Rarely, Occasionally, Frequently, Very Frequently) type that should be answered 1 week before the onset of menstruation. Cronbach alpha coefficient value of the scale was calculated as 0.96. In the Scale scoring system, the "Never" item is scored with 1 and the "Very Frequently" item with 5 points. Scale score has a range of 44 to 220. Higher

scores indicate the increased PMS symptoms. When the total score is higher than half of the highest score, this indicates the existence of PMS (Gençdoğan, 2006).

International Physical Activity Questionnaire (IPAQ)

The International Physical Activity Questionnaire-IPAQ developed by Öztürk (2005) aims to evaluate the level of physical activity and sedentary lifestyle of individuals. It has short and long forms. 7-item short form provides data about intense, moderate physical activities and time for walking. The total score is calculated with duration and frequency according to the category of exercise intensity (Öztürk, 2005).

3 Day Food Consumption Registration Chart

All food and beverages consumed by study participants were recorded for 3 days, 2 days on weekdays and 1 day on weekends; type, amount and content of food were recorded by examiners through face to face interviews. The accuracy of responses was evaluated by food replicas. Data from the food consumption registration chart were analyzed with 'The Computer Assisted Nutrition Program, Nutrition Information System, BeBiS 9" program specific to Turkey. BeBiS is a computer software that includes analysis of more than 130 nutritional elements and that provides analyses of each nutrient by dividing them into their individual units (BeBiS, 2023).

Data Analysis

Descriptive statistics for categorical variables (demographic features) were presented as frequency and percentage. "The Shapiro-Wilk Test" was used to control the conformity of numerical variables to a normal distribution. Descriptive statistics for numerical variables were presented as means ± standard deviation ($\bar{X}\pm SD$) for normally distributed and median (min-max) for non-normally distributed data, respectively. "The Independent Samples T-Test" was used to compare two normally distributed independent groups, and the "The One Way ANOVA Test" for more than two groups. Likewise, "The Mann-Whitney U Test" was used to compare two non-normally distributed independent groups, and "The Kruskal-Wallis H Test" for more than two groups. The results of multiple comparison tests were submitted as letter notation in addition to means and medians. Relations between scales were reviewed by "Pearson Product-Moments Correlation Coefficient" for normally distributed data, and by "Spearman's Rank Correlation Coefficient" for non-normally distributed data. The criteria of "<0.2 indicates a very weak correlation", "0.2-0.4 indicates a weak correlation", "0.4-0.6 indicates a moderate correlation", "0.6-0.8 indicates a high correlation", and ">0.8 indicates a very high correlation" were used to interpret correlation coefficients (Choi et al., 2010). "Regression Analysis" was used to test the relationship between variables. The level of statistical significance was set as "$p<0.05$, $p<0.01$, $p<0.001$" for all calculations and interpretations, and hypotheses were set two ways. Statistical analysis of data was performed with The SPSS v26 (IBM Inc., Chicago, IL, USA) program.

RESULTS

The average age of participants was 30.50±7.02 years, the average height was 163.79±5.48 cm, the average weight was 70.04±13.15 kg, the average waist circumference was 85.01±13.83 cm, the average hip circumference was 104.84±10.59 cm, the average waist-to-hip ratio was 0.81±0.09, the average BMI was 26.12±4.83 kg/m^2. The average "IPAQ Total" score was 1830.25±1347.62, the average PMSS "Depressive Effect" sub-factor score was 22.41±7.45, the average "Anxiety" sub-factor score was 16.05±6.93, the average "Fatigue" sub-factor score was 20.54±6.23, the average "Irritability" sub-factor score was 16.41±5.47, the average "Depressive Thoughts" sub-factor score was 18.39±7.74, the average "Pain" sub-factor score was 9.49±3.30, the average "Appetite Changes" sub-factor score was 8.75±3.37, the average "Sleep Changes" sub-factor score was 10.72±3.48, the average "Abdominal

Bloating" sub-factor score was 10.36±3.61 and the average "PMSS Total" score was 133.11±38.15. All results are presented in Table 1.

Table 1

Summary Statistics of Participants' Age, Anthopometric Measurement Values, IPAQ Total Scores, PMSS Sub-factor Scores and Total Scores

Summary Statistics	$\bar{X} \pm SD$
Age (year)	30.50±7.02
Height(cm)	163.79±5.48
Weight (kg)	70.04±13.15
Waist circumference (cm)	85.01±13.83
Hip circumference (cm)	104.84±10.59
Waist-to-hip ratio	0.81±0.09
BMI (kg/m^2)	26.12±4.83
IPAQ Total	1830.25±1347.62
Depressive Effect	22.41±7.45
Anxiety	16.05±6.93
Fatigue	20.54±6.23
Irritability	16.41±5.47
Depressive Thoughts	18.39±7.74
Pain	9.49±3.30
Appetite Changes	8.75±3.37
Sleep Changes	10.72±3.48
Abdominal Bloating	10.36±3.61
PMSS Total	133.11±38.15

BMI: Body Mass Index, IPAQ: International Physical Activity Questionnaire, PMSS: Premenstrual Syndrome Scale

$\bar{X}$: The average; SD: Standard Deviation

It was demonstrated that participants "energy (kcal)" values decreased by 14.4% (s=-0.144; p<0.01), "protein (g)" values decreased by 13.4% (s=-0.134; p<0.01), "fat (g)" values decreased by 14.8% (s=-0.148; p<0.01), "monounsaturated fat (g)" values decreased by 16.8% (s=-0.168; p<0.01), "polyunsaturated fat (g)" values decreased by 16.1% (s=-0.161; p<0.01), "Omega-3 (g)" values decreased by 12.9% (s=-0.129; p<0.01), "Omega-6 (g)" values decreased by 16.4% (s=-0.164; p<0.01) and "fiber (g)" values decreased by 14.5% (s=-0.145; p<0.01) with increasing PMSS "Depressive Effects" sub-factor score (Table 2).

Table 2

Correlation Coefficient Between PMSS Sub-Factor and Total Scores and Energy and Macronutrient Values of Women Participants

		PMSS-1	PMSS-2	PMSS-3	PMSS-4	PMSS-5	PMSS-6	PMSS-7	PMSS-8	PMSS-9	PMSS-T
Energy (kcal)	**s**	**-0.144**	**-0.153**	-0.091	-0.084	-0.077	**-0.115**	-0.096	0.001	**-0.102**	**-0.128**
	p	**0.004****	**0.002****	0.069	0.093	0.124	**0.021***	0.054	0.978	**0.040***	**0.010***
Carbohydrate (g)	**s**	-0.074	-0.079	-0.059	-0.035	-0.032	-0.074	-0.033	-0.019	-0.048	-0.063
	p	0.139	0.112	0.239	0.487	0.524	0.135	0.508	0.703	0.336	0.204
Carbohydrate (%)	**s**	0.056	0.057	0.031	0.046	0.038	0.009	0.059	-0.009	0.039	0.057
	p	0.261	0.253	0.539	0.360	0.444	0.861	0.239	0.865	0.430	0.254
Protein (g)	**s**	**-0.134**	**-0.151**	-0.087	**-0.114**	-0.064	-0.060	-0.036	0.010	-0.034	**-0.117**
	p	**0.007****	**0.002****	0.079	**0.022***	0.201	0.230	0.465	0.849	0.498	**0.018***
Protein (%)	**s**	-0.049	-0.071	-0.029	-0.067	-0.030	0.027	0.022	0.028	0.051	-0.037
	p	0.325	0.157	0.562	0.181	0.554	0.589	0.666	0.578	0.303	0.455
Fat (g)	**s**	**-0.148**	**-0.148**	-0.089	-0.098	-0.091	**-0.109**	**-0.123**	-0.009	**-0.137**	**-0.139**
	p	**0.003****	**0.003****	0.075	0.050	0.067	**0.028***	**0.013***	0.853	**0.006****	**0.005****
Fat (%)	**s**	-0.058	-0.050	-0.033	-0.044	-0.041	-0.040	-0.082	0.006	-0.072	-0.060
	p	0.243	0.316	0.504	0.381	0.412	0.418	0.100	0.898	0.150	0.229
Saturated Fat (g)	**s**	-0.046	**-0.100**	-0.060	-0.020	-0.074	-0.076	-0.078	0.048	-0.074	-0.074
	p	0.358	**0.044***	0.232	0.691	0.135	0.128	0.116	0,340	0.140	0.136
Monounsaturated Fat (g)	**s**	**-0.168**	**-0.129**	**-0.107**	**-0.109**	**-0.098**	**-0.103**	**-0.102**	-0.033	**-0.162**	**-0.146**
	p	**0.001****	**0.010***	**0.032***	**0.028***	**0.049***	**0.039***	**0.040***	0.508	**0.001****	**0.003****
Polyunsaturated Fat (g)	**s**	**-0.161**	**-0.155**	-0.076	**-0.154**	-0.085	-0.097	**-0.153**	-0.026	-0.070	**-0.142**
	p	**0.001****	**0.002****	0.127	**0.002****	0.087	0.052	**0.002****	0.608	0.158	**0.004****
Omega-3 (g)	**s**	**-0.129**	**-0.127**	-0.087	**-0.118**	**-0.098**	**-0.101**	**-0.185**	-0.022	-0.091	**-0.137**
	p	**0.009****	**0.011***	0.081	**0.018***	**0.049***	**0.043***	**<0.001*****	0.659	0.066	**0.006****
Omega-6 (g)	**s**	**-0.164**	**-0.152**	-0.065	**-0.152**	-0.085	-0.090	**-0.144**	-0.025	-0.084	**-0.138**
	p	**0.001****	**0.002****	0.189	**0.002****	0.090	0.071	**0.004****	0.614	0.092	**0.005****
Cholesterol (mg)	**s**	-0.017	-0.015	-0.036	-0.024	-0.022	-0.058	-0.073	-0.016	-0.017	-0.041
	p	0.731	0.759	0.474	0.627	0.656	0.248	0.143	0.749	0.740	0.408
Fiber (g)	**s**	**-0.145**	-0.093	-0.096	**-0.130**	**-0.109**	-0.058	-0.055	-0.053	-0.079	**-0.128**
	p	**0.003****	0.062	0.053	**0.009****	**0.028***	0.248	0.270	0.289	0.112	**0.010***

PMSS: Premenstrual Syndrome Scale , PMSS-1: Depressive Effect; PMSS-2: Anxiety; PMSS-3: Fatigue; PMSS-4: Irritability; PMSS-5: Depressive Thoughts; PMSS-6: Pain; PMSS-7: Appetite Changes; PMSS-8: Sleep Changes; PMSS-9: Abdominal Bloating; PMSS-T: Premenstrual Syndrome Scale Total Score

s: Spearman Rank Correlation Coefficient, *p<0.05; **p<0.01; ***p<0.001

"Energy (kcal)" values decreased by 15.3% (s=-0.153; p<0.01), "protein (g)" values decreased by 15.1% (s=-0.151; p<0.01), "fat (g)" values decreased by 14.8% (s=-0.148; p<0.01), "saturated fat (g)" values decreased by 10.0% (s=-0.100; p<0.05), "monounsaturated fat (g)" values decreased by 12.9% (s=-0.129; p<0.05), "polyunsaturated fat (g)" values decreased by 15.5% (s=-0.155; p<0.01), "Omega-3 (g)" values decreased by 12.7% (s=-0.127; p<0.05) and "Omega-6 (g)" values decreased by 15.2% (s=-0.152; p<0.01) with increasing PMSS "Anxiety" sub-factor score (Table 2).

"Monounsaturated fat (g)" values decreased by 10.7% (s=-0.107; p<0.05), "protein (g)" values decreased by 11.4% (s=-0.114; p<0.05), "monounsaturated fat (g)" values decreased by 10.9% (s=-0.109; p<0.05), "polyunsaturated fat (g)" values decreased by 15.4% (s=-0.154; p<0.01), "Omega-3 (g)" values decreased by 11.8% (s=-0.118; p<0.05), "Omega-6 (g)" values decreased by 15.2% (s=-0.152; p<0.01) and "fiber (g)" values decreased by 13.0% (s=-0.130; p<0.01) with increasing PMSS "Fatigue" sub-factor score (Table 2).

"Monounsaturated fat (g)" values decreased by 9.8% (s=-0.098; p<0.05), "Omega-3 (g)" values decreased by 9.8% (s=-0.098; p<0.05) and "fiber (g)" values decreased by 10.9% (s=-0.109; p<0.05) with increasing PMSS "Depressive Thoughts" sub-factor score (Table 2).

"Energy (kcal)" values decreased by 11.5% (s=-0.115; p<0.01), "Fat (g)" values decreased by 10.9% (s=-0.109; p<0.05), "Monounsaturated Fat (g)" values decreased by 10.3% (s=-0.103; p<0.05) and "Omega-3 (g)" values decreased by 10.1% (s=-0.101; p<0.05) with increasing PMSS "Pain" sub-factor score (Table 2).

"Fat (g)" values decreased by 12.3% (s=-0.123; p<0.05), "monounsaturated fat (g)" values decreased by %10.2 (s=-0.102; p<0.05), "polyunsaturated fat (g)" values decreased by %15.3 (s=-0.153; p<0.01), "Omega-3 (g)" values decreased by 18.5% (s=-0.185; p<0.001) and "Omega-6 (g)" values decreased by %14.4 (s=-0.144; p<0.01) with increasing PMSS "Appetite Changes" sub-factor score (Table 2).

"Energy (kcal)" values decreased by 10.2% (s=-0.102; p<0.05), "fat (g)" values decreased by 13.7% (s=-0.137; p<0.01) and "monounsaturated fat (g)" values decreased by 16.2% (s=-0.162; p<0.01) with increasing PMSS "Abdominal Bloating" sub-factor score (Table 2).

"Energy (kcal)" values decreased by 12.8% (s=-0.128; p<0.05), "protein (g)" values decreased by 11.7% (s=-0.117; p<0.05), "fat (g)" values decreased by 13.9% (s=-0.139; p<0.01), "monounsaturated fat (g)" values decreased by 14.6% (s=-0.146; p<0.01), "polyunsaturated fat (g)" values decreased by 14.2% (s=-0.142; p<0.01), "Omega-3 (g)" values decreased by 13.7% (s=-0.137; p<0.01), "Omega-6 (g)" values decreased by 13.8% (s=-0.138; p<0.01) and "fiber (g)" values decreased by 12.8% (s=-0.128; p<0.05) with increasing "PMSS Total" sub-factor score (Table 2).

"E Vitamin (mg)" values decreased by 15.9% (s=-0.159; p<0.01), "thiamine (mg)" values decreased by 18.2% (s=-0.182; p<0.001), "riboflavin (mg)" values decreased by 14.2% (s=-0.142; p<0.01), "Vitamin B_5 Pantothenic acid (mg)" values decreased by 11.3% (s=-0.113; p<0.05), "Biotin (µg)" values decreased by 15.8% (s=-0.158; p<0.01), "potassium (mg)" decreased by values 16.0% (s=-0.160; p<0.01), "calcium (mg)" values decreased by 12.2% (s=-0.122; p<0.05), "magnesium (mg)" values decreased by 19.5% (s=-0.195; p<0.001), "phosphor (mg)" values decreased by 18.6% (s=-0.186; p<0.001), "iron (mg)" values decreased by 12.3% (s=-0.123; p<0.05), "zinc (mg)" values decreased by 15.8% (s=-0.158; p<0.01), "copper (mg)" values decreased by 14.2% (s=-0.142; p<0.01) and "fluorine (µg)" values decreased by 11.5% (s=-0.115; p<0.05) with increasing PMSS "Depressive Thoughts" sub-factor score (Table 3).

Table 3

Correlation Coefficient Between PMSS Sub-Factor and Total Scores and Micronutrient Values of Women Participants

		PMSS-1	PMSS-2	PMSS-3	PMSS-4	PMSS-5	PMSS-6	PMSS-7	PMSS-8	PMSS-9	PMSS-T
A Vitamin (µg)	**s**	-0.052	-0.039	-0.081	-0.065	**-0.120**	-0.059	**-0.121**	0.005	-0.085	-0.086
	p	0.300	0.439	0.105	0.190	**0.016***	0.240	**0.015***	0.923	0.086	0.086
D Vitamin (µg)	**s**	-0.023	-0.039	0.039	-0.025	0.033	0.031	0.010	0.028	-0.025	0.008
	p	0.641	0.435	0.433	0.616	0.506	0.533	0.843	0.569	0.610	0.866
E Vitamin (mg)	**s**	**-0.159**	**-0.112**	-0.056	**-0.174**	**-0.109**	-0.084	**-0.098**	-0.057	**-0.147**	**-0.136**
	p	**0.001****	**0.024***	0.259	**<0.001*****	**0.028***	0.093	**0.048***	0.250	**0.003****	**0.006****
K Vitamin (µg)	**s**	-0.071	-0.048	-0.076	-0.065	**-0.113**	**-0.111**	-0.084	0.008	**-0.119**	-0.094
	p	0.155	0.340	0.126	0.189	**0.023***	**0.026***	0.090	0.873	**0.017***	0.060
Carotene (mg)	**s**	-0.056	-0.040	-0.070	-0.074	**-0.117**	-0.028	-0.074	0.015	-0.062	-0.076
	p	0.265	0.417	0.162	0.137	**0.018***	0.570	0.138	0.766	0.212	0.126
Thiamine (mg)	**s**	**-0.182**	**-0.169**	**-0.114**	**-0.154**	**-0.145**	-0.083	-0.066	-0.077	**-0.108**	**-0.169**
	p	**<0.001*****	**0.001****	**0.022***	**0.002****	**0.003****	0.094	0.183	0.121	**0.030***	**0.001****
Riboflavin (mg)	**s**	**-0.142**	**-0.147**	**-0.104**	**-0.120**	**-0.130**	-0.068	-0.076	-0.026	**-0.106**	**-0.141**
	p	**0.004****	**0.003****	**0.037***	**0.016***	**0.009****	0.173	0.125	0.603	**0.034***	**0.004****
Niacin (mg)	**s**	-0.087	**-0.105**	-0.068	-0.077	-0.070	-0.032	-0.003	0.012	-0.012	-0.086
	p	0.079	**0.034***	0.171	0.121	0.161	0.524	0.953	0.812	0.814	0.086
B_5 Vitamin Pantothenic acid (mg)	**s**	**-0.113**	**-0.142**	-0.087	**-0.102**	**-0.132**	-0.076	**-0.106**	-0.031	**-0.105**	**-0.134**
	p	**0.024***	**0.004****	0.079	**0.041***	**0.008****	0.125	**0.033***	0.529	**0.034***	**0.007****
B_6 Vitamin Pyridoxine (mg)	**s**	-0.096	-0.081	-0.069	**-0.113**	**-0.114**	-0.090	**-0.099**	-0.011	**-0.102**	**-0.114**
	p	0.054	0.105	0.166	**0.023***	**0.022***	0.072	**0.048***	0.829	**0.041***	**0.022***
Biotin (µg)	**s**	**-0.158**	**-0.106**	**-0.101**	**-0.135**	**-0.108**	**-0.108**	**-0.126**	-0.094	**-0.129**	**-0.149**
	p	**0.001****	**0.033***	**0.043***	**0.007****	**0.030***	**0.029***	**0.011***	0.059	**0.010***	**0.003****
Total Folate (µg)	**s**	-0.079	-0.076	-0.052	**-0.101**	**-0.148**	-0.064	-0.061	-0.027	-0.095	**-0.106**
	p	0.112	0.130	0.293	**0.043***	**0.003****	0.201	0.218	0.584	0.055	**0.033***
B_{12} Vitamin (µg)	**s**	-0.078	**-0.108**	0.001	-0.055	-0.060	-0.007	-0.009	0.042	0.009	-0.058
	p	0.117	**0.030***	0.988	0.266	0.228	0.890	0.853	0.405	0.862	0.246
C Vitamin (mg)	**s**	-0.031	-0.022	-0.038	-0.080	**-0.137**	-0.026	-0.061	-0.015	-0.062	-0.070
	p	0.532	0.660	0.451	0.108	**0.006****	0.603	0.219	0.762	0.211	0.159

Table 3 (continue)

		PMSS-1	PMSS-2	PMSS-3	PMSS-4	PMSS-5	PMSS-6	PMSS-7	PMSS-8	PMSS-9	PMSS-T
Sodium (mg)	**s**	0.009	-0.022	0.003	0.040	-0.048	-0.013	-0.015	0.023	-0.066	-0.011
	p	0.864	0.658	0.945	0.417	0.339	0.793	0.760	0.639	0.186	0.824
Potassium (mg)	**s**	**-0.160**	**-0.129**	-0.066	**-0.154**	**-0.126**	-0.059	-0.065	0.026	**-0.113**	**-0.135**
	p	**0.001****	**0.010***	0.183	**0.002****	**0.011***	0.239	0.189	0.597	**0.024***	**0.006****
Calcium (mg)	**s**	**-0.122**	**-0.163**	**-0.118**	-0.093	**-0.127**	-0.039	**-0.101**	-0.042	**-0.146**	**-0.139**
	p	**0.014***	**0.001****	**0.017***	0.061	**0.011***	0.430	**0.043***	0.395	**0.003****	**0.005****
Magnesium (mg)	**s**	**-0.195**	**-0.166**	**-0.112**	**-0.170**	-0.083	-0.065	-0.024	-0.029	-0.082	**-0.154**
	p	**<0.001*****	**0.001****	**0.025***	**0.001****	0.094	0.192	0.624	0.555	0.098	**0.002****
Phosphor (mg)	**s**	**-0.186**	**-0.201**	**-0.135**	**-0.154**	**-0.129**	-0.083	-0.079	-0.061	**-0.125**	**-0.179**
	p	**<0.001*****	**<0.001*****	**0.007****	**0.002****	**0.010***	0.098	0.114	0.221	**0.012***	**<0.001*****
Chlore (mg)	**s**	0.009	-0.019	0.008	0.032	-0.033	-0.014	-0.019	0.030	-0.068	-0.007
	p	0.864	0.706	0.877	0.522	0.511	0.775	0.701	0.541	0.174	0.895
Iron (mg)	**s**	**-0.123**	-0.093	-0.069	-0.077	-0.047	-0.063	0.005	0.015	-0.037	-0.094
	p	**0.013***	0.063	0.168	0.122	0.348	0.209	0.927	0.771	0.454	0.060
Zinc (mg)	**s**	**-0.158**	**-0.151**	**-0.108**	-0.093	-0.071	-0.079	-0.014	-0.020	-0.035	**-0.125**
	p	**0.001****	**0.002****	**0.029***	0.062	0.155	0.114	0.782	0.688	0.478	**0.012***
Copper (mg)	**s**	**-0.142**	-0.093	-0.076	**-0.117**	-0.057	-0.075	-0.044	-0.015	-0.090	**-0.116**
	p	**0.004****	0.061	0.125	**0.019***	0.255	0.132	0.373	0.759	0.072	**0.020***
Fluorine (µg)	**s**	**-0.115**	**-0.141**	-0.039	-0.057	-0.085	-0.027	-0.044	-0.005	-0.048	-0.088
	p	**0.021***	**0.004****	0.437	0.249	0.089	0.590	0.375	0.923	0.333	0.076
Iodure (µg)	**s**	-0.029	-0.049	0.018	-0.025	-0.036	-0.041	-0.039	0.044	-0.070	-0.027
	p	0.555	0.326	0.714	0.617	0.474	0.415	0.431	0.378	0.160	0.583
Selenium (µg)	**s**	-0.001	0.012	-0.006	-0.005	-0.002	-0.068	-0.081	-0.018	-0.045	-0.020
	p	0.978	0.806	0.898	0.916	0.976	0.170	0.105	0.717	0.370	0.682

PMSS: Premenstrual Syndrome Scale, PMSS-1: Depressive Effect; PMSS-2: Anxiety; PMSS-3: Fatigue; PMSS-4: Irritability; PMSS-5: Depressive Thoughts; PMSS-6: Pain; PMSS-7: Appetite Changes; PMSS-8: Sleep Changes; PMSS-9: Abdominal Bloating; PMSS-T: Premenstrual Syndrome Scale Total Score

s: Spearman Rank Correlation Coefficient, *p<0.05; **p<0.01; ***p<0.001

"E Vitamin (mg)" values decreased by 11.2% (s=-0.112; p<0.05), "thiamine (mg)" values decreased by 16.9% (s=-0.169; p<0.01), "riboflavin (mg)" values decreased by 14.7% (s=-0.147; p<0.01), "niacin (mg)" values decreased by 10.5% (s=-0.105; p<0.05), "Vitamin B_5 Pantothenic acid (mg)" values decreased by 14.2% (s=-0.142; p<0.01), "biotin (µg)" values decreased by 10.6% (s=-0.106; p<0.05), "Vitamin B_{12} (µg)" values decreased by 10.8% (s=-0.108; p<0.05), "potassium (mg)" values decreased by 12.9% (s=-0.129; p<0.05), "calcium (mg)" values decreased by 16.3% (s=-0.163; p<0,01), "magnesium (mg)" values decreased by 16.6% (s=-0.166; p<0.01), "phosphor (mg)" values decreased by 20.1% (s=-0.201; p<0.001), "zinc (mg)" values decreased by 15.1% (s=-0.151; p<0.01) and "fluorine (µg)" values decreased by 14.1% (s=-0.141; p<0.01) with increasing PMSS "Anxiety" sub-factor score (Table 3).

"Thiamine (mg)" values decreased by 11.4% (s=-0.114; p<0.05), "riboflavin (mg)" values decreased by 10.4% (s=-0.104; p<0.05), "biotin (µg)" values decreased by 10.1% (s=-0.101; p<0.05), "calcium (mg)" values decreased by 11.8% (s=-0.118; p<0.05), "magnesium (mg)" values decreased by 11.2% (s=-0.112; p<0.05), "phosphor (mg)" values decreased by 13.5% (s=-0.135; p<0.01) and "zinc (mg)" values decreased by 10.8% (s=-0.108; p<0.05) with increasing PMSS "Fatigue" sub-factor score (Table 3).

"E Vitamin (mg)" values decreased by 17.4% (s=-0.174; p<0.001), "thiamine (mg)" values decreased by 15.4% (s=-0.154; p<0.01), "riboflavin (mg)" values decreased by 12.0% (s=-0.120; p<0.05), "Vitamin B_5 Pantothenic acid (mg)" values decreased by 10.2% (s=-0.102; p<0.05), "Vitamin B_6 Pyridoxine (mg)" values decreased by 11.3% (s=-0.113; p<0.05), "biotin (µg)" values decreased by 13.5% (s=-0.135; p<0.01), "Total Folate (µg)" values decreased by 10.1% (s=-0.101; p<0.05), "potassium (mg)" values decreased by 15.4% (s=-0.154; p<0.01), "magnesium (mg)" values decreased by 17.0% (s=-0.170; p<0.01), "phosphor (mg)" values decreased by 15.4% (s=-0.154; p<0.01) and "copper (mg)" values decreased by 11.7% (s=-0.117; p<0.05) with increasing PMSS "Irritability" sub-factor score (Table 3).

"Vitamin A (µg)" values decreased by 12.0% (s=-0.120; p<0.05), "Vitamin E (mg)" values decreased by 10.9% (s=-0.109; p<0.05), "Vitamin K (µg)" values decreased by 11.3% (s=-0.113; p<0.05), "carotene (mg)" values decreased by 11.7% (s=-0.117; p<0.05), "thiamine (mg)" values decreased by 14.5% (s=-0.145; p<0.01), "riboflavin (mg)" values decreased by 13.0% (s=-0.130; p<0.01), "Vitamin B_5 Pantothenic acid (mg)" values decreased by 13.2% (s=-0.132; p<0.01), "Vitamin B_6 Pyridoxine (mg)" values decreased by 11.4% (s=-0.114; p<0.05), "biotin (µg)" values decreased by 10.8% (s=-0.108; p<0.05), "total folate (µg)" values decreased by 14.8% (s=-0.148; p<0.01), "Vitamin C (mg)" values decreased by 13.7% (s=-0.137; p<0.01), "potassium (mg)" values decreased by %12.6 (s=-0.126; p<0.05), "calcium (mg)" values decreased by 12.7% (s=-0.127; p<0.05) and "phosphor (mg)" values decreased by 12.9% (s=-0.129; p<0.05) with increasing PMSS "Depressive Thoughts" sub-factor score (Table 3).

"Vitamin K (µg)" values decreased by 11.1% (s=-0.111; p<0.05) and "biotin (µg)" values decreased by 10.8% (s=-0.108; p<0.05) with increasing PMSS "Depressive Thoughts" sub-factor score (Table 3).

"Vitamin A (µg)" values decreased by 12.1% (s=-0.121; p<0.05), "Vitamin E (mg)" values decreased by 9.8% (s=-0.098; p<0.05), "Vitamin B_5 Pantothenic acid (mg)" values decreased by 10.6% (s=-0.106; p<0.05), "Vitamin B_6 Pyridoxine (mg)" values decreased by 9.9% (s=-0.099; p<0.05), "biotin (µg)" values decreased by 12.6% (s=-0.126; p<0.05) and "calcium (mg)" values decreased by 10.1% (s=-0.101; p<0.05) with increasing PMSS "Appetite Changes" sub-factor score (Table 3).

"Vitamin E (mg)" values decreased by 14.7% (s=-0.147; p<0.01), "Vitamin K (µg)" values decreased by 11.9% (s=-0.119; p<0.05), "thiamine (mg)" values decreased by 10.8% (s=-0.108; p<0.05), "riboflavin (mg)" values decreased by 10.6% (s=-0.106; p<0.05), "Vitamin B_5 Pantothenic acid (mg)" values decreased by 10.5% (s=-0.105; p<0.05), "Vitamin B_6 Pyridoxine (mg)" values decreased by 10.2% (s=-0.102; p<0.05), "biotin (µg)" values decreased by 12.9% (s=-0.129; p<0.05), "potassium (mg)" values decreased by 11.3% (s=-0.113; p<0.05), "calcium (mg)" values decreased by 14.6% (s=-0.146; p<0.01) and "phosphor (mg)" values decreased by 12.5% (s=-0.125; p<0.06) with increasing PMSS "Abdominal Bloating" sub-factor score (Table 3).

"Vitamin E (mg)" values decreased by 13.6% (s=-0.136; p<0.01), "thiamine (mg)" values decreased by 16.9% (s=-0.169; p<0.01), "riboflavin (mg)" values decreased by 14.1% (s=-0.141; p<0.01), "Vitamin B_5 Pantothenic acid (mg)" values decreased by 13.4% (s=-0.134; p<0.01), "Vitamin B_6 Pyridoxine (mg)" values decreased by 11.4% (s=-0.114; p<0.05), "biotin (µg)" values decreased by 14.9% (s=-0.149; p<0.01), "total folate (µg)" values decreased by 10.6% (s=-0.106; p<0.05), "potassium (mg)" values decreased by 13.5% (s=-0.135; p<0.01), "calcium (mg)" values decreased by 13.9% (s=-0.139; p<0.01), "magnesium (mg)" values decreased by 15.4% (s=-0.154; p<0.01), "phosphor (mg)" values decreased by 17.9% (s=-0.179; p<0.001), "zinc (mg)" values decreased by 12.5% (s=-0.125; p<0.05) and "copper (mg)" values decreased by 11.6% (s=-0.116; p<0.05) with increasing "PMSS Total" score (Table 3).

PMSS "Depressive Thoughts" sub-factor score increased by 14.1% (s=0.141; p<0.01), "Fatigue" sub-factor score increased by 13.2% (s=0.132; p<0.01), "Irritability" sub-factor score increased by 14.5% (s=0.145; p<0.01), "Depressive Thoughts" sub-factor score increased by 10.2% (s=0.102; p<0.05), "Pain" sub-factor score increased by 18.3% (s=0.183; p<0.001), "Sleep Changes" sub-factor score increased by 11.6% (s=0.116; p<0.05), "Abdominal Bloating" sub-factor score increased by 13.5% (s=0.135; p<0.01) and "PMSS Total" score increased by 16.8% (s=0.168; p<0.01) with increasing "IPAQ Total" score (Table 4).

Table 4

Correlation Coefficient Between IPAQ Total Scores and PMSS Sub-Factor and Total Scores of Women Participants

PMSS Sub-factor and Total Scores	**IPAQ Total**	
	S	**P**
Depressive Effect	**0.141**	**0.005****
Anxiety	0.083	0.094
Fatigue	**0.132**	**0.008****
Irritability	**0.145**	**0.004****
Depressive Thoughts	**0.102**	**0.040***
Pain	**0.183**	**<0.001*****
Appetite Changes	0.094	0.060
Sleep Changes	**0.116**	**0.020***
Abdominal Bloating	**0.135**	**0.007****
PMSS Total	**0.168**	**0.001****

PMSS: Premenstrual Syndrome Scale , IPAQ: International Physical Activity Questionnaire
s: Spearman Rank Correlation Coefficient, *p<0.05; **p<0.01; ***p<0.001

DISCUSSION

Most of the study participants were of a normal weight in terms of BMI and had a normal waist-to-hip ratio. In similar studies; the majority of participants had normal weight in terms of BMI and normal waist-to-hip ratio (Altun, 2021; Ayvazoğlu, 2022; Hasdemir, 2020; Özçelik, 2019; Sincar, 2022; Şahin, 2021). On the contrary, a study performed by Albayrak in 2019 demonstrated that the majority of participants were obese (Albayrak, 2019). This situation could be explained by the fact that women consider slimness to be their associated with health, better social relations and characteristic features, and that appearance is dictated by certain standards in media, so the existence of visual anxiety, and efforts to keep body weight lower than or within the normal BMI range (Çakır, 2020; Ergün et al., 2022; Önal et al., 2019).

In this study, it was found that "calcium", "magnesium", "phosphor", "zinc", "thiamine", "riboflavin", "biotin" and "monounsaturated fat" values decreased with increasing PMSS "fatigue" sub-factor score. On the contrary, in the study performed by Albayrak (2019) no statistically significant relationship was found between "Fatigue" sub-factor score and the amount of calcium, magnesium, zinc, thiamine, riboflavin intake (Albayrak, 2019). This situation could be explained as follows: female serum calcium levels are lower in the luteal phase of the menstrual cycle (Abdi et al., 2019; Arab et al., 2020; Bahrami et al., 2018) and this, in turn, might lead to depression, malaise and fatigue (Bahrami et al., 2018), thiamin deficiency might cause malaise (Tunç, 2019), magnesium and phosphor deficiency might cause fatigue (Çayakar, 2019), magnesium level is associated with muscle weakness and thus fatigue (Onur, 2022), people with insufficient and unbalanced nutrition might suffer fatigue (Ağmaz, 2019).

In this study, "protein", "monounsaturated fat", "polyunsaturated fat", "Omega-3", "Omega-6", "fiber", "Vitamin E", "thiamine", "riboflavin", "Vitamin B_5 Pantothenic acid", "Vitamin B_6", "biotin", "total folate", "potassium", "magnesium", "phosphor" and "copper" values decreased with increasing PMSS "Irritability" sub-factor score. On the other hand, in the 2019 study, no statistically significant relationship was found between "Irritability" sub-factor scores and amounts of protein, cholesterol, riboflavin, Vitamin B_6, Vitamin C, sodium, potassium, calcium, magnesium, iron and zinc intake, while the statistically significant positive relationship was found between energy and amounts of fat, carbohydrate, fiber, Vitamin E, thiamine and folate intake (Albayrak, 2019). This situation could be explained as follows: thiamine, niacin and B_{12} play a role in nervous system (Ağmaz, 2019) and their deficiencies might cause mood changes, perception of increased anxiety, Vitamin E is an antioxidant that plays role in decreasing oxidative changes originating from stress and lower Vitamin E level is related to depression, anxiety and increased irritability (Lee et al., 2022), fatty acids are building blocks of central nervous system, higher anxiety, depression and irritability are associated with insufficient unsaturated fatty acids and omega-3 levels (Petermann et al., 2022).

In this study, "potassium", "calcium", "phosphor", "magnesium", "zinc", "copper", "Vitamin A", "Vitamin E", "Vitamin K", "carotene", "thiamine", "riboflavin", "Vitamin B_5", "Vitamin B_6", "Biotin", "Total Folate" and "Vitamin C" values decreased with increasing "Depressive Thoughts" sub-factor score. Whereas, in another study, no statistically significant relationship was found between the "Depressive Thoughts" sub-factor score and amounts of potassium, calcium, Vitamin A, Vitamin E, thiamine, riboflavin, Vitamin B_6, Vitamin C intake, while there was a positive statistically significant relationship with the amount of folate intake (Albayrak, 2019). This situation could be explained as follows: oxidative stress plays an important role in the pathophysiology of depression (Zhang et al., 2022), to caroteneoids, precursors of Vitamin A, could protect organisms against oxidative damage by

disposing of reactive oxygen species and other free radicals and decreased Vitamin A and beta-carotene intake are positively correlated with "Depressive Thoughts" because of its antidepressant characteristics (Hu et al., 2022; Zhang et al., 2022), deficiency of zinc might lead to depressive thoughts because of its antioxidant and antidepressant effects (Siminiuc & Ţurcanu, 2023), magnesium deficiency might lead to deterioration in mood (Özçelik, 2019), deficiency of thiamine, riboflavin, Vitamin B_6 and Vitamin B_{12} might cause symptoms of depression as they are essential vitamins for the synthesis of neurotransmitters that play role in PMS pathophysiology (Siminiuc & Ţurcanu, 2023).

"Energy", "fat", "monounsaturated fat", "Omega-3", "Vitamin K" and "biotin" values decreased with increasing "Pain" sub-factor score. Whereas, in the 2019 study, no statistically significant relationship between the "Pain" sub-factor score and amounts of fat, carbohydrate, fiber, cholesterol, and Vitamin K intake, while a positive relationship was found with energy and amount of protein intake (Albayrak, 2019). This situation could be explained as follows: as the intake of monounsaturated fatty acid decreases, inflammatory signal increases (Ayyıldız & Yıldıran, 2019) and feeding with omega-3 fatty acid reach diet might have an alleviating effect on pain due to the effects of produced proinflammatory prostaglandins (Habib et al., 2022), total fat intake is significantly related to pain symptoms of PMS (Siminiuc & Ţurcanu, 2023), and "Pain" sub-factor score might increase with decreased monounsaturated fatty acid and omega 3 intake.

"Fat", "monounsaturated fat", "polyunsaturated fat", "Omega-3", "Omega-6", "calcium", "Vitamin A", "Vitamin E", "Vitamin B_5 ", "Vitamin B_6" and "Biotin" values decreased with increasing the "Appetite Changes" sub-factor score. Whereas in a previous study no statistically significant relationship was found between "Appetite Changes" sub-factor score and amounts of Vitamin A and Vitamin E intake, while a positive relationship was found with energy, protein fat, carbohydrate, fiber, thiamine, riboflavin, folate, potassium, calcium, magnesium, iron and zinc (Albayrak, 2019). This situation could be explained by the fact that thiamine, B_5, B_{12}, folic acid and biotin deficiency might be associated with Appetite Changes (Türker & Yüksel, 2019) and emotional and stress-induced eating might lead to excessively increased appetite (Tunç, 2019). Contradictory results have been obtained because there have been several studies showing any relationship between serum vitamins, trace elements and PMS symptoms (Ayvazoğlu, 2022).

"Energy", "fat", "monounsaturated fat", "Vitamin E", "Vitamin K", "Thiamine", "Riboflavin", "Vitamin B_5", "Vitamin B_6", "Biotin", "potassium", "calcium", "phosphor" values decreased with increasing "Abdominal Bloating" sub-factor score. Whereas in Albayrak study no statistically significant relationship was found between the "Abdominal Bloating" sub-factor score and energy, fat, Vitamin E, Vitamin K, thiamine, riboflavin, Vitamin B_6, calcium, phosphor intake (Albayrak, 2019). This situation could be explained as follows: when essential fatty acids are taken in sufficient amounts abdominal bloating decreases (Sun, 2019). Increased intake of monounsaturated fatty acid and polyunsaturated fatty acid and decreased inflammatory signal (Ayyıldız & Yıldıran, 2019) increases symptoms of Abdominal Bloating. Vitamin E deficiency might increase symptoms of Abdominal Bloating because it prevents conversion of arachidonic acid to prostaglandin by suppressing protein kinase C responsible for release of arachidonic acid (Güvey, 2019) and due to the symptom-enhancing effects of prostaglandin (Güngördü, 2019). Since dopamine has a suppressing effect on aldosterone and decreased dopamine levels increase sodium absorption, Abdominal Bloating symptoms occur and Vitamin B_6 intake has an effect similar to aldosterone-suppressing drugs (Işgın & Büyüktuncer, 2017).

"Energy", "protein", "fat", "saturated fat", "monounsaturated fat", "polyunsaturated fat", "Omega-3", "Omega-6", "potassium", "calcium", "magnesium", "phosphor", "zinc", "fluorine", "Vitamin E", "thiamine", "riboflavin", "niacin", "Vitamin B_5", "biotin" and "Vitamin B_{12}" values decreased with increasing "Anxiety" sub-factor score. Similarly, in 2019 study serum calcium, magnesium, zinc, iron and Vitamin D concentrations in the PMS group were lower than control group however there was no difference except for Vitamin D (Fatemi et al., 2019). On the other hand, in 2019 study there was no statistically significant relationship between "Anxiety" sub-factor score and amounts of protein, fat, carbohydrate, fiber, cholesterol, potassium, calcium, phosphor and zinc intake but the positive statistically significant relationship was present with energy, Vitamin E, amount of magnesium intake (Albayrak, 2019). This situation could be explained as follows: symptoms of depression, anxiety and dysphoric disorder in a state of hypocalcemia are also present in PMS, calcium is important in the PMS etiology (Özçelik, 2019) fatty acid intake might be insufficient, serum levels of B vitamins and magnesium are low, anxiety could develop in case of increased noradrenaline and decreased dopamine (Sun, 2019), serotonin has an established role in anxiety pathogenesis and anxiety might develop due to deficiency of triptophane which is a building block of serotonin production and protein intake (Aucoin et al., 2021), low Vitamin E level is associated with depression, anxiety and increased irritability (Lee et al., 2022), micronutrients such as zinc and selenium act as coenzymes that are essential in the synthesis and regulation of neurotransmitters and neurotrophic factors and protect mental health by these characteristics (Aucoin et al., 2021) and zinc consumption is inversely proportional to anxiety as reported by a meta-analysis of 9 studies that examined the relationship between zinc and anxiety (Azargoonjahromi, 2023).

"Energy", "protein", "fat", "monounsaturated fat", "polyunsaturated fat", "Omega-3", "Omega-6", "fiber", "Vitamin E", "Thiamine", "Riboflavin", "Vitamin B_5", "Vitamin B_6 Pyridoxine", "Biotin" and "Total Folate" values decreased with increasing "PMSS Total" score. Whereas in a study performed in 2021 carbohydrate, protein, fat and total energy intake was found to increase in premenstrual period in participants with PMS (Altun, 2021). This situation could be explained as follows: thiamine, riboflavin, Vitamin B_6 Pyridoxine, folic acid and Vitamin B_{12} take place in the neurotransmitter synthesis and their deficiencies increase PMS symptoms (Siminiuc & Ţurcanu, 2023), women who take excessive amounts of thiamine, riboflavin and Vitamin B_6 with food are under lower PMS risk (Retallick Brown et al., 2020; Siminiuc & Ţurcanu, 2023), the problem of constipation and abdominal pain (one of the symptoms of constipation) might be due to dietary fiber deficiency in PMS and might increase pain (Morino et al., 2022), low protein and spesific amino acid intake might increase PMS risk because triptophan, glutamate and other amino acids are precursors of neurotransmitters in PMS etiology (Houghton et al., 2019), excessive and uncontrolled prostaglandin synthesis occur in PMS pathogenesis, low Vitamin E levels are correlated with prolonged menstruation because Vitamin E might regulate prostaglandin synthesis (Bahrami et al., 2020) so its deficiency might increase PMS symptoms.

"Depressive Effect", "Fatigue", "Irritability", "Depressive Thoughts", "Pain", "Sleep Changes", "Abdominal Bloating" scores and "PMSS Total" score increased with increasing "IPAQ Total" score. Whereas in previous studies it has been reported that individuals with high physical activity have less severe PMS symptoms (Kawabe et al., 2022; Maged et al., 2018; Ravichandran & Janakiraman, 2022). This situation could be explained as follows: exercise elevates endorphin levels, helps regulate progesterone and estrogen synthesis and promotes endogenos antiinflamatory chemical production (Cano Sokoloff et al., 2016), improves general fitness, provides other benefits such as socializing opportunities and potential to decrease depression and PMS symptoms and as a result individuals with

severe PMS symptoms might be oriented to more physical activity (Pearce et al., 2020). We need additional studies the relationship between macro and micro nutrients and premenstrual syndrome most relevant.

CONCLUSION AND SUGGESTIONS

While PMSS affects macro and micronutrient intakes, physical activity affects PMSS. In the literature, further studies are needed on this issue due to the scarcity of studies in this field and the results of this study indicate that physical activity affects Premenstrual Syndrome and Premenstrual Syndrome affects macro and micro nutrient intake of women. How physical activity during this period will affect premenstrual syndrome and how premenstrual syndrome can affect the macro and micronutrient intakes of women this study indicated. Symptom-dependent nutritional problems might be reduced by promoting healthy nutrition.

LIMITATIONS

This study were limited to the DİYET SENİNLE The Center for Nutrition and Diet Consultancy women who are admitted at a center where the data collected.

Ethic Approval

The study was initiated with the approval of the Uskudar University Institute of Medical Sciences Researches Ethics Committee (Date: 28.12.2022, Decision No: 61351342).

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Conflict of Interest

The authors have no conflict of interest.

Author Contributions

Design: H.K.D., Data Collection or Processing: H.K.D., Analysis or Interpretation: H.K.D., M.A., Literature Search: H.K.D., Writing: H.K.D., M.A.,

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