



## THE RELATIONSHIP BETWEEN PREMENSTRUAL SYNDROME AND EMOTIONAL EATING IN ADOLESCENTS

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### Abstract

**Objective:** The negative effects of eating habits in parallel with the emotional turmoil in adolescence may cause the failure to fully meet nutritional requirements and may also increase the severity of the Premenstrual Syndrome (PMS). The aim of this study was to determine the relationship between premenstrual syndrome symptoms and emotional eating attitudes in adolescents.

**Methods:** The descriptive, correlational and cross-sectional study was conducted with 242 female adolescents aged 12-18 years. Data were collected using a questionnaire, the Premenstrual Syndrome Scale (PMSS) and the Emotional Eating Scale for Children and Adolescents (EES-C-T).

**Results:** It was found that depressive symptoms and restless mood increased in EES-C-T and its sub-dimensions as fatigue increased among PMSS sub-dimensions, that depressive symptoms increased in EES-C-T sub-dimensions as irritability and depressive thoughts increased among PMSS sub-dimensions, and that EES-C-T and its sub-dimensions increased as symptoms related to appetite changes increased among PMSS sub-dimensions ( $p<0.05$ ). In addition, it was found that depressive symptoms among EES-C-T sub-dimensions increased as PMSS increased ( $p<0.05$ ).

**Conclusion:** In the study, 74% of adolescents were found to have premenstrual syndrome. The presence of depressive symptoms in adolescents experiencing PMS may increase emotional eating behavior. Evaluating the eating habits of adolescents who experience premenstrual syndrome symptoms may be effective in improving quality of life and psychological health.

**Keywords:** *Premenstrual syndrome, emotional eating, adolescent, nurse.*

## Introduction

Premenstrual syndrome (PMS) is defined as a condition characterized by the presence of physical, cognitive, behavioral and emotional symptoms that occur recurrently during the luteal phase of the menstrual cycle and affect certain aspects of life.<sup>1,2</sup> When evaluated according to countries, the prevalence of PMS has been reported to be quite high. Therefore, PMS may cause unbearable conditions for many women of reproductive age.<sup>2,3</sup> In epidemiological studies conducted with different diagnostic criteria in the literature, the prevalence of PMS in adolescents and university students varies between 36-68%.<sup>4,5</sup> The most common PMS symptoms are reported to be physical symptoms such as irritability, depressive mood, anxiety, headache, changes in sleep quality, muscle pain, increased breast tenderness, nausea, vomiting, water retention, fatigue, acne and diarrhea, overeating and weight gain.<sup>6</sup> These symptoms in the premenstrual period may impair young girls' activities of daily living, attendance, school performance, emotional well-being, family relationships and quality of life.<sup>1,2,4,5</sup>

Premenstrual syndrome can develop for a variety of reasons, including hormonal imbalance, food consumption, genetic susceptibility, and psychological problems. However, the exact cause of PMS remains unknown. These factors often affect hypoglycemia, insulin resistance, appetite control and eating behaviour in women with PMS, and accordingly, changes in food consumption and eating attitudes are observed.<sup>7,8</sup>

As in certain stages of life, the increase in the rate of growth and development in adolescence increases the need for nutrients and energy. In this period, turning to unhealthy food consumption, irregular meal habits and developing unhealthy eating behaviours have been recorded as common behaviours. Overeating in response to emotion is relatively more common in adolescence, especially among girls.<sup>9</sup> Emotional eating is defined as "the tendency to overeat in response to negative emotions such as anxiety or irritability".<sup>10</sup> Eating in reaction to affect is commonly classified as emotional eating. The majority of theories and measurements have an emphasis on overeating in response to negative affect, and because this behavior is associated with a higher body mass index (BMI), it is frequently seen as a disordered eating habit.<sup>11</sup> Emotional eating occurs because of emotions, not because of hunger symptoms, and by the time of adolescence, eating problems in response to emotion are more common.<sup>9,12,13</sup> In addition, when compared across studies, emotional eating appears to be higher among mid-to-late adolescents.<sup>14</sup> Therefore, supporting the physical, cognitive and psychosocial development of adolescent is very important in terms of healthy nutrition.<sup>4,7</sup> It is thought that the nutritional attitudes of female adolescents experiencing premenstrual syndrome during this period should be evaluated and the current situation should be determined in order to minimize the negative effects on quality of life, general level of health and education process.

In line with all this information, the purpose of this study was to ascertain the connection between premenstrual syndrome symptoms and adolescents emotional eating attitudes.

The questions of the study are:

1. What is the level of PMS of female adolescents?
2. What is the level of emotional eating of female adolescents?

3. Is there a relationship between the levels of PMS and emotional eating behaviors of female adolescents?
4. What are the factors that affect the levels of PMS and emotional eating behaviors of female adolescents?

## Methods

### Study Design

The research is a study with descriptive, correlational and analytical type. The research was conducted between September 2022 and January 2023 with secondary and high school students in Kahramanmaraş province.

### Study Population

The population of the study consisted of all students studying in secondary schools and high schools within the borders of Kahramanmaraş Metropolitan Municipality in the autumn term of the 2022-2023 academic year. The sample consisted of a total of 242 female students aged 12-18 years, who were selected using a simple random number table, who were studying in 2 secondary schools and 2 high schools of different school types, who volunteered to participate in the study and who had no communication problems. It is aimed to reach all female adolescents studying in these four schools. In the study, 55% of the students participated. Since it was accepted that they may not have menstruation yet, those who were between the ages of 10-11 years and the sample age who had never menstruated, could not communicate verbally and speak Turkish at the level of reading comprehension, and adolescents who had a psychiatric illness were not included in the study. Stratified sampling method was used to select students from the grades. Power analysis was performed using G\*Power (3.1.9.2) programme to determine the sample size. In line with the findings obtained from the study titled "The Relationship Between Premenstrual Syndrome and Eating Attitudes in Adolescents", the effect size was calculated as = 0.18, and the sample size was determined as 239 students. Data from 242 female adolescents were included in the research, and 20 individuals who filled out the questionnaire incompletely or incorrectly were excluded from the study. The data collection forms were distributed to the students in the presence of the school's Psychological Counsellor and Guidance (PCG) teacher and were filled out by the students in about 15 minutes.

### Data Collection Tools

The data were collected using the Questionnaire Form, Premenstrual Syndrome Scale and Emotional Eating Scale for Children and Adolescents prepared by the researchers.

**Questionnaire Form:** In this section, there were 15 questions developed by the researchers in line with the literature and including the socio-demographic characteristics of the students<sup>7,9,13-16</sup>. These questions were composed of questions related to age, grade, educational status, employment status, economic level, etc. In the study, Body Mass Index (BMI) was measured by the researcher during the survey and recorded in the questionnaire.

**Instrument:** Height and weight measurements were performed using DESIS M301 brand stadiometer (measures height and weight together). BMIs were calculated by Weight (kg) / Height<sup>2</sup> (m) formula. According to BMI values, 18.5–24.9 was normal weight, 25.0–29.9 was pre-obesity, 30.0–39.9 was obese and above 40 was considered morbid obese.

**Premenstrual Syndrome Scale (PMSS):** The scale developed by Gençdoğan (2006) is a 44-item five-point Likert-type scale measuring the severity of premenstrual symptoms.<sup>16</sup> The application of the PMSS is evaluated retrospectively by taking into account the person's status of "being within the period of one week before menstrual bleeding". The options in the scale are scored as "Never (1 point)", "Very rarely (2 points)", "Sometimes (3 points)", "Frequently (4 points)" and "Continuously (5 points)". The scale has 9 sub-dimensions (Anxiety, Depressive Affect, Pain, Irritability, Fatigue, Bloating, Depressive Thoughts, Appetite Changes and Sleep Changes). The total score obtained from all sub-dimensions constitutes the "PMSS Total Score". The scale is scored between 44 and 220. According to the condition that the total and subscale scores exceed 50% of the highest possible score, an evaluation is made to determine whether there is PMS or not. The scale's Cronbach's Alpha value was found to be 0.75. Cronbach's Alpha for this study was determined to be 0.95.

**Emotional Eating Scale for Children and Adolescents (EES-C-T):** The scale was developed by Tanofsky-Kraff et al., by adapting the adult emotional eating scale to children/adolescents and it is a scale used to assess emotional eating in children and adolescents aged 10-18 years.<sup>12</sup> Additionally, the Turkish validity and reliability of the scale was conducted by Bektaş et al.<sup>13</sup> The scale consists of 25 items describing eating behaviours related to emotional state. The scale consists of three sub-dimensions as anxiety-anger-frustration (EES-C-AAF), depressive symptoms (EES-C-DEP), feeling unsettled (EES-C-UNS) as the reason for eating. The Cronbach's alpha coefficients for the three sub-dimensions of the original scale were 0.95, 0.92 and 0.83, respectively, whereas they were 0.86, 0.76 and 0.72 in the Turkish version. The scale has a minimum and maximum score of 25 and 125, respectively. As the score rises, eating behavior rises in reaction to negative emotional state. Cronbach's alpha value for this study was found to be 0.91.

### Statistical Analysis

The data of 242 participants were evaluated and transferred to IBM SPSS Statistics 23 programme in computer environment. Descriptive characteristics of the participants were analyzed using mean and standard deviation for continuous variables and frequency (n, %) for categorical variables. While independent sample t test was used to examine the difference between discontinuous variables with two groups, "one-way analysis of variance" test was used to examine the difference in more than two groups. The relationship between the scales was investigated using Pearson correlation analysis.

### Results

The data on the descriptive characteristics of 242 female adolescents are presented in Table 1. Among the adolescents who were included in the study, 20.2% were 9th Grade, 64.9% were between 18.5 – 24.9 BMI, 53.7% perceived

school achievement were satisfactory, 60.3% reported regular menstruation and 33.9% reported severe pain during menstruation. The mean age of the adolescents participating in the study was 14.69±1.79 (min-max: 12-18), the mean weight was 53.76±10.11 (min-max: 31-90 kg), the mean height was 160.51±6.312 (min-max: 139-178 cm), the mean age at first menarche was 12.50±1.153 (min-max: 9-16) and the mean duration of menarche was 5.52±1.37 (min-max: 2-8) (Table 1).

There was no significant correlation between BMI, education level of the father and mother, and family type of the adolescents who participated in the study and the scales, but there was a statistically significant difference between their grades and feeling the need to eat more before menarche and the mean score of EES-C-T ( $p<0.05$ ). Accordingly, the mean EES-C-T scores of adolescents who were in the 7th grade were significantly higher than adolescents in the 9<sup>th</sup> and 11<sup>th</sup> grades and adolescents who stated that they felt the need to eat more before menarche (Table 1).

There is a statistically significant difference ( $p<0.05$ ) between the school achievement levels, the regularity of menarche, the presence of pain during menarche, feeling the need to eat more before menarche and the negative effects of menarche on school and the mean score of PMSS. As a result, individuals with low school success status had mean PMSS scores that were considerably higher than those with good school accomplishment status, those with irregular menarche were significantly higher than those with regular menarche, those who reported pain during menarche, those who felt the need to eat more before menarche and those who thought that menarche had a negative effect on their schools were significantly higher (Table 1).

The mean total scores and sub-dimension scores of PMSS and EES-C-T are shown in Table 3. In the study, it was found that the mean total score of the PMS scale was above the cut-off score with 131.69±36.85 and the mean total score of the EES-C-T was below the average with 52.19±17.93 (Table 2). In addition, the presence of premenstrual syndrome was found in 74% of the adolescents in the study.

It was determined that there was a significant positive correlation between fatigue and EES-C-T, C-DEP and C-UNS, between irritability and depressive thoughts and C-DEP, and between appetite changes and EES-C-T and all its sub-dimensions ( $p<0.05$ ). Accordingly, it can be said that as fatigue related to premenstrual symptoms increases, depressive symptoms, feeling unsettled and emotional eating increase, that as irritability and depressive thoughts increase, depressive symptoms increase, that as symptoms related to appetite changes increase, emotional eating and anxiety-anger-frustration, depressive symptoms and feeling unsettled, which are the causes of emotional eating, also increase. In addition, it was determined that there was a statistically significant positive correlation between the total score of the PMS scale of the adolescents participating in the study and C-DEP, one of the sub-dimensions of the EES-C-T scale ( $p<0.05$ ). Accordingly, it can be said that as premenstrual syndromes increase, depressive symptoms, one of the causes of emotional eating, also increase (Table 3).

**Table 1.** Comparison of the difference between the scales and sub-dimensions and sociodemographic variables by groups (N: 240)

Variables	n	%	PMSS Mean ± SD	EES-C-T Mean ± SD	
Grade	7 <sup>th</sup> Grade (1)	32	13.2	127.75±37.45	63.78±17.15
	8 <sup>th</sup> Grade (2)	41	16.9	128.29±39.04	54.51±20.78
	9 <sup>th</sup> Grade (3)	49	20.2	121.02±39.58	46.28±16.73
	10 <sup>th</sup> Grade (4)	39	16.1	142.10±34.57	55.82±19.21
	11 <sup>th</sup> Grade (5)	41	16.9	133.43±31.04	45.87±12.61
	12 <sup>th</sup> Grade (6)	40	16.5	139.47±35.93	50.70±15.07
	F/p			2.003/ .079	<b>5.782/ .000</b> **a,b
BMI	< 18.5 (1)	60	24.8	126.31±40.18	55.11±19.33
	between 18.5 – 24.9 (2)	157	64.9	132.66±36.78	51.71±17.50
	between 25 – 29.9 (3)	20	8.3	136.45±29.11	46.60±17.41
	30 or higher (4)	5	2.1	146.80±18.41	54.20±13.49
	F/p			.851/ .467	1.240/ .296
Father's Level of Education	Primary School (1)	78	32.2	126.25±38.62	49.97±14.84
	Secondary School (2)	71	29.3	136.02±34.26	52.6±17.48
	High School (3)	60	24.8	134.46±37.19	52.81±20.06
	University (4)	33	13.6	130.18±37.28	55.36±21.44
	F/p			1.025/ .382	.777/ .508
Mother's Level of Education	Primary School (1)	122	50.4	130.69±38.73	51.06±17.07
	Secondary School (2)	51	21.1	139.03±35.54	49.13±17.12
	High School (3)	49	20.2	130.28±30.87	56.75±20.12
	University (4)	20	8.3	122.50±41.19	55.65±18.15
	F/p			1.146/ .331	1.982/ .117
Family Type	Nuclear Family	195	80.6	130.67±37.21	51.85±18.48
	Extended Family	47	19.4	135.93±35.37	53.57±15.55
	t/p			-.879/ .380	-.589/ .557
Perceived school achievement	Poor (1)	23	9.5	152.86±30.30	59.26±22.82
	Satisfactory (2)	130	53.7	133.36±35.88	50.95±16.54
	Good (3)	89	36.8	123.78±37.65	52.16±18.29
	F/p			<b>6238/ .002</b> **a	2.115/ .123
Regularity of menarche	Yes	146	60.3	125.84±36.90	51.79±18.57
	No	96	39.7	140.58±35.13	52.79±17.00
	t/p			<b>3.096/ .002</b>	.422/ .673
Presence of Pain during Menarche	None (1)	17	7.0	110.58±38.45	56.41±22.08
	Mild/Moderate (2)	143	59.1	125.26±37.78	52.62±18.23
	Severe (3)	82	33.9	147.28±28.88	50.56±16.48
	F/p			<b>13.580/ .000</b> **a	.849/ .429
Feeling the need to eat more before menarche	Yes	114	47.1	140.61±32.77	54.77±16.88
	No	128	52.9	123.75±38.55	49.89±18.59
	t/p			<b>-3.642/ .000</b>	<b>-2.128/ .034</b>
Menarche having a negative impact on school	Yes	145	59.9	142.09±33.47	51.08±17.18
	No	97	40.1	116.14±36.35	53.83±18.98
	t/p			<b>-5.709/ .000</b>	1.168/ .244

t: Independent sample t test; F: One-way ANOVA test; a: 1-3; b: 1-5; \* $p < 0.05$ ; \*\* $p < 0.001$

**Table 2.** Mean PMS Scale and EES-C-T Scores of Adolescents

	Minimum	Maximum	Mean ± SD
PMSS total	<b>44.00</b>	<b>212.00</b>	<b>131.69±36.85</b>
Depressive Affect	7.00	35.00	21.50±6.81
Anxiety	7.00	35.00	18.54±6.77
Fatigue	6.00	64.00	20.81±6.67
Irritability	5.00	25.00	15.94±5.80
Depressive thoughts	7.00	35.00	21.05±7.67
Pain	3.00	15.00	8.93±3.69
Changes in Appetite	3.00	15.00	9.41±3.97
Sleep changes	3.00	15.00	8.89±3.59
Bloating	3.00	15.00	6.57±3.43
EES-C-T	<b>25.00</b>	<b>113.00</b>	<b>52.19±17.93</b>
EES- C-AAF	13.00	57.00	25.28±10.21
EES-C-DEP	6.00	30.00	14.55±5.08
EES-C-UNS	6.00	26.00	12.35±4.71

**Table 3.** Analysing the Relationship between Scale and Sub-Dimensions

		EES-C-T	C-AAF	C-DEP	C-UNS
Depressive Affect	r	-.005	-.025	.037	-.006
	p	.933	.696	.568	.931
Anxiety	r	.023	.006	.060	.012
	p	.717	.931	.351	.854
Fatigue	r	.136	.101	.156	.130
	p	<b>.034</b>	.117	<b>.015</b>	<b>.043</b>
Irritability	r	.126	.097	.145	.113
	p	.050	.133	<b>.024</b>	.079
Depressive thoughts	r	.097	.085	.129	.045
	p	.133	.186	<b>.045</b>	.486
Pain	r	.012	.025	.019	-.031
	p	.858	.701	.764	.636
Changes in appetite	r	.350	.290	.390	.282
	p	<b>.000</b>	<b>.000</b>	<b>.000</b>	<b>.000</b>
Sleep changes	r	.017	.007	.025	.023
	p	.787	.909	.694	.722
Bloating	r	.069	.050	.121	.024
	p	.285	.439	.060	.716
PMS total	r	.115	.087	.154	.084
	p	.074	.178	<b>.017</b>	.194

r: Pearson correlation analysis

\* $p < 0.05$ \*\*  $p < 0.001$ 

It was determined that there was a significant positive correlation between fatigue and EES-C-T, C-DEP and C-UNS, between irritability and depressive thoughts and C-DEP, and between appetite changes and EES-C-T and all its sub-dimensions ( $p < 0.05$ ). Accordingly, it can be said that as fatigue related to premenstrual symptoms increases, depressive symptoms, feeling unsettled and emotional eating increase, that as irritability and depressive thoughts increase, depressive symptoms increase, that as symptoms related to appetite changes increase, emotional eating and anxiety-anger- frustration, depressive symptoms and feeling unsettled, which are the causes of emotional eating, also increase. In addition, it was determined that there was a statistically significant positive correlation between the total score of the PMS scale of the adolescents participating in the study and C-DEP, one of the sub-dimensions of the EES-C-T scale ( $p < 0.05$ ). Accordingly, it can be said that as premenstrual syndromes increase, depressive symptoms, one of the causes of emotional eating, also increase (Table 3).

## Discussion

In this study, which aim to understand the connection between emotional eating behaviors and premenstrual syndrome symptoms in adolescents, premenstrual syndrome was found to affect 74% of the participants. Premenstrual syndrome is defined as a condition that manifests itself with disturbing physical, behavioural and psychological symptoms without an underlying psychiatric disease.<sup>17,18</sup> Changes in cognitive and emotional processes are thought to be related to the etiology of PMS. There are few epidemiological studies specific to this age group in Turkey, and it is reported that the incidence of PMS, especially among secondary school students, varies between 18.9% and 55.9%.<sup>19,20</sup> In community studies conducted in Turkey, the prevalence of PMS was found to vary between 5.9% and 76%.<sup>21,22</sup> However, the group in which these studies were concentrated was university students and there is a need for more studies in this field since there is no literature on this subject in the 12-18 age range. In addition, the prevalence of adolescents with PMS in our study is similar to other studies.

The prevalence of PMS in adolescents may vary depending on many factors such as family structure, dietary patterns depending on the region of residence, and character traits.<sup>23</sup> There is a need for prevalence studies covering Turkey in general and interventional studies aimed at identifying risk groups and reducing symptom severity.

When we examine the differences between the scales and sociodemographic variables, which constitute another dimension of the study, it is a remarkable finding that there is no significant relationship between BMI and the scales (Table 1). This result is in line with cross-sectional studies carried out in the UK by Hashim et al. and in Turkey by Isgin-Atici et al., who found no discernible variation in anthropometric measures between PMS patients.<sup>23,24</sup> However, it contradicts studies with adolescent girls aged 11-21 years from Pakistan, Korea, Iran, and the USA, which emphasise that having a high BMI is a risk factor for PMS severity and menstrual irregularity.<sup>25-29</sup> Emotional eating is also defined as eating based on mood without feeling hungry, eating beyond mealtimes or without social obligation, and is considered as a coping mechanism for some children.<sup>12,13,24</sup> Emotional eating may lead to weight gain, hence obesity. However, the fact that the BMI of our study group was at normal values suggested that it had a positive impact on both emotional eating and PMS.

PMS sub-dimensions and emotional eating were shown to be significantly correlated, despite the fact that there was no association between the EES-C-T and PMS scales. It is seen that emotional eating is affected as fatigue, irritability, depressive thoughts and feeling unsettled, which are the sub-dimensions of PMS related to premenstrual symptoms, increase, and that anxiety- anger- frustration, depressive symptoms and feeling unsettled, which are one of the causes of emotional eating, also increase. According to studies on the topic, women who have Premenstrual Dysphoric Disorder (PMDD), a more severe form of PMS that significantly impairs a person's functioning, consume more calories in the late luteal phase of the cycle and also have a strong desire to eat sugary or fatty foods during this time.<sup>30-31</sup> In another study, researchers reported that women with PMDD increasingly engaged in uncontrolled eating from the

follicular phase to the late luteal phase.<sup>32</sup> In a study evaluating eating behaviours, depression and impulsivity simultaneously, the results showed that women with PMDD commonly reported uncontrolled eating behaviours and were correlated with both depression and impulsivity.<sup>33</sup> Çoban et al. also found that there was a significant relationship between PMDD and both emotional and uncontrolled eating.<sup>34</sup> Although our study is similar in terms of the relationship between PMS and depressive symptoms, one of the sub-dimensions of emotional eating, and although the mean scores of the EES-C-T scale were significantly higher in adolescents who felt the need to eat more before menarche, it also suggests that multicenter studies to be conducted in our country that address regional and cultural differences and compare different phases in the menstrual cycle are needed. This study has certain limitations. Firstly, the data obtained are limited to adolescents with normal BMI between the ages of 12 and 18, and cannot be generalized to all age groups. Secondly, differences in adolescence of lower and upper age groups (12-18 years) may affect premenstrual syndrome levels and food consumption habits. Finally, the data were evaluated in accordance with the personal answers given to the questions included in the measurement tool.

### Conclusion

This study is one of the first studies emphasizing the high prevalence rate of PMS in the early adolescent population in our country. The severity of PMS is significantly correlated with dietary patterns and lifestyle choices (smoking, eating foods high in calories, fat, sugar, and salt, etc.), and whole grain, fruit, and vegetable diets, as well as foods high in antioxidants, are effective in preventing PMS and can lessen dysmenorrhea.<sup>35,36</sup> There is a need for better detection and management of PMS in the adolescent group. Due to the rapid growth in this period, nutritional quality, adequate and balanced consumption of energy and nutrients are of great importance. On the other hand, frequent consumption of ready-to-eat foods due to increased time spent outside the household and irregular lifestyle may cause inadequate fulfilment of nutritional requirements and may increase the severity of PMS. If adolescence, which is a stage of life in which the individual undergoes rapid changes in many social, biological and psychological aspects, and the rapid changes brought about by adolescence cannot be coped with, the mental health of young girls can be negatively affected. In addition, it should be taken into consideration that physical activity, lifestyle and stress/anxiety may also affect the menstrual cycle in adolescents in addition to dietary habits. Educational programmes should be designed to increase awareness about nutrition and lifestyle habits and risky behaviours affecting PMS symptoms in this group. Interventional studies are needed to investigate the hormonal, molecular and genetic changes associated with PMS in early adolescence.

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### Conflict of Interest

The authors have no conflicts of interest to disclose.

### Compliance with Ethical Statement

The study was approved by the Clinical Studies Ethics Committee of Kahramanmaraş Sütçü İmam University (Date: 2022/272, Decision No: 04) and institutional permission from

the school where the study was conducted were obtained. Written informed consent was obtained from all participants before enrollment into the study.

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### Author Contributions

SYÇ, ST, MA: Study idea/Hypothesis; ST, MA: Data Preparation; SYÇ: Analysis; SYÇ, ST: Literature Review; SYÇ, ST: Writing; SYÇ, ST: Critical Review.

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