ANATOLIAN JOURNAL OF HEALTH RESEARCH

Original Article

2025; 6(3): 170-175
http://dx.doi.org/10.61534/anatoljhr.1599895

Determining the relationship between smoking behaviors and menstrual irregularity in women

Kadınlarda sigara içme davranışları ile menstrual düzensizlik arasındaki ilişkinin belirlenmesi

Nurgül Şimal Yavuz[1], Didem Şimşek Küçükkelepçe[1], Zehra Gölbaşı[2]

[1]Lokman Hekim University, Faculty of Health Sciences, Department of Midwifery, Ankara, Türkiye
[2]Lokman Hekim University, Faculty of Nursing, Department of Obstetrics and Gynecology Nursing, Ankara, Türkiye

ABSTRACT

Aim: Considering the increasing trend of smoking rates among women, it is thought that there is a need for studies examining the relationship between menstrual irregularities and smoking in women of reproductive age. This study was carried out to determine the relationship between women's smoking behaviors and menstrual irregularities.

Method: This cross-sectional and correlational study was conducted between November-December 2022 among women aged 18-49 years in Türkiye. Data were collected using a personal information form and the Fagerstrom Nicotine Dependence Test. Data collection tools were made online through Google Forms and the link was shared with the participants via e-mail and WhatsApp messenger application. Descriptive statistics, independent t-test, ANOVA and Post hoc analyses, correlation and regression analyses were used for statistical analysis of the study. In statistical analyses, p<0.05 was accepted as significant.

Results: The study was completed with 630 women. The study showed that the mean total nicotine dependence of women was 3.06±2.47, and 11% were highly nicotine dependent. The regression analysis showed that the relationship between the nicotine dependence total score and menstrual pain severity was significant (F=7.168; p<0.05). The nicotine dependence total score increased the level of menstrual pain severity (ß=0.106).

Conclusion: This study demonstrated that smoking may be a risk factor for menstrual irregularities and that the level of nicotine dependency affects the severity of dysmenorrhea. Raising awareness about reducing smoking in women with menstrual irregularities is important for improving both women's and public health.

Keywords*:* dysmenorrhea; menstrual cycle; smoking; woman

ÖZ

***Amaç*:** Kadınlar arasında sigara içme oranlarının artan eğilimi göz önüne alındığında, üreme çağındaki kadınlarda menstrual düzensizliklerin sigara kullanımı ile ilişkisini inceleyen çalışmalara ihtiyaç olduğu düşünülmektedir. Bu çalışma, kadınların sigara içme davranışları ile menstrual düzensizlikler arasındaki ilişkiyi belirlemek amacıyla yapılmıştır.

Yöntem: Kesitsel ve ilişkisel tipte olan bu araştırma, Kasım-Aralık 2022 tarihleri arasında Türkiye'de 18-49 yaş arası kadınlar arasında yapılmıştır. Veriler kişisel bilgi formu ve Fagerstrom Nikotin Bağımlılığı Testi kullanılarak toplanmıştır. Veri toplama araçları Google Forms aracılığıyla çevrimiçi hale getirilmiş ve bağlantı e-posta ve WhatsApp messenger uygulaması aracılığıyla katılımcılarla paylaşılmıştır. Çalışmanın istatistiksel analizi için tanımlayıcı istatistikler, bağımsız t-testi, ANOVA ve Post hoc analizleri, korelasyon ve regresyon analizleri kullanılmıştır. İstatistiksel analizlerde p<0.05 anlamlı olarak kabul edilmiştir.

Bulgular: Çalışma 630 kadınla tamamlanmıştır. Bu çalışma kadınların ortalama toplam nikotin bağımlılığının 3.06±2.47 olduğunu ve %11'inin yüksek düzeyde nikotin bağımlısı olduğunu gösterdi. Regresyon analizi nikotin bağımlılığı toplam puanı ile menstrual ağrı şiddeti arasındaki ilişkinin anlamlı olduğunu gösterdi (F=7.168; p<0.05). Nikotin bağımlılığı toplam puanı menstrual ağrı şiddeti düzeyini artırmıştır (ß=0.106).

Sonuçlar: Bu çalışma, sigara içmenin adet düzensizlikleri için bir risk faktörü olabileceğini ve nikotin bağımlılık düzeyinin dismenore şiddetini etkilediğini göstermiştir. Menstrual düzensizliği olan kadınlarda sigara kullanımının azaltılması konusunda farkındalığın artırılması hem kadın hem de toplum sağlığının iyileştirilmesi açısından önemlidir.

Anahtar kelimeler*:* dismenore; kadın; menstrual siklus; sigara içme

Introduction

Menstruation a period of uterine bleeding that begins with menarche and ends with menopause, is regulated by the production of estrogen and progesterone, and occurs during a critical stage in a woman's life (Taheri et al., 2020). The menstrual cycle is one of the most important indicators of women's health, and its regularity is crucial. A healthy menstrual cycle should begin between the ages of 9 and 15 years old, the time between two bleedings should be between 21 and 35 days, and the duration of bleeding should be between 3 and 7 days. Cycles outside these limits are regarded as menstrual irregularities (Kulshrestha & Durrani, 2019; Matteson & Zaluski, 2019). The most common menstrual irregularities include dysmenorrhea, amenorrhea, polymenorrhoea, metrorrhagia, hypomenorrhea, oligomenorrhoea, and menorrhagia (Kulshrestha & Durrani, 2019). Evidence shows that the incidence of women with any form of menstrual irregularity is 24% in Pakistan (Kollipaka et al., 2013; Dars et al., 2014); 76.9% in India (Kulshrestha & Durrani, 2019); 21.1% in Korea (Song et al., 2022); and 23.4% in Türkiye (Simsek Kucukkelepce et al., 2021). Menstrual irregularities affect 8.4%-76.9% of women, albeit this varies depending on the features of the study group (Adam et al., 2020; Kulshrestha & Durrani, 2019; Kwak et al., 2019; Laksham et al., 2019; Sakai & Ohashi 2021; Taheri et al., 2020). Age, age of first menstruation, dietary habits,

Corresponding Author: Nurgül Şimal Yavuz, Lokman Hekim University, Faculty of Health Sciences, Department of Midwifery, Ankara, Türkiye
Phone: +90 554 234 8957, E-mail: nurgul.yavuz@lokmanhekim.edu.tr
Received: 11.12.2024, Revision: 09.07.2025, Accepted: 04.11.2025

physical activity level, body mass index, ethnicity, stress, caffeine consumption, and alcohol use are reported to be associated with menstrual irregularities (Ju et al., 2015; Bae et al., 2018; Kwak et al., 2019). Smoking is also highlighted as one of the factors affecting menstrual irregularity (Arafa et al., 2018; Kwak et al., 2019; Şahin et al., 2015). Nicotine, the main ingredient of cigarettes, is a vasoconstrictor and causes decreased endometrial blood flow, and cigarette smoke may have an anti-estrogenic effect and lead to menstrual irregularities (Arafa et al., 2018; Qin et al., 2020).

According to the World Health Organization's (WHO) Global Report on Trends in Prevalence of Tobacco Use 2000-2025, smoking among increases steadily from the 15–24 age group, peaking in the 55–64 age group (WHO, 2019). Data from the Turkish Statistical Institute show that while the rate of women using tobacco every day was 12.3 in 2010, it increased to 14.9 in 2019 (Turkish Statistical Institute [TUİK], 2019). Given the rising trend of female smoking rates, it appears that studies evaluating the association between menstrual irregularities and smoking in women of reproductive age are required. The studies that have been undertaken to investigate the association between smoking and menstrual irregularities have been fairly limited, and the smoking parameter has not been addressed separately (Bae et al., 2018; Elbi et al. 2018; Jung et al., 2017). This research aimed to examine the association between smoking habits and menstrual irregularities in women.

Methods

Study design and data collection

This cross-sectional and correlational study was conducted in Türkiye between November and December 2022 to determine the relationship between women's smoking behaviour and menstrual irregularities. In the sample calculation, the data obtained from the descriptive study conducted by Kaya and Gölbaşı (2016) were taken as reference. The minimum sample size to be included in the analysis with an effect size of 0.255, 80% power and 5% significance level (α=0.05) was determined as 484 women. The calculation was made using G*Power 3.1.9.7 programme. The study was completed with 630 women who participated in the online questionnaires. Inclusion criteria: Being between 18-49 years of age, being a smoker or former smoker and having an ongoing menstrual cycle. Women who did not meet these criteria were excluded from the study. Data collection tools were converted online via Google Forms, and the link was shared with the participants via e-mail and the WhatsApp messenger application. Participants were also requested to share this link with others to increase sample size. The first page of the questionnaire form has statements explaining the aim of the study, the responsible researchers, and the participants' agreement. Completing the questionnaire took approximately 10 minutes.

Data collection tools

Data were collected using the Personal Information Form, developed by the researchers based on relevant literature, and the Fagerstrom Test for Nicotine Dependence.

The personal information form

Developed by the researchers after reviewing the literature, the form consists of 16 questions regarding descriptive characteristics (age, education level, smoking, etc.) and menstrual cycle (age of first menstruation, duration of menstrual bleeding, menstrual irregularity, having a family member with menstrual irregularity, etc.). (Fernández-Martínez et al., 2018; Laksham et al., 2019; Uçar et al., 2015; Yaşar et al., 2020).

The Fagerstrom Test For Nicotine Dependence

The Fagerstrom nicotine dependence test was used to evaluate the nicotine dependence level of the participants. The test was first published by Fagerstrom in 1978 as the "Fagerstrom Tolerance Questionnaire" (Fagerstrom, 1978) and then revised in 1991 and named the "Fagerstrom Test for Nicotine Dependence". The Turkish validity and reliability of the test were performed by Uysal et al. (2004). It consists of six items, and the minimum and maximum scores to be obtained from the test are 0 and 10. The scoring of nicotine addiction is as follows: 0-3: low, 4-6: moderate, and 7-10: high. The Turkish reliability coefficient of the scale was reported as 0.56 (Uysal et al., 2004), while in the current study, Cronbach's alpha was found to be 0.71.

Data analysis

The research data were evaluated using the SPSS 22.0 statistical program. Frequency and percentage analyses were used to determine the descriptive characteristics of the women involved in the study, and the mean and standard deviation statistics were used to examine the scale. Kurtosis and skewness values were examined to assess the normality of variable distributions (Table 2). In evaluating normality, skewness and kurtosis values within the range of ±2.0 were considered acceptable, based on the guideline by George and Mallery (2010). The data were analyzed using parametric approaches. Pearson correlation and linear regression analysis were used to investigate the links between the dimensions determining scale levels. T-tests, one-way ANOVA, and post hoc (Tukey, LSD) analyses were employed to investigate differences in scale levels based on women's descriptive characteristics. A significance level of $p<0.05$ was used for all statistical tests.

Ethical approval

This study was approved by Lokman Hekim University Non-Interventional Clinical Research Ethics Committee (Date: 22 May 2022, Decision No: 2022/72). All procedures were conducted in accordance with the principles of the Helsinki Declaration and ethical standards for publication. Artificial intelligence-assisted technologies (e.g., Large Language Models [LLMs], chatbots, or image generators) were not used at any stage of this study.

Results

Table 1 presents the distribution of women in the study according to their descriptive characteristics. According to the results, the mean age of the women was 28.99±5.45, the mean body mass index was 23.40±4.33, and the mean age of first menstruation was 13.17±1.41. 24.7% of the women were university graduates, 64.6% had normal body weight, 80.8% were current smokers, and the mean duration of smoking was 8.17±5.09 years. Regarding the menstrual characteristics of the women, it was determined that 81.0% of the women had regular menstruation, 86.5% had menstruation with a frequency between 21 and 35 days, and 84% had menstruation lasting between 3-7 days. 44.8% had a history of menstrual irregularity, 35.7% had consulted a doctor because of menstrual irregularity, 37.6% had a family history of menstrual irregularity, and 83.8% had painful menstruation.

Table 1. Descriptive characteristics of women

Groups	Mean	SD	Groups	Mean	SD	Groups	Mean	SD
Age	28.990	5.451	**BMI**	23.403	4.334	**Menstrual pain severity**	5.800	3.060
Weight	63.690	12.626	**Age of first menstruation**	13.170	1.415	**Duration of smoking**	8.170	5.090
Height	164.880	5.867						
	n	**%**		**n**	**%**		**n**	**%**
Education level			**Menstrual bleeding intervals**			**Menstrual pain**		
High school	29	4.6	Less than 21 days	39	6.2	Yes	528	83.8
University	162	25.7	Between 21 and 35 days	545	86.5	No	102	16.2
Post-graduate	439	69.7	More than 35 days	46	7.3			
Smoking			**Amount of menstrual bleeding**			**Menstruation pattern**		
Former smoker	121	19.2	Light	83	13.2	Regular	510	81.0
Current smoker	509	80.8	Normal	388	61.6	Irregular	120	19.0
Duration of smoking			**Family history of menstrual irregularity**			Heavy	159	25.2
5 years and less	217	34.4	Yes	237	37.6	Less than 3	20	3.1
6-10 years	270	42.9	No	393	62.4	3-7 days	529	84.0
10 years or more	143	22.7				More than 7 days	81	12.9
Body mass index (BMI)			**History of menstrual irregularities**			**Visiting a doctor for menstrual irregularity**		
Weak	45	7.1	Yes	282	44.8	Yes	225	35.7
Normal	407	64.6	No	348	55.2	No	405	64.3
Overweight	128	20.4						
Obese	50	7.9						

The mean total nicotine dependence score of the women was found to be 3.060±2.477 (Table 2). The analyses performed to examine the differentiation of the nicotine addiction score of the women according to their descriptive characteristics are shown in Table 3.

Table 2. Mean nicotine dependence scores and distribution

	Mean ± SD	Min.-Max.	Scale Min-Max	Kurtosis	Skewness
Total	3.060±2.47	0.000-9.000	0-10	-0.759	0.507
Groups	**n**		**%**		
Nicotine dependence					
Low	379		60.1		
Moderate	182		28.9		
High	69		11.0		

The total nicotine dependence scores of the women did not differ significantly (p>0.05) according to their educational status, BMI value, menstruation pattern, menstrual bleeding intervals, menstrual length, duration of menstruation, amount of menstrual bleeding, history of menstrual irregularities, family history of menstrual irregularities, visiting a doctor for menstrual irregularities, and menstrual pain (p>0.05). The total nicotine dependence scores of the former smokers (x=2.430) were found to be lower than scores of the current smokers (x=3.210) (t=-3.138; p<0.05; d=0.317; η2=0.015). The total nicotine dependence scores of the former smokers (x=2.430) were found to be lower than scores of the current smokers (x=3.210) (t=-3.138; p<0.05; d=0.317; η2=0.015). Total nicotine dependence scores of women showed a significant difference according to the duration of smoking (p<0.05; η2=0.109). In the analysis performed to determine the reason for the difference, it was determined that the total scores of those who smoked for 10 years or more were higher than those who smoked for 6-10 years and those who smoked for 5 years or less (p<0.05).

Table 3. Differentiation of nicotine dependence scores according to descriptive and menstrual pattern characteristics

Variables	n	Mean ± SD		Variables	n	Mean ± SD	
Education level				**Menstrual bleeding intervals**			
High school	29	3.830±2.633	F^1 / p	Less than 21 days	39	3.100±2.573	F / p
University	162	3.100±2.481	1.582 / 0.206	Between 21 and 35 days	545	3.050±2.455	0.042 / 0.959
Post-graduate	439	2.990±2.461		More than 35 days	46	3.150±2.700	
BMI				**Duration of smoking**			F / p
Underweight	45	2.980±2.589	F / p	5 years and less	217	1.990±1.996	38.173 / <0.001
Normal weight	407	3.100±2.444	0.335 / 0.800	6-10 years	270	3.410±2.446	
Overweight	128	3.090±2.566		10 years and more	143	4.030±2.612	Post Hoc^3=
Obese	50	2.740±2.456					2>1, 3>1, 3>2
Smoking			t^2 / p	**Menstruation pattern**			t / p
Former smoker	121	2.430±2.513	-3.138 / **0.002**	Regular	510	3.050±2.481	-0.318 / 0.751
Current smoker	509	3.210±2.446		Irregular	120	3.120±2.468	
Menstruation length				**Amount of menstrual bleeding**			
Less than 3 days	20	3.250±2.731	F / p	Light	83	3.570±2.480	F/ p
Between 3 and 7 days	529	3.090±2.459	0.590 / 0.554	Normal	388	2.940±2.451	2.254 / 0.106
More than 7 days	81	2.790±2.538		Heavy	159	3.100±2.516	
History of menstrual irregularities			t / p	**Family history of menstrual irregularity**			t / p
Yes	282	3.140±2.439	0.711 / 0.477	Yes	237	3.030±2.563	-0.275 / 0.783
No	348	3.000±2.508		No	393	3.080±2.426	
Visiting a doctor for menstrual irregularity			t / p	**Menstrual pain**			t / p
Yes	225	3.100±2.416	0.283 / 0.777	Yes	528	3.130±2.487	1.669 / 0.096
No	405	3.040±2.512		No	102	2.690±2.396	

[1]ANOVA test, [2] Independent groups t-test, [3] Tukey - LSD.

Table 4. Correlation analysis

	Nicotine dependence total (r)
Age	-0.005
BMI	-0.010
Age of first menstruation	-0.026
Menstrual pain severity	0.106**

**<0.01; Pearson correlation analysis.

The correlation analyses between nicotine dependence total scores, age, BMI, age of first menstruation, and menstrual pain severity revealed a positive correlation of r=0.106 between menstrual pain severity and nicotine dependence total score at a very weak (p<0.05) level. Correlation relationships between other variables were not statistically significant (p>0.05) (Table 4).

Table 5. The effect of nicotine dependence on the severity of menstrual pain

Independent variable	Unstandardised Coefficients		Standardised Coefficients	t / p	VIF	95% Confidence Interval	
	ß(0)	SE	ß(1)			Lower	Upper
Constant	5.403	0.193		27.999 **<0.001**		5.024	5.782
Nicotine dependence total	0.131	0.049	0.106	2.677 **0.008**	1.000	0.035	0.228

*Dependent variable: The severity of menstrual pain, R=0.106, R^2=0.010, F=7.168, p<0.001, Durbin Watson Değeri=2.063, Linear regression analysis

The regression analysis performed to determine the cause-and-effect relationship between nicotine dependence total score and menstrual pain severity was found to be significant (F=7.168; p<0.05). The total change in menstrual pain severity was explained by nicotine dependence total score at a rate of 1% (R^2=0.010). Nicotine dependence total score increased the level of menstrual pain severity (ß=0.106) (Table 5).

Discussion

This study, conducted to examine the relationship between smoking and menstrual irregularities, is discussed with the relevant literature.

The incidence of menstrual irregularities in women is reported to vary in a wide range between 8.4% and 76.9% (Adam et al., 2020; Kulshrestha & Durrani, 2019; Kwak et al., 2019; Laksham et al., 2019; Nohara et al., 2011; Sakai & Ohashi, 2021; Taheri et al., 2020; Toffol et al., 2014). However, few studies have examined the relationship between smoking and menstrual irregularities (Bae et al., 2018; Elbi et al., 2018; Jung et al., 2017). Bae et al. (2018) determined that 10.3% of women who smoked experienced menstrual irregularity, and this relationship was statistically significant. In another study, it was emphasized that lifelong smoking and the current smoking status of women caused menstrual irregularity (Jung et al., 2017). In this study, 19% of women who were current or former smokers reported monthly irregularities, although the link between smoking and menstrual irregularity was not statistically significant.

In terms of menstrual cycle length, duration, and amount, most smokers in this study fall within the usual range. Contrary to our findings in most of the research, women who smoke report various sorts of menstrual irregularities (Bae et al., 2018; Jung et al., 2017; Kulshrestha & Durrani, 2019). The fact that all women were included in the sample group without specifying the age range may explain why the majority of the participants in this study had menstrual patterns within the usual range.

In this study, no significant relationship was found between nicotine dependence and the incidence of dysmenorrhea. In the literature, studies evaluated smoking, not nicotine addiction. Many studies, including ours, concluded that smoking did not affect the frequency of dysmenorrhea (Aykut et al., 2007; Fernández-Martínez et al., 2018; Seven et al., 2014; Unsal et al., 2010; Yaşar et al., 2020). However, contrary to our findings, some studies show a link between smoking and dysmenorrhea (Ivanova Panova et al., 2022; Jenabi et al., 2018; Şahin et al., 2015). In contrast to this study, Qin et al. (2020) indicated that both current and former smoking was related to dysmenorrhea. This disparity between studies is assumed to be owing to sample group characteristics (age, lifestyle disparities, etc.) and how smoking was questioned throughout the data collection phase.

In this study, there was no relationship between nicotine addiction and the frequency of dysmenorrhea, but there was a significant relationship between nicotine addiction and the severity of dysmenorrhea. As the nicotine dependence of the women in the study increased, the severity of menstrual pain also increased. The most significant feature of nicotine as the primary component in cigarettes is that it is a vasoconstrictor. This characteristic is hypothesized to cause dysmenorrhea by decreasing endometrial blood flow. Endometrial blood flow (Güvey, 2019; Qin et al., 2020). Only one study was encountered in the literature that investigated the relationship between dysmenorrhea severity and smoking, and it was discovered that smoking exacerbated the severity of dysmenorrhea (Burnett et al., 2005) , which is consistent with this study results.

Limitations of the Study

The main identified limitations of the study are that the data were collected online and that the majority of the participants had a postgraduate degree.

Conclusion

In conclusion, this study demonstrated that smoking may be a risk factor for menstrual irregularities and that a high level of nicotine dependence worsens the severity of dysmenorrhea. Given the association between smoking and menstrual irregularities, it is recommended that smoking be prevented and smoking cessation programs for smokers be implemented more successfully to enhance Turkish women's reproductive health. It is also recommended to conduct further comprehensive studies on the subject.

Ethics Committee Approval

Ethics committee approval was obtained from Non-Interventional Clinical Research Ethics of Lokman Hekim University (Board Decision No: 2022/72) on May 22, 2022.

Informed Consent

Written consent was obtained from the participants.

Peer-Review

Externally peer-reviewed.

Author Contributions

N.S.Y.: Design, Data Collection and/or Processing, Analysis and/or Interpretation, Literature Review, Writing, Critical Review.

D.S.K.: Design, Supervision, Writing, Critical Review.

Z.G.: Design, Critical Review.

Conflict of Interest

There is no conflict of interest.

Sources of Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

References

Adam, A. M., Mosaad, H. K., & Fadlalmola, H. A. (2020). Menstrual disorders among nursing students at Al Neelain University, Khartoum State. *Sudan Journal of Medical Sciences*, *15*(2), 199–214. https://doi.org/10.18502/SJMS.V15I2.7067

Arafa, A. E., Senosy, S. A., Helmy, H. K., & Mohamed, A. A. (2018). Prevalence and patterns of dysmenorrhea and premenstrual syndrome among Egyptian girls (12–25 years). *Middle East Fertility Society Journal*, *23*(4), 486–490. https://doi.org/10.1016/J.MEFS.2018.01.007

Aykut, M., Gunay, O., Gun, I., Balcı, E., Ozdemir, M., & Ozturk, Y. (2007). The effect of biological, socio-demographic and nutritional factors on the prevalence of dysmenorrhoea [Biyolojik, sosyo-demografik ve nutrisyonel faktorlerin dismenore prevalansına etkisi]. *Erciyes Medical Journal*, *29*(5), 393–402.

Bae, J., Park, S., & Kwon, J.-W. (2018). Factors associated with menstrual cycle irregularity and menopause. *BMC Women's Health*, *18*(36), 1–11. https://doi.org/10.1186/s12905-018-0528-x

Burnett, M. A., Antao, V., Black, A., Feldman, K., Grenville, A., Lea, R., Lefebvre, G., Pinsonneault, O., & Robert, M. (2005). Prevalence of primary dysmenorrhea in Canada. *Journal of Obstetrics and Gynaecology Canada*, *27*(8), 765–770. https://doi.org/10.1016/S1701-2163(16)30728-9

Dars, S., Khashia, S., & Zara, Y. (2014). Relationship of menstrual ırregularities to BMI and nutritional status in adolescent girls. *Pakistan Journal of Medical Sciences, 30*(1), 140-144. http://dx.doi.org/10.12669/pjms.301.3949

Elbi, H., Aktas, A., Rahman, S., Altan, S., & Ozyurt, B. C. (2018). Self-reported prevalence of tobacco use; ıncluding the fagerstrom test, among an university students, Turkey. *The Journal of Tepecik Education and Research Hospital*, *28*(1), 33–38. https://doi.org/10.5222/TERH.2018.033

Fagerström, K.O. (1978). Measuring degree of physical dependence to tobacco smoking with reference to individualization of treatment. *Addictive Behaviors, 3*(3–4): 235–241. https://doi.org/10.1016/0306-4603(78)90024-2

Fernández-Martínez, E., Onieva-Zafra, M. D., & Laura Parra-Fernández, M. (2018). Lifestyle and prevalence of dysmenorrhea among Spanish female university students. *PLoS ONE*, *13*(8), e0201894. https://doi.org/10.1371/JOURNAL.PONE.0201894

George, D., & Mallery, M. (2010). *SPSS for windows step by step: A simple guide and reference,* 17.0 update (10a ed.). Pearson.

Güvey, H. (2019). Primary dysmnorhea in adolescents and therapeutic approaches. *Jinekoloji-Obstetrik ve Neonatoloji Tıp Dergisi*, *16*(3), 160–166. https://orcid.org/0000-0002-8603-6981

Ivanova Panova, D., Zafirova Ivanovska, B., Jovanovska, V., Dimitrov, G., Boshku, A. A., & Ilijevska, V. D. (2022). 125 Dysmenorrhea among young student population-epidemiological analysis. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, *273*, e53. https://doi.org/10.1016/j.ejogrb.2022.02.154

Jenabi, E., Khazaei, S., & Veisani, Y. (2018). The relationship between smoking and dysmenorrhea: A meta-analysis. *Women & Health, 59*(5), 524–533. https://doi.org/10.1080/03630242.2018.1508541

Ju, H., Jones, M., & Mishra, G. D. (2015). A u-shaped relationship between body mass index and dysmenorrhea: A longitudinal study. *PloS ONE*, *10(7),* 1–12. https://doi.org/10.1371/journal.pone.0134187

Jung, A. N., Park, J. H., Kim, J., Kim, S. H., Jee, B. C., Cha, B. H., Sull, J. W., & Jun, J. H. (2017). Detrimental effects of higher body mass index and smoking habits on menstrual cycles in Korean women. *Journal of Women's Health*, *26*(1), 90. https://doi.org/10.1089/JWH.2015.5634

Kaya, D., & Gölbaşı, Z. (2016). Prevalence of premenstrual syndrome in nursing/midwifery students and the relationship between premenstrual syndrome and smoking behaviour. *TAF Preventive Medicine Bulletin*, *15*(4), 305-311.

Kollipaka, R., Arounassalame, B., Lakshminarayanan, S. (2013). Does psychosocial stress ınfluence menstrual abnormalities in medical students? *Journal of Obstetrics and Gynaecology,* 33(5): 489–493. https://doi.org/10.3109/01443615.2013.782272

Kulshrestha, S., & Durrani, A. M. (2019). Prevalence of menstrual disorders and their association with physical activity in adolescent girls of Aligarh city. *International Journal of Health Sciences & Research*, *9*(8), 393.

Kwak, Y., Kim, Y., & Ah Beek, K. (2019). Prevalence of irregular menstruation according to socioeconomic status: A population-based nationwide cross-sectional study. *Plos One*, *14(3)*, 1–12. https://doi.org/10.1371/journal.pone.0214071

Laksham, K. B., Selvaraj, R., & Kar, S. S. (2019). Menstrual disorders and quality of life of women in an urban area of puducherry: A community-based cross-sectional study. *Journal of Family Medicine and Primary Care*, *8*(1), 140. https://doi.org/10.4103/JFMPC.JFMPC_209_18

Matteson, K. A., & Zaluski, K. M. (2019). Menstrual health as a part of preventive health care. *Obstetrics and Gynecology Clinics of North America*, *46*, 441–453. https://doi.org/10.1016/j.ogc.2019.04.004

Nohara, M., Momoeda, M., Kubota, T., & Nakabayashı, M. (2011). Menstrual cycle and menstrual pain problems and related risk factors among Japanese female workers. *Industrial Health*, *49*, 228–234.

Qin, L. L., Hu, Z., Kaminga, A. C., Luo, B. A., Xu, H. L., Feng, X. L., & Liu, J. H. (2020). Association between cigarette smoking and the risk of dysmenorrhea: A meta-analysis of observational studies. *PLoS ONE*, *15*(4), e0231201. https://doi.org/10.1371/JOURNAL.PONE.0231201

Şahin, S., Kaplan, S., Abay, H., Akalın, A., Demirhan, İ., & Pınar, G. (2015). Evaluatıon of the frequency of dysmenorrhea and associated factors among the universıty students. *Ankara Sağlık Bilimleri Dergisi*, *3*, 25–43.

Sakai, H., & Ohashi, K. (2021). Effects of past environmental tobacco smoke exposure on the menstrual cycle and menstrual phase-related symptoms: A cross-sectional study. *Journal of Obstetrics and Gynaecology Research*, *47*(1), 243–253. https://doi.org/10.1111/JOG.14496

Seven, M., Güvenç, G., Akyüz, A., & Eski, F. (2014). Evaluating dysmenorrhea in a sample of Turkish nursing students. *Pain Management Nursing: Official Journal of the American Society of Pain Management Nurses*, *15*(3), 664–671. https://doi.org/10.1016/J.PMN.2013.07.006

Simsek Kucukkelepce, D., Hazar, S., Aytop, S., & Tashan Timur, S. (2021). The correlatıon between the menstrual irregularity and eating attitude and social appearance anxiety among university students. *Munzur Üniversitesi Sosyal Bilimler Dergisi, 10*(2), 112–128. https://dergipark.org.tr/tr/download/article-file/1848799

Song, S., Choi, H., Pang, Y., Kim, O., Park, H. Y. (2022). Factors associated with regularity and length of menstrual cycle: Korea Nurses' health study. *BMC Womens Health*, *22*(1), 361. https://doi.org/10.1186/s12905-022-01947-z

Taheri, R., Ardekani, F. M., Shahraki, H. R., Heidarzadeh-Esfahani, N., & Hajiahmadi, S. (2020). Nutritional status and anthropometric indices in relation to menstrual disorders: A cross-sectional study. *Journal of Nutrition and Metabolism*, *2020*. https://doi.org/10.1155/2020/5980685

Toffol, E., Koponen, P., Luoto, R., & Partonen, T. (2014). Pubertal timing, menstrual irregularity, and mental health: Results of a population-based study. *Archives of Women's Mental Health*, *17*, 127–135. https://doi.org/10.1007/s00737-013-0399-y

Turkish Statistical Institute (TUIK) (2019, June). *Türkiye health survey, 2019*. https://data.tuik.gov.tr/Bulten/Index?p=Turkiye-Saglik-Arastirmasi-2019-33661

Uçar, T., Derya, Y. A., & Taşhan, S. T. (2015). A study on the status of and factors in irregular menstruation in university students. *TAF Preventive Medicine Bulletin, 14*(3), 221. https://doi.org/10.5455/pmb.1-1413184900

Unsal, A., Ayranci, U., Tozun, M., Arslan, G., & Calik, E. (2010). Prevalence of dysmenorrhea and its effect on quality of life among a group of female university students. *Upsala Journal of Medical Sciences*, *115*(2), 138–145. https://doi.org/10.3109/03009730903457218

Uysal, M. A., Kadakal, F., Karşidağ, C., Bayram, N. G., Uysal, O., & Yilmaz, V. (2004). Fagerstrom test for nicotine dependence: reliability in a Turkish sample and factor analysis. *Tuberk Toraks, 52*(2), 115-21.

World Health Organisation (WHO). (2019). *WHO global report on trends in prevalence of tobacco use 2000-2025, third edition*. https://www.who.int/publications/i/item/who-global-report-on-trends-in-prevalence-of-tobacco-use-2000-2025-third-edition

Yaşar, Ö., Yıldırım, D., & Turhan, S. (2020). Primary dysmenorrhea and personality. *Jinekoloji- Obstetrik ve Neonatoloji Tıp Dergisi, 17*(2), 364–367. https://doi.org/10.38136/jgon.695077

.