Research Article

THE RELATIONSHIP OF ANXIETY LEVELS OF WOMEN RECOVERING FROM COVID-19 WITH MENSTRUAL CYCLE CHANGES

Özlem KAPLAN[1], Salime MUCUK[2] Merve Gül ŞAHİN[3], Ali ÇETİNKAYA[4]

Abstract

Aim: In this study, it was aimed to determine the relationship between anxiety levels of women recovering from COVID-19 and menstrual cycle changes.

Method: A descriptive cross-sectional study was conducted between 25 October 2021 and 27 February 2022 on 324 women who were diagnosed with COVID-19 and recovered at the Pandemic Outpatient Clinic of Kayseri City Training and Research Hospital. Study data were collected using a Personal Information Form, A Menstrual Symptom Scale, and a State-Trait Anxiety Inventory.

Findings: Women's Menstrual Symptom Scale total score is 59.03 ± 19.47, State-Trait Anxiety Inventory scores were 40.92 ± 4.49 and 47.69 ± 4.27 respectively. While there was an increase in length of menstrual cycle, duration of menstrual bleeding, severity of dysmenorrhea and number of analgesics used in the menstrual cycle after COVID-19 infection compared to before COVID-19 infection ($p<0.05$), there was no difference in the number of pads used ($p>0.05$). There was a weak positive correlation between women's state anxiety score and the Menstrual Symptom Scale negative effects sub-dimension ($r=.131$; $p<0.05$). There was a statistically significant positive and weak correlation between state anxiety score and menstrual symptom scale negative effects ($r=0.232$; $p<0.001$), menstrual pain symptoms ($r=0.240$; $p<0.001$), coping methods sub-dimension ($r= 0.147$; $p =0.008$) and total scale score ($r=0.237$; $p<0.001$).

Results: As a result of this study, it has been determined that women who have had COVID-19 disease have disorders in menstrual cycle patterns and increased anxiety levels. High state anxiety may exacerbate menstrual symptoms. Nurses should assess the menstrual cycles of women with COVID-19 infection and refer them to appropriate treatment and counseling services if necessary.

Keywords: Anxiety; COVID-19; Menstrual Cycle; Nursing and Woman

[1] Corresponding Author: Dr. Öğr. Üyesi, University of Erciyes, Health Science Faculty, Department Nursing, Kayseri, Türkiye ozlem.kaplan@erciyes.edu.tr ORCID: 0000-0003-1050-8804
[2] Prof. Dr., University of Erciyes, Health Science Faculty, Department Nursing, Kayseri, Türkiye smucuk@erciyes.edu.tr ORCID: 0000-0003-4787-7515
[3]Uzm. Hemşire, University Of Health Sciences, Health Research Center, Kayseri, Türkiye mervegulsahin95@gmail.com ORCID: 0000-0002-1181-6086
[4] Assoc. Prof., University Of Health Sciences, Health Research Center, Kayseri, Türkiye dracetinkaya@gmail.com ORCID: 0000-0001-8485-0982

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COVID-19 Sonrası İyileşen Kadınların Anksiyete Düzeylerinin Menstrual Siklus Değişiklikleri İle İlişkisi

Öz

Amaç: Bu çalışmada COVID-19 sonrası iyileşen kadınların anksiyete düzeylerinin menstrual siklus değişiklikleri ile ilişkisinin belirlenmesi amaçlanmıştır.

Yöntem: Tanımlayıcı kesitsel türde olan çalışma 25 Ekim 2021- 27 Şubat 2022 tarihleri arasında, Kayseri Şehir Eğitim ve Araştırma Hastanesinin Pandemi Polikliniğinde COVID-19 tanısı almış ve iyileşmiş olan 324 kadın ile yapılmıştır. Çalışma verileri Kişisel Bilgi Formu, Menstrual Semptom Ölçeği, Durumluluk-Sürekli Kaygı envanteri ile toplanmıştır.

Bulgular: Kadınların Menstrüel Semptom Ölçeği toplam puanı 59.03 ± 19.47, Durumluk-Sürekli Kaygı Envanteri puanları sırasıyla 40.92 ± 4.49 ve 47.69 ± 4.27'dir. Kadınların COVID-19 enfeksiyonu sonrası COVID-19 enfeksiyonu öncesine göre menstrual siklus süresi, menstrual kanama süresi, dismenore şiddeti ve menstrual siklusta kullanılan analjezi saysısında artış olurken ($p<0.05$), kullanılan ped sayısında farklılık bulunmamaktadır ($p>0.05$). Kadınların durumluluk kaygı puanı ile Menstrüel Semptom Ölçeği negatif etkiler alt boyutu arasında pozitif yönlü zayıf bir ilişki bulunmaktadır ($r=0,131$; $p<0,05$). Sürekli kaygı ölçeği puanı ile menstrual semptom ölçeği negatif etkiler ($r=0,232$; $p<0,001$), menstrual ağrı belirtileri ($r=0,240$; $p<0,001$), baş etme yöntemleri alt boyutları ($r=0,147$; $p=0,008$) ve ölçek toplam puanı ($r=0,237$; $p<0,001$) arasında arasında pozitif yönlü zayıf bir ilişki bulunmaktadır.

Sonuç: Bu bulgulara dayanarak, COVID-19 hastalığı geçirmiş kadınların adet döngüsü düzenlerinde bozukluklar ve kaygı düzeylerinde artış olduğu tespit edilmiştir. Yüksek durumluk kaygı menstrüel semptomları şiddetlendirebilir. Hemşireler COVID-19 enfeksiyonu geçirmiş olan kadınların mesntrual siklus özelliklerini değerlendirmeli ve gerektiğinde uygun tedavi ve danışmanlık hizmetlerine yönlendirmelidir.

Anahtar Kelimeler: Anksiyete, COVID-19, Menstrüel Döngü, Hemşirelik ve Kadın.

1. INTRODUCTION

Menstruation is a physiological cycle in which the hypothalamus-pituitary-ovaries and hormones work in harmony during the reproductive years between puberty and menopause (Nagma vd., 2015:1). Approximately 30-50% of women of reproductive age may experience irregular, abnormal bleeding that is not associated with a clear anatomical pathology. This may be referred to as hypomenorrhea, menorrhagia, shortened menstrual cycle or prolonged menstrual periods (Arslan Özkan, 2019:625; Choudhury & Nath, 2020:52). Some menstrual symptoms experienced by 47.8% of women during menstruation (Direkvand-Moghadam vd., 2014: 106). Stress and anxiety affect menstrual patterns (frequency, amount and duration) and menstrual symptoms (Mitsuhashi, vd., 2022:569).

Major life changes such as earthquakes, floods and epidemics are known to be associated with psychological stress (Beaglehole vd., 2018:716). The COVID-19 pandemic, which began in Wuhan, China, in December 2019 and spread rapidly around the world, has not only remained a health problem but has also disrupted daily activities such as curfews, reduced socialisation, work life, eating habits and exercise. It has caused devastating life changes. This situation has led to mental health problems and chronic symptoms such as anxiety and post-traumatic stress disorder (Arora vd., 2022:805). It has been found that changes in daily life and hormonal changes caused by stress and illness can affect women's health, affecting menstrual function and menstrual symptoms (Ding vd., 202: 635255; Lebar vd., 2022:3800; Sharp vd., 2022:691). The menstrual cycle is an important part of woman's life. Characteristics of the menstrual cycle are considered 'vital signs' that are both indicators and possible determinants of health and well-being (ACOG Committee, 2015:143). Irregular and long menstrual cycles have been associated with the risk of premature death (Wang, 2020: 3464). It can also be an indicator of reduced fertility if you do not have a menstrual cycle (Shufelt vd., 2017:256).

There are studies in the literature evaluating the menstrual function of women who have had COVID-19 after recovery (Lebar vd., 2022: 3800; Taşkaldıran vd., 2022: 3199758). However, a meta-analysis states that there is not enough research on this topic to draw definitive conclusions and that more research is needed. It is important to clarify the effects of COVID-19 infection on women's menstrual cycles. The results that can be drawn from studies on this subject will have a significant impact on defining the effect of COVID-19 infection on the menstrual cycle (Lebar vd., 2022:3800).

Nurses should assess patients' risk factors for menstrual cycle disorders and provide appropriate counselling as needed (T.C. Resmi Gazete 2010).

The study was designed to determine the menstrual cycle characteristics and anxiety levels of women who had a regular menstrual cycle before COVID-19 disease after COVID-19. In line with the stated purpose, women in the research; distribution of post-COVID-19 "Menstrual Symptom Scale" (MSS), "State and Trait Anxiety Inventory" (STAI-1, STAI-2) scores according to socio-demographic characteristics; comparison of some features of the menstrual cycle before and after COVID-19; The relationship between MSS and its subscale scores and STAI-1, STAI-2 scores after COVID-19 will be investigated.

2. METHODS

2.1. Research Design

This study was conducted as a descriptive cross-sectional study. The data of the study were collected at the Pandemic Polyclinic of Kayseri City Training and Research Hospital between 25 October 2021 and 27 February 2022. The study population consisted of women who attended to the Pandemic Polyclinic during the pandemic, were diagnosed with COVID-19 and recovered.

2.2. Participants

The study was conducted in women who had been diagnosed with COVID-19 at least 1 month and not more than 12 months previously. Women were enrolled if they had no communication problems, had previously been diagnosed with COVID-19 and were at least one month recovered, were 18 years of age or older, and had a regular menstrual cycle. Women were excluded from the study if they were menopausal, used combined oral contraceptives, had neurological or psychiatric disorders, were pregnant or breastfeeding, had a positive active COVID-19 test, or had received a COVID-19 vaccine before their illness.

A total of 423 women were interviewed during data collection. A total of 99 women were excluded from the study because 15 were under the age of 18, 10 had previously received the COVID-19 vaccine, 26 were menopausal, 22 were taking oral contraceptives, and 26 had irregular menstrual cycles. The study sample consisted of 324 women. As a result of the post-power calculation, which was done by taking the average of the total score of the Menstrual Symptom Scale (59.03 ±19.47) used in this study, the effect size was determined to be 0.66 and the power of the study was determined to be 0.95.

2.3. Assessment Tools

Study data were collected using the Personal Information Form, MSS, STAI-1 and STAI-2.

2.3.1. Personal Information Form: The form developed by the researchers contains 15 questions on socio-demographic characteristics, menstrual cycle and COVID-19 (Bruinvels vd., 2021:1; Demir vd., 2021:1257).

2.3.2. Menstruation Symptom Scale (MSS): "The Menstrual Symptom Scale was developed by Chesney & Tasto (1975:237). It was Turkish adapted by Güvenç vd. (2014:367). It is a five-point Likert scale consisting of twenty-four items. Participants are asked to give a number between 1 (never) and 5 (always) for the symptoms they experience in relation to menstruation. The scale has a total of 3 sub-dimensions, 1-13. The items are in the subscale 'negative effects/somatic complaints', 14-19. The items are in the subscale "menstrual pain symptoms", 20-24. The items are scored in the "coping methods" sub-dimension. The MSS total score is calculated by taking the average score of the items in the scale. An increase in the average score indicates an increase in the severity of menstrual symptoms. The Cronbach's alpha value of the scale is 0.86, (Güvenç vd., 2014:367) and was determined to be 0.93 in this study.

2.3.3. State-Trait Anxiety Inventory (STAI-1, STAI-2*:* "The State-Trait Anxiety Inventory (STAI-1) was developed by Spielberger vd (1971:3) to measure individuals' levels of anxiety. The Turkish validity and reliability study of the scale was conducted by Öner & Le Compte (1998:1). There is a total of 40 statements in the scale. The first twenty items measure the level of situation-related anxiety and each item is answered on a four-point Likert scale (1: not at all, 2: a little, 3: a lot, 4: completely). In the scale, the 1st, 2nd, 5th, 8th, 10th, 11th, 15th, 16th, 19th, 20th items are reverse coded. State anxiety scores are obtained by subtracting the total score of the reverse coded items from the total score of the directly coded items and adding the number 50, which is the constant value of the state anxiety scale, to the value obtained.

Items 21 to 40 of the scale measure the individual's level of trait anxiety (STAI-2). Each item is answered on a four-point Likert scale (1: not at all, 2: a little, 3: a lot, 4: completely). In this section seven item are reverse coded: 21, 26, 27, 33, 36, 39. By subtracting the total score of the reverse coded items from the total score of the directly coded items and adding 35, which is the constant value of the trait anxiety scale, the individual's trait anxiety level is obtained. The total score obtained from both scales varies between 20 and 80. An increase in the score obtained from the scale indicates an increase in the level of anxiety.

The Cronbach's alpha coefficient of the "State and Trait Anxiety Inventory" was found to be 0.90 for the "Trait Anxiety Scale" and 0.96 for the "State Anxiety Scale" (Öner & Le Compte,1998:1). In this

study, Cronbach's alpha coefficients were found to be 0.81 for the State Anxiety Scale and 0.82 for the Trait Anxiety Scale.

2.4. Data Collection

Contact information for women who had been diagnosed with COVID-19 at least 1 month and not more than 12 months previously was obtained from the outpatient clinic. Women were informed about the study by telephone. Women who agreed to participate in the study were asked to complete the Google survey by receiving a link on their mobile phone. Study data were collected using the Personal Information Form, MSS, STAI-1 and STAI-2. In addition, women were asked to evaluate menstrual cycle characteristics (cycle duration, duration of mesntrual bleeding, analgesia use, severity of dysmenorrhoea, number of pads used) before and after COVID-19 infection. Women were asked to evaluate menstrual cycle characteristics twice with the MSS scale considering the period before and after COVID-19 infection. It took approximately 10-15 minutes to complete the forms. Standardization was achieved in the design of the form by limiting one response per IP address so that women could only respond once.

2.5. Statistical Analysis

IBM SPSS Statistics Standard Concurrent User V 25 (IBM Corp., Armonk, New York, USA) was used for all statistical analyses. The normal distribution of the data was examined using kurtosis and skewness values. Compliance of numerical data with normal distribution was determined by Kolmogrov-Smirnow test, skewness and kurtosis (between +1 and -1) (Tabachnick & Fidell, 2013:1). The study found that some data were normally distributed and some were not. Analyses were chosen accordingly. Descriptive statistics that are normally distributed are presented as mean ± standard deviation ($\bar{x}$ ± SD), and those that are not normally distributed are presented as median (interquartile range). MSS and STAI-1 and STAI-2 scale scores were compared using Mann-Whitney U analysis in two independent groups and Kruskal-Wallis test in three or more groups. When the Kruskal Wallis analysis result was found to be significant, the Conover test was used as a multiple comparison test. The paired samples t-test was used to analyze normally distributed data in dependent groups, and the paired samples Wilcoxon signed rank test was used for non-normally distributed data. The correlation between numerical values was assessed using Spearman analysis. Using Cohen (1988: 425) as a reference for correlation coefficients, an r value of 0.10-0.29 was considered weak, 0.30-0.49 moderate and 0.50-1.0 strong.

2.6. Ethical Approval

To conduct the study, written institutional approval (54/2021) was obtained from the Kayseri City Training and Research Hospital Medical Medical Specialisation Training Board and written ethics

committee approval was obtained from the Clinical Research Ethics Committee (534/2021). Verbal consent was obtained after the participants had been informed by telephone about the content and purpose of the study. In addition, in online surveys, women were asked to tick a box to indicate that their participation in the study was voluntary.

3. RESULTS

Table 1 shows the socio-demographic characteristics of women and the distribution of MSS, STAI-1 and STAI-2 scores by socio-demographic characteristics. Of the 30.6% of women participating in the research, they are between the ages of 26 and 33, 49.7% have a BMI between 18.5 and 24.99, 60.2% are married, 58.3% have a bachelor's degree or higher, and 49.7% have an income that equals their expenses. It was found that most women did not smoke (86.5%) or exercise regularly (88.6%). 43.5 % of the women had been infected with COVID-19 9-12 months previously and 58.2% reported no change in their menstrual cycle after COVID-19 infection.

When the distributions of women's MSS scores were analyzed in terms of characteristics such as economic status (KW: 0.517, p=0.772), smoking (WU: 0.313, p=0.754) and regular exercise (WU: 1.660, p=0.097), it was found that there was no statistically significant difference. There is a statistically significant difference in women's MSS scores according to age (KW: 26.772, p <0.001). This significance results from the differences between 18-25 - 34-41 (p <0.001), 18-25 - 42 and above (p <0.001), 26-33 - 42 and above (p =0.016). The difference between MSS scores according to BMI is statistically significant. (KW: 15.760 p = 0.003). This significance is due to the differences between 18.5–24.99 – 25-29.99 (p =0.012), 18.5–24.99 – 30 and over (p=0.029). A statistically significant difference was found between MSS scores according to marital status (WU: -6.238, p <0.001). The MSS score is higher in the single group. There is a statistically significant difference in MSS scores according to educational level (KW: 26.376, p <0.001). This significance is due to the differences between primary education - undergraduate and above (p <0.001) and secondary education - undergraduate and above (p <0.001). There is a statistically significant difference in MSS scores according to the time after COVID-19 recovery (KW: 6.352, p =0.042). There is a statistically significant difference in MSS scores according to whether there is a change in the menstrual cycle after COVID-19 infection. The MSS score was found to be higher in the group that reported a change (WU: 3.131, p = 0.002) (Table 1).

Table 1. Women's sociodemographic characteristics and distribution of MSS, STAI-1 and STAI-2 scores after COVID-19 infection by sociodemographic characteristics (*n* = 324)

Features	*n%*	MSS Total Score		STAI-1 Total Score		STAI-2 Total Score	
		M (IQR)	*Test* *p*	M (IQR)	*Test* *p*	M (IQR)	*Test* *p*
Age							
18-25[a]	86 (26.5)	75.50 (35.25)	*KW:* 26,772 **<0.001**	41.50 (6.00)	*KW:* 1.624 0.654	47.00 (5.00)	*KW:* 1.476 0.688
26-33[b]	99 (30.6)	57.00 (35.00)		42.00 (6.00)		47.00 (24.00)	
34-41[c]	80 (24.7)	48.50 (30.50)		42.00 (22.00)		47.00 (22.00)	
42 and over[d]	59 (18.2)	45.00 (23.00)		41.00 (18.00)		47.00 (16.00)	
post hoc		a>c, d; b>d					
BMI							
< 18.5[a]	17 (5.3)	61.00 (33.00)	*KW:* 15.760 **0.003**	41.00 (14.00)	*KW:* 1.339 0.720	47.00 (6.00)	*KW:* 6.103 0.107
18.5-24.99[b]	161 (49.7)	59.00 (38.50)		42.00 (6.00)		47.00 (5.00)	
25-29.99[c]	89 (27.5)	48.00 (30.50)		42.00 (5.00)		48.00 (7.00)	
30 and over[d]	57 (17.5)	48.00 (30.00)		40.00 (6.00)		46.00 (6.50)	
Marital status		b>c,d					
Married	195 (60.2)	48.00 (30.00)	*WU:* -6.238 **<0.001**	42.00 (5.00)	*WU:* 1,266 0.206	47.00 (6.00)	*WU:-1.448 0.148*
Single	119 (39.8)	75.00 (24.00)		42.00 (6.00)		47.00 (5.00)	
education level							
Primary education[a]	48 (14.8)	44.50 (17.50)	*KW:* 26,376 **<0.001**	41.00 (7.00)	*KW:* 8.609 **0.014**	47.00 (6.00)	*KW:* 5,788 0.055
Secondary education [b]	87 (26.9)	47.00 (50.00)		42.00 (4.00)		47.00 (7.00)	
Bachelor's degree or higher [c]	189 (58.3)	67.00 (36.00)		41.00 (6.00)		47.00 (5.00)	
post hoc		c>a,b		b>c			
Economic situation							
My income is less than my expenses	83 (25.6)	50.00 (38.00)	*KW:* 0.517 0.772	42.00 (6.00)	*KW:* 0.035 0.983	47.00 (5.00)	*KW:* 3,931 0.140
My income equals my expenses	161 (49.7)	56.00 (33.00)		42.00 (6.00)		47.00 (6.00)	
My income is more than my expenses	80 (24.7)	55.50 (32.50)		41.00 (6.00)		48.00 (5.00)	
Smoking status							
Yes	44 (23.5)	59.00 (39.75)	*WU:* 0.313 0.754	39.50 (6.75)	*WU:* -1.444 0.149	48.00 (6.00)	*WU:* 0.845 0.398
No	280 (86.5)	55.00 (33.00)		42.00 (6.00)		47.00 (6.00)	
Regular exercise status							
Yes	37 (11.4)	60.00 (27.00)	*WU:* 1,660 0.097	41.00 (6.00)	*WU:* -0.726 0.468	47.00 (5.00)	*WU:* -0.1661 0.868
No	287 (88.6)	53.00 (34.00)		42.00 (6.00)		47.00 (6.00)	
Recovery time after COVID-19 (months)							
1-4[a]	71 (21.9)	55.00 (33.00)	*KW:* 6.352 **0.042**	43.00 (5.00)	*KW:* 5,032 0.672	47.00 (6.00)	*KW:* 0.752 0.686
5-8[b]	112 (34.6)	47.00 (34.75)		42.00 (4.00)		47.00 (5.75)	
9-12[c]	141 (43.5)	60.00 (37.00)		41.00 (6.00)		47.00 (5.00)	
post hoc		c>b					
Changes in menstrual cycle after COVID-19 infection							
Yes	136 (41.8)	61.50 (41.00)	*WU: 3,131* **0.002**	42.00 (5.00)	*WU:* 1.458 0.145	47.00 (5.00)	*WU:* 1.221 0.222
No	188 (58.2)	49.00 (30.00)		41.00 (6.00)		47.00 (5.75)	

***MSS**: Menstruation Symptom Scale, **STAI-1:** State Anxiety Inventory, **STAI-2:** Trait Anxiety Inventory, **BMI:** Body mass index, **KW**: Kruskal-Wallis analysis of variance, **WU:** Mann-Whitney U test, **M (IQR):** Median (Inter Quantile Range)*

The distributions of women's STAI-1 scores includes age (KW : 1.624, p =0.654), BMI (KW: 1.339, p =0.720), marital status (WU : 1.266, p =0.206), economic status (KW : 0.035, p =0.983), smoking (WU :1.444, p =0.149), regular exercise (WU :-0.726, p =0.468), time after COVID-19 recovery (KW :5.032, p =0.672), post-COVID-19 infection. When examining in terms of characteristics such as experiencing a change in the menstrual cycle (WU: 1.458, p = 0.145), it was found that there was no statistically significant difference, but there was a difference in terms of education level. This significance is due to the difference between secondary education- undergraduate education and above (p = 0.009) (KW: 8.609, p = 0.014) (Table 1).

The distributions of women's STAI-2 scores includes age (KW :1.476, p =0.688), BMI (KW :6.103, p =0.107), marital status (WU :-1.448, p =0.148), educational level (KW :5.788, p = 0.055), economic status (KW : 3.931, p =0.140), smoking (WU: 0.845 , p = 0.398), regular exercise (WU : -0.1661, p =0.868), time after COVID-19 recovery (KW : When examined in terms of characteristics such as 0.752, p = 0.686), experiencing a change in the menstrual cycle after COVID-19 infection (WU : 1.221, p = 0.222), it was found that there was no statistically significant difference (Table 1).

Table 2 shows the women's MSS, STAI-1 and STAI-2 scale scores before COVID-19 infection. Women's MSS negative effects/somatic complaints subscale score is 36.14 ± 10.82, menstrual pain symptoms subscale score is 15.54 ± 6.45, coping methods subscale score is 7.34 ± 3.91, and the scale total scale score is 59.03 ± 19.47. Women's STAI-1 and STAI-2 scores were 40.92 ± 4.49 and 47.69 ± 4.27 respectively (Table 2).

Table 2. Women's MSS, STAI-1 and STAI-2 scores after COVID-19 infection (n=324)

Scale and sub-dimensions	$\bar{X}$ ± SD	M (IQR)
Negative effects/somatic complaints	36.14 ± 10.82	34.00 (21.00)
Menstrual pain symptoms	15.54 ± 6.45	15.00 (21.75)
Coping methods	7.34 ± 3.91	6.50 (7.00)
MSS total score	59.03 ±19.47	55.00 (23.00)
STAI-1 total score	40.92 ± 4.49	42.00 (6.00)
STAI-2 total score	47.69 ± 4.27	47.00 (6.00)

***MSS**: Menstruation Symptom Scale, **STAI-1**: State Anxiety Inventory, **STAI-2:** Trait Anxiety Inventory, **M(IQR):** Median (Inter Quantile Range), $\bar{X}$ ± **SD**: mean ± standard deviation*

Table 3 shows the changes in menstrual cycle that women reported after COVID-19 infection. It was found that the most common menstrual change experienced by women after recovery was an increase in the duration of the menstrual cycle at 13.3%.

Table 3. Changes in menstrual cycle reported by women infected with COVID-19 (*n* = 324)

Specified Changes	***n%****
Increase in length of menstrual cycle	43 (13.3)
Decrease in menstrual cycle length	39 (12.1)
Increase in menstrual bleeding time	14 (4.3)
Decrease in menstrual bleeding time	30 (9.3)
Increase in the amount of menstrual bleeding	11 (3.4)
Decrease in the amount of menstrual bleeding	24 (7.4)
Increase in dysmenorrhea	17 (5.3)
Decrease in dysmenorrhea	5 (1.5)
Increased nausea	2 (0.6)
Irregular menstrual bleeding	19 (5.9)
Breakthrough bleeding	13 (4.0)

**Only those who answered yes were included.*

A comparison of some characteristics of the women's menstrual cycle before and after COVID-19 infection is shown in Table 4. Women's menstrual cycle duration (W: 23.208, p <0.001), menstrual bleeding duration (t :2.628, p =0.009), dysmenorrhea severity (t: -2.544, p =0.011) after COVID-19 infection compared to before COVID-19 infection. While there was a statistically significant increase in the number of analgesics used during the menstrual cycle (t: -2.578, p =0.010), there was no statistically significant change in the number of pads used (t :0.456, p =0.649) (Table 4).

Table 4. Comparison of women's menstrual cycle characteristics before and after COVID-19 infection (n = 324)

	Before COVID-19 infection M (IQR)	**After COVID-19 infection M (IQR)**	**Test *p***
Length of menstrual cycle	28.00 (4.00)	29.00 (4.00)	*W*: 23.208 **<0.001**
	$\bar{X}$ ± SD	**$\bar{X}$ ± SD**	
Length of menstrual bleeding	6.18±1.22	6.52 ± 9.49	*t:* 2.628 **0.009**
Dysmenorrhea severity	3.41 ± 2.74	3.54 ± 2.83	*t:* -2.544 **0.011**
Average pad usage	4.27 ± 1.21	4.25 ± 1.28	*t:* 0.456 0.649
Number of analgesics used in the menstrual cycle	0.53 ± 0.88	0.58 ± 0.92	*t:* -2.578 **0.010**

***W**: Will coxen test, **t** : paired sample-t test, **M (IQR):** Median (Inter Quantile Range), **$\bar{X}$ ± SD:** mean ± standard deviation*

Table 5 shows a correlation analysis of MSS and its subscale scores with STAI-1, STAI-2 scores after COVID-19 infection. Women's scores on the STAI-1 scale, MSS subscale menstrual pain symptoms (r=0.090; p=0.107), coping methods (r=0.067; p=0.228) and total scale score (r=0.070; p=0.206). While there is no statistically significant relationship between the MSS subscale negative effects/somatic complaints (r=0.131; p=0.018), there is a weak positive, statistically significant relationship (Table 5).

There is a statistically significant, positive, weak relationship between women's STAI-2 scale scores and MSS scale negative effects/somatic complaints (r=0.232; p<0.001), menstrual pain symptoms (r=0.240; p<0.001), coping methods sub-dimensions (r=0.147; p=0.008) and total scale score (r=0.237; p<0.001) (Table 5).

Table 5. Correlation analysis of the MSS and its subscale scores with the scores of the STAI-1, STAI-2 after infection with COVID-19 (*n* = 324)

MSS scale and its sub-dimensions	STAI-1	STAI-2
Negative effects/somatic complaints score *rho* *p*	0.131 **0.018**	0.232 **<0.001**
Menstrual pain symptoms score *rho* *p*	0.090 0.107	0.240 < **0.001**
Coping methods score *rho* *p*	0.067 0.228	0.147 **0.008**
MSS total score *rho* *p*	0.070 0.206	0.237 **<0.001**

MSS: *Menstruation Symptom Scale,* ***STAI-1:*** *State Anxiety Inventory,* ***STAI-2:*** *Trait Anxiety Inventory,* ***rho:*** *Spearman correlation analysis*

4. DISCUSSION

This study was conducted to determine menstrual cycle changes and anxiety levels in women who had a regular menstrual cycle prior to COVID-19 infection after recovery. In this study, the total MSS score of the women was 59.03 ± 19.47, and the results are similar to those of another study (Demir vd.,2021:1257). 41.8 % of the women who reported a change in their menstrual cycle after recovery. Differences in these changes between women. These changes include prolonged or shortened menstrual cycles, increased or decreased duration of bleeding, increased or decreased flow, increased or decreased dysmenorrhea, increased nausea, breakthrough bleeding and menstrual irregularities. The most commonly reported changes were an increase in the length of the menstrual cycle at 13.3% and a decrease in the length of the menstrual cycle at 12.1%. In addition, when cycle characteristics were compared before and after infection, there was a statistically significant increase in cycle duration, menstrual bleeding time, dysmenorrhea severity and the amount of analgesics used in the cycle, while

there was no change in the number of pads used. Although cycle length (29.00 (4.00)) and bleeding duration (6.52 ± 9.49) increased following infection, they were within the range considered normal (Taşkın, 2020:47). There is no clinical significance to the change expressed in this context. In similar studies, Taşkaldıran vd (2022: 3199758) reported that 35.7% of women with COVID-19 infection experienced various changes in their menstrual cycle patterns, such as changes in cycle duration, bleeding duration and amount, in the first three cycles after infection, with the most common change being 17.4%. An increase in cycle length was observed. The findings of the meta-analysis in this area and other literature are consistent with the frequency and nature of changes in our study. It is stated that menstrual cycle changes after COVID-19 infection have been reported differently in different countries and races (Al-Najjar vd., 2022: 0270537; Lebar vd., 2022: 3800; Muharam vd., 2022: 0270658; Taşkaldıran vd., 2022: 3199758). One of the main reasons why COVID-19 causes menstrual irregularities in women is that the SARS-CoV-2 virus can directly affect the ovarian follicles by binding to ACE2 receptors in the ovaries, which can lead to a decrease in ovarian reserve and menstrual disorders. It has also been suggested that the virus may also act in the endometrium and play a role in the initiation of menstruation by binding angiotensin II through ACE2 receptors (Ding vd., 2021: 635255; Talwarvd., 2022:400).

Disease processes can lead to mental health problems. Even if steps are taken towards normalization towards the end of the pandemic period, the psychological effects may persist. In addition to social changes, the possibility of experiencing physiological health problems has been identified as an important stressor for individuals (Beaglehole vd., 2018:716; Arora vd., 2022:805). In this study, it was determined that women experienced anxiety (STAI-1: 40.92 ± 4.49, STAI-2: 47.69 ± 4.27). In the study by Lagha vd. (2022:490), which assessed the anxiety levels of women who had COVID-19 infection and recovered and those who did not have the disease, it was found that COVID-19 was significantly associated with anxiety even in mildly symptomatic clinical forms.

Female reproductive organs are very sensitive to stress. Women who experience anxiety and depression are more likely to have menstrual cycle disorders (Ansong vd., 2019:19). In our study, a weak positive relationship was found between women's state anxiety and the MSS negative effects/somatic complaints sub-dimension, while no significant relationship was found between the other sub-dimensions and the total scale score. It was found that there was a weak positive relationship between trait anxiety scale score and MSS total score and all sub-dimensions. Tripathy vd. (2022: 3328) also found that the disease process significantly affects women's reproductive and mental health. It has been suggested that severe stress caused by COVID-19 may contribute to menstrual irregularities by causing dysfunction of the

hypothalamic-pituitary-gonadal axis and ovulation disorders (Vigil vd., 2022: 866104). In this context, it is important to assess women who with COVID-19 infection holistically in terms of bio-psycho-social aspects and provide psychological support after recovery.

There are several factors which predict irregular menstrual cycles (Mitsuhashi vd., 2022: 569). In the study, women were older, had a lower BMI, were single, had a higher level of education, had a COVID-19 recovery time of more than nine months, and had more severe menstrual symptoms. It was found to be higher in those who experienced changes in their cycle. In a systematic review and meta-analysis study by Mitsuhashi vd (2022: 569), physical characteristics and lifestyle such as low BMI, being in one's 20s, irregular cycle, family history, sleeping less than seven hours, stress and smoking were found to be risk factors for increasing the severity of menstrual symptoms. In the study by Al-Najjar vd (2022: 0270537), single women and smokers were found to be more likely to experience menstrual cycle changes, whereas this risk was found to be low in people with a high level of education. Our study results are consistent with the literature. Although similar, it differs from the literature in terms of smoking and educational level (Al-Najjar vd., 2022: 0270537; Mitsuhashi vd., 2022: 569). The reason for the difference in smoking may be due to the low percentage of smokers in our study. The reason for the difference obtained according to education level may be due to the characteristics of the different populations in which the research was conducted. No study was found in the literature that investigated the relationship between the time after COVID-19 recovery and menstrual symptoms. The reason why the severity of menstrual symptoms is higher in those with a recovery period of nine months or more than in other months may be due to infection-related reasons, or it may be due to other reasons experienced during this period because of the intervening time.

Limitations

Our study has some limitations. It was not possible to inquire about the women's hospital admissions and treatments received due to COVID-19 infection. Other limitations of the study were that laboratory results of coagulation factors and duration could not be queried, and the survey questions were a subjective and retrospective method of assessment.

5. CONCLUSION

This research is one of the few studies to look at menstrual cycle changes in women with COVID-19 infection after recovery. The results show that a significant proportion of women who had COVID-19 experienced changes in their menstrual cycle after recovery. Among these changes, an increase in cycle length was noted. In addition, statistically significant increases in cycle duration, menstrual bleeding duration, severity of dysmenorrhea and number of analgesics used were observed after the disease. It

was found that the severity of menstrual symptoms may vary depending on the level of trait anxiety, age, body mass index, marital status, time since recovery and changes in the menstrual cycle. It is believed that taking these factors into account will help both clinicians and academics working in the field of obstetrics and gynecology to plan more effective interventions for the menstrual changes and psychological effects experienced by women with the disease. In this context, the information from the study can be used to recommend that women with COVID-19 infection should be followed up and, if necessary, given support.

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