Impact of COVID-19 and Its Vaccine on Menstrual Cycle Among Medical Staff in Sulaimani Maternity Teaching Hospital

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Abstract- Despite extensive research on the effects of the COVID-19 pandemic and its vaccine, detailed reports specifically addressing their impact on the menstrual cycle and the female reproductive system have been lacking. The present study aimed to assess the impact of the COVID-19 virus and its vaccines on the menstrual cycle pattern among Sulaimani Maternity Teaching Hospital medical staff. This cross-sectional study was conducted among female healthcare workers at Sulaimani Maternity Teaching Hospital who contracted COVID-19 or received the COVID-19 vaccine. Demographic data were collected through direct interviews, while clinical information was obtained through medical history reviews, clinical examinations, and relevant investigations. A total of 143 participants were recruited out of an initial 195 candidates, all meeting the study's inclusion criteria. Data analyses were performed using the Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) version 21. The participants' ages ranged from 20 to 35 years, with over half (60.8%) being married. Among the study participants, 93% had contracted COVID-19, and 72% had received the COVID-19 vaccine. Among the women who had contracted COVID-19, 30.1% reported experiencing menstrual irregularities, with the most common being oligomenorrhea (54.83%). Following vaccination, 8.4% of participants experienced menstrual changes, primarily intermenstrual spotting (58.33%) and oligomenorrhea (25%). However, no significant associations were found between the severity of COVID-19 infection, vaccination status, and menstrual irregularities, with *P* of 0.773 and 0.676, respectively. Furthermore, thyroid dysfunction was observed in 70% of the women who experienced prolonged menstrual irregularities, suggesting a potential endocrine-related factor contributing to these changes. COVID-19 infection and vaccination were associated with transient menstrual irregularities in some women. These changes were generally short-lived and not significantly linked to the severity of infection or vaccine type.

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Introduction

COVID-19 is a viral infection primarily affecting the lungs, with symptoms including fever, cough, fatigue, and difficulty breathing. It ranges in severity from asymptomatic to critical, potentially causing severe respiratory infections, acute respiratory distress syndrome, and death (1,2). Research on COVID-19 vaccines focuses on eliciting an immune response against specific viral proteins. Most vaccines require two doses to achieve full immunity. While side effects are generally mild to moderate and resolve within a few days, they can include injection site reactions, fever, headache, and muscle pain. Younger individuals may experience more pronounced side effects, particularly after the second dose (3,4).

The female reproductive system undergoes regular cyclical changes, part of a periodic preparation for pregnancy and fertilization. In mammals and humans, this cycle is known as the menstrual cycle, characterized by periodic vaginal bleeding resulting from the shedding of the uterine lining (menstruation) (5). Several factors can

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disrupt this cycle, including physiological changes, diseases, medication use, and viral infections such as COVID-19 (6-9).

Reported menstrual changes include variations in cycle lightness, heaviness, irregularity, and missed periods (10,11). Research on the impact of COVID-19 on the menstrual cycle is limited, and the underlying mechanisms of these changes remain unclear. A 2020 study indicated that the endometrium may resist COVID-19 infection due to its lower levels of ACE2 (Angiotensin-converting enzyme 2), the receptor the virus binds. However, other findings from this research revealed that individuals with acute COVID-19 experienced temporary alterations in menstrual bleeding volume and cycle length. Some individuals reported a menstrual cycle extending beyond 37 days, with no significant changes observed in levels of sex hormones such as follicle-stimulating hormone (FSH), estrogen, and progesterone. Notably, individuals generally returned to their pre-existing menstrual patterns after recovering from the infection (12). Other studies suggest that COVID-19 may potentially influence menstrual cycles, leading to irregularities such as changes in menstrual flow or cycle length (13-15).

Menstruation is a complex biological process influenced by various factors (16,17). Physiologically, the brain regions responsible for fever and inflammation overlap with those that regulate hormonal control of the menstrual cycle. Consequently, hormonal regulation can modulate inflammatory responses, potentially affecting the severity of vaccine-related effects (18).

Post-vaccination, a surge of chemical signals in the body can influence immune cells, potentially leading to endometrial shedding and spotting (19). Recent findings suggest that inflammation can impact the endometrium and the timing of ovulation, with fever potentially causing deviations in menstrual cycle timing, either advancing or delaying it (20). Additionally, some studies propose that inflammatory responses may lead to dysmenorrhea. Vaccination triggers an inflammatory reaction, producing antibodies and immune cells to combat the pathogen. Furthermore, a reduction in blood platelets, crucial for clotting, has been observed in some individuals post-vaccination, potentially intensifying menstrual bleeding (21).

Given the limited research on the impact of the COVID-19 vaccine on the menstrual cycle and the significance of this issue, this study aimed to investigate the effects of COVID-19 infection and vaccination on menstrual cycle patterns among the medical staff at Sulaimani Maternity Hospital.

Materials and Methods

Study design and patients

The present cross-sectional study was conducted at Sulaimani Maternity Teaching Hospital from October 1, 2021, to September 30, 2022. It focused on female staff members who either contracted COVID-19 or received COVID-19 vaccines. Data on demographic characteristics, clinical symptoms, and signs, including menstrual abnormalities, were systematically recorded and analyzed. A total of 143 women participated in the study, with cases being randomly selected from among the doctors and staff at the Sulaimani maternity teaching hospital.

Data collection

data were collected through direct interviews using a standardized questionnaire that included demographic information and clinical conditions (e.g., past medical history, COVID-19 status). The inclusion criteria were age between 20 and 35 years, single, married, or divorced status, use of natural or barrier contraception, and having contracted COVID-19 or received the COVID-19 vaccine during the study period. Exclusion criteria included: history of menstrual irregularity, age outside the range of 20-35 years, use of hormonal contraception or intrauterine contraceptive devices (IUCD), pathological ultrasound findings, known endocrine disorders such as thyroid disease or polycystic ovary syndrome, use of medications affecting menstruation, and pregnancy.

Informed consent was obtained from each participant, and anonymity was maintained. Administrative approvals were granted by The Council of Arab Board of Medical Specialization and the Maternity Hospital before data collection began.

Demographic information was collected through direct interviews, while clinical data were gathered. Of 195 patients initially considered, 143 were recruited for the study and met the inclusion criteria. A comprehensive medical history was taken, clinical examinations were performed, and relevant investigations were conducted to assess menstrual irregularities.

Statistical analysis

Data entry was conducted using Microsoft Excel (2016), and statistical analyses were performed with the Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) version 21 for Windows. Qualitative data were expressed as frequencies and percentages, while quantitative data were reported as means and standard deviations. Statistical significance was

determined with a *P* of <0.05. The Chi-square test was employed to analyze categorical parameters among the study groups.

Results

Demographic characteristics are summarized in Table 1 and illustrated in Figure 1. Table 1 indicates that 72 women (50.3%) were between 21 and 30 years old, while only 2 (1.4%) were 20. Additionally, 142 women (99.3%) had no prior medical history. Figure 1 demonstrates that 87 women (60.8%) in the study were married.

As detailed in Table 2, 42 (29.4%) of the women in this study began menstruating at the age of 12. The majority, 73 (51%), had a menstrual cycle length of 28 days, while only 8 (5.6%) reported a cycle length of 31 days. Additionally, 48 (33.6%) of the participants reported a menstrual duration of 5 days, whereas only 3 (2.1%) reported a menstrual duration of 8 days.

As shown in Table 3, 133 (93%) of the women in this study were infected with the disease of COVID-19, of which only 22 (15.4%) received steroids. According to the results, 103 (72%) infected women received the coronavirus vaccine, and only 43 (30.1%) reported a change in their menstrual cycle.

Among the 143 women in this study, 43 (30.06%) reported changes in their menstrual cycle following either vaccination or COVID-19 infection.

As detailed in Table 4, 12 women experienced menstrual changes after receiving the vaccine. Of these 12 women, 4 (33.33%) reported amenorrhea, and 2 (16.66%) reported menorrhagia. No significant association was found between vaccination and menstrual irregularities (*P*=0.676). Additionally, 8 (66.66%) of these women experienced irregularities lasting less than three months.

According to Table 5, 31 (21.67%) of the women in this study experienced changes in their menstrual cycle after being infected with COVID-19. Among these, 12 (38.71%) experienced amenorrhea, while 17 (54.83%) experienced oligomenorrhea. However, there was no significant relationship between COVID-19 infection and menstrual irregularity (*P*=0.996). The duration of menstrual irregularity in 25 (80.63%) of these women was less than three months.

Among the 143 participants in the study, 133 (93%) had contracted the virus. Of those infected, 65 (45.45%) experienced mild disease, 60 (41.95%) had moderate disease, and 8 (5.60%) had severe disease (Table 6). No significant relationship was found between the severity of COVID-19 infection and menstrual irregularities (*P*=0.773).

Forty-three of the people examined in this study had menstrual irregularities. Only 10 out of 43 people experienced menstrual irregularity, and the length of their menstrual irregularity lasted longer than two months. Among these ten people, 7 (70%) people had abnormal TSH, and 2 (20%) people had abnormal prolactin (Table 7). Of those with abnormal TSH, 4 (57.14%) received R_x for 1-3 months, after which they reached normal TSH. Half the people who received the Rx used it for two months and then achieved normal TSH.

Table 1. Demographic characteristics

Variables		Frequency (Percentage)
Age group	20 years	2 (1.4%)
	21-30 years	72 (50.3%)
	31-40 years	69 (48.3%)
Past medical history	Yes	1 (0.7%)
	No	142 (99.3%)
Occupation	Doctor	53 (37%)
	Medical Staff	65 (45.45%)
	Nurse	25 (17.48%)
	Total	143 (100%)

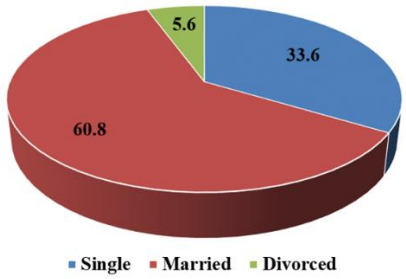

Figure 1. Marital status of women

Table 2. Menstrual history of women

Variables		Frequency (Percentage)
Menarche (years)	10	24 (16.8%)
	11	35 (24.5%)
	12	42 (29.4%)
	13	34 (23.8%)
	14	8 (5.6%)
Cycle length (days)	28	73 (51%)
	29	10 (7%)
	30	43 (30.1%)
	31	8 (5.6%)
	35	9 (6.3%)
Duration (days)	3	9 (6.3%)
	4	26 (18.2%)
	5	48 (33.6%)
	6	34 (23.8%)
	7	23 (16.1%)
	8	3 (2.1%)
	Total	143 (100%)

Table 3. The percentage of women infected with COVID-19 and receiving the vaccine

Variables		Frequency (Percentage)
Got COVID-19	Yes	133 (93%)
	No	10 (7%)
Used steroid	Yes	22 (15.4%)
	No	121 (84.6%)
Got vaccine	Yes	103 (72%)
	No	40 (28%)
Menstrual irregularity	Yes	43 (30.1%)
	No	100 (69.9%)
	Total	100

Table 4. Irregularity type after getting the COVID-19 vaccine

Irregularity type	Frequency Percentage	*P**
Intermenstrual Spotting	7 (58.33%)	0.676
Oligomenorrhea	3 (25%)	
Menorrhagia	2 (16.66%)	
Total	12 (100%)	

**P* Chi-square test

Table 5. Irregularity type after got COVID-19

Irregularity type	Frequency Percentage	*P**
Oligomenorrhea	17 (54.83%)	0.996
Polymenorrhagia	8 (25.80%)	
Menorrhagia	6 (19.35%)	
Total	31 (100%)	

**P* Chi-square test

Table 6. Stages of COVID-19

Stage of Covid-19	Frequency (Percentage)	*P**
Mild	65 (45.45%)	0.773
Moderate	60 (41.95%)	
Severe	8 (5.60%)	
Not-Covid-19	10 (7%)	
Total	143 (100%)	

**P* Chi-square test

Table 7. TSH, prolactin, and treatment varieties

Variable		Normal N (%)	Abnormal N (%)	Total N (%)
TSH		3 (30%)	7 (70%)	10 (100%)
Prolactin		8 (80%)	2 (20%)	10 (100%)
		Received N (%)	Not received N (%)	Total N (%)
		4 (57.14%)	3 (42.85%)	Total N (%)
R_x	One month N (%)	2 months N (%)	Three months N (%)	7 (100%)
	1 (25%)	2 (50%)	1 (25%)	–

Discussion

The present study aimed to investigate the impact of the COVID-19 virus and its vaccines on menstrual cycle patterns among the medical staff at Sulaimani Maternity Teaching Hospital.

Sharp *et al*., study (2022) found that 52.6% of women reported changes in their menstrual cycles during the home quarantine imposed due to the COVID-19 pandemic. The stress associated with illness or prolonged quarantine can lead to irregular menstrual cycles (11).

Research conducted by American scientists revealed that women vaccinated with the Pfizer or Moderna COVID-19 vaccines experienced menstruation approximately one day later than unvaccinated women. This study included 4,000 participants and found no change in bleeding days among vaccinated women. The researchers concluded that the impact of COVID-19 vaccination on menstruation is minimal and likely temporary (22). They further noted that the slight delay in the menstrual cycle is not clinically significant. The International Federation of Gynecology and Obstetrics (FIGO) considers any menstrual cycle variation of less than eight days within the normal range (23).

However, recent research conducted by European scientists challenges these claims (11,21,24). The European Health Union issued a statement asserting that, based on the evidence gathered, mRNA-based COVID-19 vaccines do not cause amenorrhea or the cessation of monthly bleeding in women (24). The organization emphasizes that amenorrhea can be attributed to a variety of factors, with stress and fatigue being among the most significant contributors. Additionally, it has been observed that contracting COVID-19 itself can disrupt the menstrual cycle in women. The research by European scientists was initiated following reports of women experiencing amenorrhea after receiving one or two doses of the Moderna or Pfizer vaccines; however, the findings from these studies refuted such claims (21,25,26).

Dexamethasone, a key medication in the treatment of hospitalized COVID-19 patients, may influence menstrual cycle patterns and blood loss due to its effects on cortisol levels. Therefore, it is a potential risk factor for menstrual changes in COVID-19 patients (27).

Based on the studies conducted by Li *et al*., (14), Khan *et al*., (1), and Ding *et al*., (28), the available data suggest that vaccination does not significantly contribute to menstrual irregularities in women. Li *et al*., (14) identified several risk factors associated with COVID-19 vaccination, including comorbidities, age, organ complications, glucocorticoid treatment, and disease severity. Notably, only an increase in the menstrual cycle length was correlated with complications in other organs. It is essential to highlight that Khan *et al*., (1) did not account for potential confounding factors in their analysis. Furthermore, Ding *et al*., (28) focused on the hormonal effects of COVID-19 vaccination but did not investigate menstrual changes. None of the studies adjusted for treatments administered to patients for COVID-19.

COVID-19 infection may cause long-term disruptions in menstrual function; however, recent findings from the Nurses' Health Study (26) found no association between COVID-19 infection and alterations in typical menstrual cycle characteristics. COVID-19 vaccinations are widely considered safe for menstruating women, and this study supports that conclusion.

In this study, over 90% of the participants had been infected with COVID-19, with only 15.4% of those infected receiving steroid treatments. No significant relationship was found between COVID-19 infection and menstrual irregularities. Similarly, Ding et al. (2021) (28) reported no significant association between COVID-19 infection and menstrual disturbances.

Among the participants, 72% received one, two, or three doses of the COVID-19 vaccine, with only 30.1% reporting changes in their menstrual cycle. This finding aligns with the study by Muhaidat *et al*., (25), which examined 2,269 women and found that 30.5% reported menstrual changes after receiving the COVID-19

vaccine. Muhaidat *et al*., also noted that menstrual irregularities were more common among individuals who experienced other side effects from the vaccine. Overall, no significant relationship was observed between COVID-19 vaccination and menstrual irregularities, as confirmed by Alvergne *et al*., (29).

After receiving the COVID-19 vaccine, 12 women reported changes in their menstrual cycles, with four cases of amenorrhea. This finding is consistent with the report by Rodríguez *et al*., (24), which observed similar outcomes in a study of 950 women.

Menstrual cycle changes following COVID-19 infection were observed in 31 women, with 12 cases of irregular amenorrhea. These results align with the findings of Lebar *et al*., (10), who reported that individuals with severe COVID-19 experienced higher rates of amenorrhea and increased menstrual volume.

Following COVID-19 vaccination, some women experienced menstrual irregularities, with most cases resolving within three months. Similarly, a preprint study by Alvergne *et al*., (30) found that 93.6% of menstrual abnormalities resolved within two months post-vaccination, suggesting that these vaccine-related side effects are generally self-limiting.

The findings of this study suggest that women who receive the COVID-19 vaccine or contract COVID-19 may experience menstrual abnormalities, such as prolonged menstrual duration or extended menstrual cycles. However, these irregularities are not confined to these specific changes. Additionally, it is important to consider that the shifting priorities during the COVID-19 pandemic may have reduced the likelihood of women seeking timely healthcare or engaging in health-seeking behaviors.

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