Original Article

Investigate the Relationship Between Receiving the COVID-19 Vaccine and Menstrual Disorders among Females of Reproductive Age in Jeddah, Saudi Arabia

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Abstract

Background: There are many physical side effects of the COVID-19 vaccine, including unexpected changes occurring in menstrual bleeding. This study aimed to assess the relation between the COVID-19 vaccine and disorders in menstruation among females of reproductive age. **Materials and Methods:** Participants were recruited from a nonprobability snowball sampling targeted at females who are living in Jeddah city between March 2022 and August 2022, Kingdom of Saudi Arabia (KSA). A quantitative cross-sectional design was utilized to conduct the study, a nonexperimental design based on a single observation point. The sample size is estimated by the G*Power software to be 180, considering missed cases, it increased to 197. **Results:** Regarding menstrual changes, n = 86 (43.65%) experienced a delay, and about one-third reported an earlier menstruation cycle. A significant relationship is observed between nationality, occupation, and changes in period (t = 3.89, $P < 0.001$ and t = −2.94, $P < 0.004$). There is no significant difference in the occurrence of complications among the different vaccine types. **Conclusions:** Receiving the COVID-19 vaccine was strongly linked with unexpected disturbance in menstruation among the studied group, from simple menstrual irregulates to reported amenorrhea after receiving the booster doses. However, the occurrence of menstrual cycle delays was not linked to the vaccine type. Further studies should be done to investigate each type of vaccine specifically to determine if the type of vaccine affects the reproductive function generally not only the menstrual cycle, in a larger survey for more generalizability.

Keywords: *COVID-19 vaccines, female, humans, menstruation disturbances, reproduction*

Introduction

At the end of 2019, an epidemic of the COVID-19 disease appeared in Wuhan, China; later, it rapidly expanded all over the world, developing a major catastrophe impacting public health.[1] There are many physical side effects of COVID-19 vaccination, including a sore arm, fever, fatigue, and myalgia. In addition, unexpected changes occurred in menstrual bleeding, which are not included in the common side effects. The Healthcare Products Regulatory Agency (MHPR) of the United Kingdom's Medicines reported that more than 30,000 of these events had been reactions against all COVID-19 vaccines.[2]

The menstrual cycle can be affected by immune triggering in response to several stimuli, including virus-related infection. A study conducted in China reported that about one-fourth of menstruating women infected with SARS-CoV-2 suffered from menstrual disorders.[3] Though reported changes to the menstrual cycle due to vaccination are recent, strong research remains crucial to the global victory of the vaccination program. Inadequate comprehensive research reports about menstrual changes after vaccination are likely to increase these concerns. Therefore, obvious and trustworthy info is vital for those who depend on being able to expect their menstrual cycles to either occur or prevent pregnancy.[4] However, few studies conducted in different countries that assessed menstrual function and included an unvaccinated comparison group found an association between COVID-19 vaccination and a small, temporary increase

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in menstrual cycle length, but little association with cycle irregularity.[5-9]

Additionally, a study by Wesselink *et al.*[10] concluded that there is still limited assessment of COVID-19 vaccination and other menstrual cycle characteristics, including bleed length, heaviness of low, and menstrual pain. To the best of our knowledge, there have been no studies that explored the relation between receiving the COVID-19 vaccine and menstrual disorders among females of reproductive age in Arabic countries, and due to the novelty of the topic, there is still a gap in the information related to menstrual cycle disturbance and its relation to receiving the COVID-19 vaccine in Saudi Arabia. Therefore, this study aims to investigate the relationship between receiving the COVID-19 vaccine and menstrual disorders among females of reproductive age

Materials and Methods

A cross-sectional study design was utilized to conduct the study between March 2022 and August 2022. The sample size is estimated by G*Power software. A medium effect size of 0.15, power of 0.80, and alpha significance level of 0.05 to guide our statistical analysis, with a sample size of 180, considering the missing data as 10%. The total sample size is $N = (180 + 18) = 198$. A convenient sampling technique was used in this study to recruit via a snowballing technique using WhatsApp application, Facebook, and Twitter.

The data collected between March 2022 and August 2022 used a questionnaire to include five parts: demographic data such as age, marital status, educational level, and occupation. The 2nd part is medical history, chronic diseases, and medication. The 3rd part is obstetric history, such as the number of pregnancies, the number of deliveries, and contraceptive methods. The fourth part is menstrual history, such as menarche, menstrual regularity in the last 6 months, and menstrual problems in the last 6 months. The 5th and last part are COVID-19-related data, such as receiving the vaccine, the number of received doses, the type of vaccine, menstrual disorders after receiving the vaccine, and intention to receive the third dose.

An anonymous online form of the questionnaire was disseminated virtually, targeting females of reproductive age who lived in Jeddah, Saudi Arabia, using snowball sampling on social media apps (WhatsApp, Facebook, Microsoft Teams, Twitter, and Messenger, etc.). Participant recruitment was conducted via online surveys disseminated through family-based media platforms (e.g., WhatsApp and Facebook). The distribution process was initiated through friends and colleagues and subsequently expanded to their families. The sampling specifically targeted females residing in Jeddah city. The rationale behind conducting the study in Jeddah is that the western region has the second-largest population in Saudi Arabia. The eligible participants include females of reproductive age (15–59 years) have menstruation, have received at least one dose of the COVID-19 vaccine, are residents in Jeddah, who agreed to participate in the study, and speak and read Arabic. In addition, participants should fill in electronic informed consent before answering the questionnaire.

The content validity and reliability of the instrument were measured by exposing the questionnaire to five experts in Community Health Nursing and Gynecological and Obstetric Nursing fields; the field and their comments were taken into consideration. For reliability, the Cronbach alpha test was calculated and reflected 0.70. The Statistical Package for Social Sciences (SPSS) software version 22 is used for data entry and analysis. Descriptive statistics (e.g., number, percentage) are applied for categorical variables and presented in tables and graphs. Mean and standard deviation will be utilized for continuous variables. Analytic statistics using Chi-square tests (χ^2) to test the relation and/or the difference between two categorical variables will be utilized. Statistical significance was considered at $P < 0.05$ throughout the study.

Ethical considerations

The study was approved by the Ethical Committee at KAIMRC and the IRB of King Saud bin Abdulaziz University for Health Sciences. (IRB/0388/22). Explanations and the purpose of the study were provided to the participants to obtain their consent through the first page of the questionnaire. Only those who selected "Agree" were able to proceed to the survey items, while those who selected "Disagree" were not permitted to continue. The data will be kept in strict confidence and used only for research purposes. All responses will remain strictly confidential, stored securely, and used only for research purposes, with no identifying information disclosed at any stage.

Results

The results of this study show that less than half of them, $n = 85$ (43.15%), are aged 31 to 40 years old, while more than one third of them, $n = 70$ (35.53%), are aged 40 years or more. However, the table shows $n = 93$ (52. 79%) of the participants were Saudi, while the rest of them were non-Saudi. In relation to marital status, nearly three-quarters of the participants, $n = 144$ (73.09%), were married, while $n = 49$ (24.87%) of them were single. The table also shows that about two-thirds, $n = 125$ (63.46%) of the sample studied had university education; however, nearly one fourth of them, $n = 49$ (24.87%), had a postgraduate degree, and in addition, $n = 20$ (10.25%) had secondary education. Moreover, more than half, $n = 107$ (54.31%) of the sample studied were working while the rest of them were not working

Table 1 shows that most of the participants, $n = 112$ (56.86%), had 1–3 pregnancies, $n = 12$ (6.09%) had more than 6 pregnancies, $n = 111$ (56.34%) had up to three

Table 1: Sociodemographic and health history characteristics of the sample studied (*n*=197)

Items	*n* (%)	Items	*n* (%)
Age group (years)		No. of pregnancy	
18–30	42 (21.32)	1–3 times	112 (56.86)
31–40	70 (35.5)	4–6 times	36 (18.27)
+40	85 (43.1)	+6 times	12 (6.09)
		Not applicable	37 (18.78)
Nationality		No. of delivery	
Saudi	104 (52.87)	1–3 times	111 (56.34)
Non-Saudi	93 (47.21)	4–6 times	34 (17.25)
		+6 times	11 (5.58)
		Not applicable	41 (20.8)
Marital status		No. of abortion	
Single	49 (24.87)	None	103 (52.28)
Married	144 (73.09)	1–3 times	60 (30.46)
Widow	4 (2.03)	+3 times	4 (2.03)
		Not applicable	30 (15.23)
Educational level		Family planning methods	
Middle	3 (1.52)	Pills	42 (21.32)
Secondary	20 (10.25)	IUD	20 (10.15)
University	125 (63.46)	Hormonal patch	4 (2.03)
Postgraduate	49 (24.87)	Metallic IUD	32 (16.24)
		Condom	31 (15.74)
		Breastfeeding	11 (5.58)
		Not applicable	57 (28.94)
Occupation		Age at menarche	
Work	90 (45.69)	10–13	112 (56.85)
Not work	107 (54.31)	14–16	55 (27.92)
		+16	30 (15.23)
Health History		Regularity Last 6 months	
Hypertension	186 (94.42)	Yes	103 (52.28)
Diabetes mellitus	185 (93.90)	No	94 (47.72)
Cardiac diseases	195 (98.98)	Menstrual irregularity (*n*=94)	
Thyroid	189 (95.96)	Delay	30 (31.91)
Hematology	193 (97.96)	In advance	19 (20.22)
		Prolongation	8 (8.51)
		Bleeding	9 (9.57)
		Amenorrhea	19 (20.22)
		Not applicable	9 (9.57)

deliveries, *n* = 60 (30.46%) had up to three abortions, and *n* = 11 (28.94%) reported breastfeeding not applicable. The majority *n* = 112 (56.85%) reported that age at menarche was between 10 and 13 years, *n* = 103 (52.28%) reported having regular menstruation, *n* = 30 (31.91%) experienced delays, *n* = 19 (20.22%) had menstruation in advance, *n* = 8 (8.51%) experienced prolongation, *n* = 9 (9.57%) had bleeding issues, *n* = 19 (20.22%) had amenorrhea, and 9.6% reported not applicable.

Table 2 summarizes participants' COVID-19 vaccination status and its effects on the menstrual cycle. All participants were vaccinated, with Pfizer *n* = 122 (61.92%) and AstraZeneca, *n* = 64 (32.49%) being the most common. After the first dose, common side effects included fever *n* = 68 (34.52%) and body ache, *n* = 66 (33.51%), while *n* = 86 (43.65%) reported menstrual changes, mainly delays of 2–6 months *n* = 35 (40.69%) for 2 months, *n* = 25 (29.07%) for 3–6 months, and *n* = 10 (11.63%) beyond 6 months). Some experienced earlier periods, *n* = 54 (27.41%), increased bleeding, *n* = 46 (23.40%), decreased volume, *n* = 53 (26.90%). Following the second dose, *n* = 94 (47.72%) reported menstrual

Table 2: COVID 19 vaccine (first dose) and effect on menstrual health

Items	No. (%)	Items	No. (%)
First dose time		Second dose time	
6 months	29 (14.72)	Less 1 month	9 (4.57)
7–12 months	107 (54.31)	3–6 months	84 (42.63
+1 year	61 (30.97)	+6 months	104 (52.80)
Vaccine name		Vaccine name	
Pfizer	122 (61.92)	Pfizer	144 (73.09)
AstraZeneca	64 (32.49)	AstraZeneca	6.6 (18.27)
Moderna	7 (3.56)	Moderna	4 (2.03)
Jhonson	4 (2.03)	Jhonson	13 (6.61)
First-dose side effects		Second dose side effects	
Fever	68 (34.52)	Fever	24 (12.18)
Body ache	66 (33.51)	Body ache	127 (64.46)
Sneezing and cough	5 (2.53)	Sneezing/cough	21 (10.65)
Sore throat	15 (7.61)	Sore throat	25 (12.69)
General body pain and drowsiness	43 (21.82)		
Change of Menstrual period		Change of period habits	
No	111 (56.35)	No	103 (52.28)
Yes	86 (43.65)	Yes	94 (47.72)
Describe the change (*n*=86)		Period delay time *n*=94)	
Delay 2 months	35 (40.69)	Less 1 month	23 (24.48)
Delay 3–6 months	25 (29.07)	1–2 months	20 (21.27)
Delay+6 months	10 (11.63)	+3 months	6 (6.38)
Not applicable	16 (18.61)	Not applicable	45 (47.87)
Coming earlier (*n*=197)		Coming in advance (*n*=94)	
Less 1 month	54 (27.41)	Less 1 month	28 (29.79)
1–2 months	5 (2.53)	1–2 months	3 (3.19)
+3 months	2 (1.01)	+3 months	1 (1.06)
Not applicable	136 (69.05)	Not applicable	62 (65.96)
Increase menstrual period days		Increase period days (*n*=94)	
Yes	46 (23.40)	1–3 days	21 (22.34)
No	151 (76.60)	4 days–1 weeks	16 (17.02)
		+1 week	17 (18.08)
		Not applicable	40 (42.56)
Increase menstrual bleeding.		Increase bleeding (*n*=94)	
Yes	46 (23.40)	Yes	38 (35.72)
Not applicable	151 (76.60)	Not applicable	56 (52.64)
Decrease menstrual blood volume.		Amenorrhea (*n*=94)	
Yes	53 (26.90)	Less 1 month	10 (10.64)
Not applicable	144 (73.10)	1–2 months	18 (19.16)
		+3 months	6 (6.38)
		Not applicable	60 (63.82)
Amenorrhea		Receiving booster dose	
Less 1 month	17 (8.63)	Yes	128 (64.97)
1–2 months	13 (6.61)	No	69 (35.03)
+3 months	6 (3.04)		
Not applicable	161 (81.72)		
If habit changes you notify the physician		Relation between vaccines and changes	
Yes	27 (13.70)	No	35 (17.77)
No	170 (86.30)	May be	98 (49.75)
		Sure	64 (32.48)
Admission to the hospital due to complications			
Yes	185 (93.90)		
No	12 (6.10)		

changes, including delays of less than 2 months n = 23 (24.48%), earlier periods (n = 28 (14.21%), changes in menstrual duration (n = 94 (47.72%), increased bleeding (n = 38 (35.72%), and amenorrhea (n = 18 (19.1%). For booster doses, n = 128 (64.97%) had received one, with n = 27 (13.70%) seeking medical consultation for menstrual changes, 49.7% perceiving a probable vaccine–menstrual link, n = 64 (32.48%) a definite link, and n = 12 (6.10%) requiring hospitalization due to complications.

Table 3 shows the relation between demographic characteristics and changes in period habits. The table shows that a significant relation was observed between nationality, marital status, and reported changes in the periods (t = 2.13, P < 0.001, and t = 2.38, P < 0.001), respectively. A significant relation was observed between nationality, occupation, and changes in the period since (t = 3.89, P < 0.001 and t = −2.94, P < 0.004), respectively.

Table 4 represents the model suggests that taking the COVID-19 vaccine has a significant positive effect, while other variables, such as the vaccine name, the time of the second vaccine, and the second vaccine dose name, do not have significant effects. The regression analysis revealed that most chronic conditions (diabetes, hypertension, hormonal disorders, others) and reproductive factors (pregnancy, labor, abortion frequency, family planning methods) were not significantly associated with menstrual habit changes after the first or second COVID-19 vaccine dose (P > 0.05). However, cardiac disease consistently occurred as a significant predictor (B = 0.80, P < 0.012 for the first dose; B = 0.62, P < 0.044 for the second dose), suggesting that women with cardiovascular comorbidities may be more sensitive to systemic stressors such as vaccination. Family planning methods approached significance (P < 0.077), warranting further investigation. When vaccine-related factors were included, both taking the vaccine (B = 0.85, P < 0.001) and vaccine type (B = 0.28, P = 0.005) were found to be stronger predictors than health or reproductive history, indicating that vaccine-related characteristics play a central role in menstrual cycle alterations.

Table 5 presents a Chi-square value (X^2 =0.76, P = 0.943), indicating no significant difference in the presence of complications across vaccine types. Similarly, the distribution of vaccine names with respect to changes in menstrual period habits shows a Chi-square value (X^2 =14.78, P = 0.097), suggesting no significant difference in menstrual cycle delays across vaccine types.

Discussion

The current study aimed to investigate the relations between receiving the COVID-19 vaccine and menstrual disorders among females of reproductive age in Jeddah, Saudi Arabia. The relationship between receiving the COVID-19 vaccine and the occurrence of menstrual disorders among females of reproductive age has garnered significant attention due to widespread vaccination campaigns and reports of menstrual irregularities postvaccination. Menstrual disorders, such as changes in cycle length, increased bleeding, and irregular periods, can impact women's health and quality of life.[11]

The findings of the current study revealed that the majority of participants had received the COVID-19 vaccine, with varying timings for the administration of the first dose. Following vaccination, participants reported side effects such as fever, body aches, sneezing and cough, sore throat, generalized body pain, and drowsiness. These reactions are consistent with commonly observed postvaccination responses reported in previous studies.[12,13] While such immediate side effects resemble those associated with other vaccines, including the influenza vaccine, it is important

Table 3: Predictors of demographic characteristics on period habit change after 1st dose received

After 1st Dose		Unstandardized coefficients		Standardized coefficients	t	p
		B	Std. Error	Beta		
1	(Constant)	1.77	0.38		4.60	0.001*
	Age group	−0.11	0.06	−0.16	−1.88	0.061
	Nationality	0.30	0.07	0.30	3.89	0.001*
	Marital status	0.12	0.08	0.11	1.37	0.171
	Education	−0.06	0.06	0–0.07	−1.05	0.293
	Occupation	−0.26	0.08	−0.26	−2.94	0.004*
After 2nd Dose		**Unstandardized coefficients**		**Standardized coefficients**	***t***	***p***
		B	**Std. Error**	**Beta**		
1	(Constant)	1.58	0.38		4.06	0.001*
	Age group	−0.08	0.06	−0.12	−1.36	0.174
	Nationality	0.16	0.07	0.16	2.13	0.034*
	Marital status	0.20	0.08	0.19	2.38	0.018*
	Education	−0.07	0.05	−0.08	−1.23	0.219
	Occupation	−0.14	0.08	−0.14	−1.55	0.121

*p<0.05 indicates statistical significance

Table 4: Predictors of history of chronic diseases on period habit change after 1st and 2nd dose receiving

Model		Unstandardized coefficients		Standardized coefficients	*t*	*p*
		B	Std. Error	Beta		
1	(Constant)	1.39	0.10		13.28	0.001*
	DM	−0.30	0.19	−0.15	−1.59	0.114
	HTN	−0.08	0.19	−0.04	−0.45-	0.655
	Cardiology	0.80	0.32	0.19	2.52	0.012*
	Hormonal	0.19	0.26	0.06	0.76	0.449
	OTHERS	0.01	0.18	0.00	0.03	0.977
	Pregnancy frequency	−0.04	0.08	−0.09	−0.53	0.596
	Labor frequency	0.02	0.07	0.05	0.31	0.761
	Abortion frequency	−0.02	0.05	−0.04	0–0.41	0.682
	Family planning methods	0.03	0.02	0.10	1.42	0.158
1	(Constant)	1.35	0.11		12.76	0.001*
	DM**	−0.01	0.19	−0.05	−0.06	0.953
	HTN****	−0.08	0.19	−0.04	−0.04	0.968
	Cardiology	0.63	0.32	0.15	1.94	0.044*
	Hormonal	0.11	0.26	0.03	0.39	0.691
	OTHERSS	0.13	0.18	0.05	0.70	0.481
	Pregnancy frequency	−0.07	0.08	−0.18	−0.96	0.335
	Labor frequency	0.08	0.07	0.21	1.14	0.255
	Abortion frequency	−0.04	0.04	−0.08	−0.75	0.457
	Family planning methods	0.03	0.02	0.14	1.77	0.077
	Taking COVID vaccine	0.85	0.13	0.23	6.37	0.001*
	Vaccine name	0.28	0.09	−0.13	2.82	0.005*
	Second vaccine time	−0.05	0.03	−0.02	−1.34	0.181
	Second vaccine dose name	−0.01	0.03	0.02	−0.316	0.752

*p<0.05 indicates statistical significance, **DM=Diabetes Miletus, ***HTN=Hypertension

Table 5: Distribution of vaccine names concerning complications

Vaccine name	Yes *n* (%)	No *n* (%)	Significance
Pfizer	114 (57.90)	8 (4.10)	χ^2=0.76, p=0.943
AstraZeneca	60 (30.50)	4 (2)	
Moderna	7 (3.60)	0 (0)	
Johnson	2 (1)	0 (0)	
Others	2 (1)	0 (0)	

Vaccine name	Delay 2 months *n* (%)	Delay 3–6 months *n* (%)	Delay +6 months *n* (%)	Not applicable *n* (%)	Sig.
Pfizer	27 (31.40)	18 (20.90)	5 (5.80)	6 (7)	χ^2=14.78, p=0.097
AstraZeneca	6 (7)	7 (8.10)	4 (4.70)	8 (9.30)	
Moderna	2 (2.30)	0 (0)	0 (0)	1 (1.20)	
Jhonson	0 (0)	0 (0)	1 (1.20)	1 (1.20)	

to consider and monitor potential long-term effects, particularly regarding women's health.

A notable, less than half of the participants reported changes in their menstrual cycle postvaccination. Among those who experienced changes, more than one-third of women had a delay of two months. These findings are consistent with other research indicating a potential association between COVID-19 vaccines and menstrual irregularities.[12,14] This may be due to the systemic reaction of the vaccine or stress and fear related to receiving the vaccine and the occurrence of COVID-19, which may have an impact on hormonal levels and the menstrual cycle.

Changes in menstrual period and bleeding: about one-quarter of the studied women experienced an increase in the number of menstrual period days, as well as an increase in menstrual bleeding. likewise reported by Nazir and others reported increased menstrual bleeding and changes in cycle length after COVID-19 vaccination.[15] Moreover, a study supporting the findings of increased menstrual period days and bleeding.[16] Another study[17] highlights the association between heavy menstrual bleeding postvaccination. These changes in the number of menstruation days can occur due to receiving vaccination among studied women, or it may be associated with other factors as age, change in hormonal level or thyroid

function, or psychological condition, so further research is needed to confirm the COVID-19 vaccination side effects on the menstrual cycle and hormonal level.

Amenorrhea was reported by participants for up to 1–2 months. These results suggest a diverse range of menstrual changes among participants. Likewise,[18,19] Furthermore,[20] stated that about one-fifth reported menstrual cycle changes after their first COVID-19 vaccine injection. These findings highlight the need for further research to understand the underlying mechanisms to provide clear guidance for women experiencing such side effects.

The side effects of the second dose were diverse, with the most common body aches by two-thirds included fever, sneezing and cough, and sore throat. These findings align with existing literature on the common side effects of COVID-19 vaccines, which often include systemic reactions such as fever and body aches.[21]

Almost half of the participants experienced changes such as delay or earlier periods up to 2 or more than 3 months. These results suggest a significant portion of the population experienced alterations in menstrual timing postvaccination, in convenient with previous studies,[22,23] indicating menstrual irregularities following COVID-19 vaccination, reported menstrual symptoms after the first and second dose cycles, respectively.

Menstrual period days and bleeding, reported by one-fifth of participants, up to 4 days or more than 1 week. Additionally, more than one-third reported an increase in menstrual bleeding. Similarly,[14] study reported that menstrual. On the other hand, this may be due to other factors like a change in lifestyle, physical complaints, and reduced participation in life activities. This highlights the need for further research to understand the underlying patterns and changes.

Amenorrhea after booster doses was reported by one-tenth of participants for less than 1 month or more than 3 months. Furthermore, more than two-thirds of those who experienced changes in menstrual habits. This indicates a potential underreporting of menstrual changes and suggests that many women may not seek medical advice for these changes, possibly due to a lack of awareness or concern about the implications.[24] Similarly, a clinical study demonstrated the impact of the COVID-19 vaccine on menstrual health, including amenorrhea.[25]

The results reported no significant relation between chronic diseases and period habit changes, except for cardiology: The cardiology predictor shows a significant positive effect on period habit change with a coefficient of 0.804 (P = 0.012). This suggests that individuals with a history of cardiology issues are more likely to experience changes in their period habits after the first dose of the vaccine. The coefficient for DM is − 0.303, indicating a potential negative association, but it is not statistically significant (P = 0.114). While variables related to reproductive issues did not show significant effects on period habit change.

The analysis indicates that a history of cardiology issues is a consistent predictor of changes in period habits following both the first and second doses of the COVID-19 vaccine. This finding is significant and suggests a potential area for further investigation. The lack of significant associations with other chronic conditions, such as diabetes, hypertension, and hormonal issues, suggests that these conditions do not have a notable impact on menstrual cycle changes postvaccination. Similarly,[15] a study interpreted of menstrual cycle changes after COVID-19 vaccination, corroborating the observed significant effects, especially in individuals with cardiology issues. Additionally,[26] stated that there was no relation between chronic disease and changes in menstruation habits post-COVID-19, depending on occupation, age, and geographic location.[27] Furthermore, a study[28] found that there was no significant effect between menstrual changes and suffering from chronic disease. Similarly,[21] another study found that no predictors were reported for menstrual adverse effects. Lee *et al*.[29] found that age, systemic vaccine side-effects, number of pregnancies, and ethnicity (Hispanic) were the predictors of menstrual problems postvaccination. These results indicate that there is no significant difference in the occurrence of complications among the different vaccine types. This finding is crucial as it suggests that all the vaccines evaluated have a similar safety profile regarding complications. These results, supported by the studies,[7,30] indicate that no change in menses length between or within vaccination cohorts was found.

This study, a pioneer study, focuses on menstrual disorders, not only the delay of the cycle. In addition to chronic conditions and are predictors of COVID-19 vaccines. The sample size was small, which affected the generalizability of the study outcomes. The types of vaccines mentioned are in a limited range due to the sample size and cannot reflect the whole picture of the effect of each specific vaccine.

Conclusion

Receiving the COVID-19 vaccine was strongly associated with menstrual disturbances among the studied group, ranging from simple menstrual irregularities to reported cases of amenorrhea following booster doses. Participants' sociodemographic characteristics—such as nationality, marital status, and reported changes—were also significantly related to these menstrual disturbances. However, the occurrence of menstrual cycle delays was not linked to the type of vaccine received. Further research is needed to investigate each vaccine type individually to determine whether the vaccine type specifically affects reproductive function in general, not just menstrual cycles. A larger, more comprehensive survey would be valuable to

enhance the generalizability of the findings. The implication of the future studies should investigate each type of vaccine specifically to show if the type of vaccine affects the reproductive function generally not only the menstrual cycle a tremendous survey for more generalizability.

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Conflicts of interest

Nothing to declare.

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