

## Association between Different Types of COVID-19 Vaccines and Menstrual Cycle Patterns among Women of Reproductive Age

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### Abstract

**Background:** The menstrual cycle is a major aspect of a woman's general health. There were concerns that the COVID-19 vaccine could possibly alter women's menstrual cycles during the early stages of the mass vaccination campaigns. **Aim:** To assess the association between different types of covid-19 vaccines and menstrual cycle patterns among women of reproductive age. **Design:** A quantitative, cross-sectional, descriptive design **Setting:** The study was conducted through an online self-administered survey (google forms). **Subjects:** A purposive sampling was taken from an online self-administered survey, through the period from the 27<sup>th</sup> of February to the 27<sup>th</sup> of March. The sample size is over 500 Saudi women of reproductive age between 18 and 45 years. **Tool for data collection:** An online self-administered survey covered four parts: sociodemographic data (3 items), obstetric history (4 items), Information on the COVID-19 vaccine (3 items), and menstruation experience before and after the COVID-19 vaccine (23 items). **Result:** The results showed that most of the participants were aged between 18-24 years, unmarried, and had normal BMI (47.6%, 52.6% &50.7% respectively). A menstrual disturbance was reported by (44.4%) of those who received the COVID-19 vaccination, results indicate that there was found a significant relationship between the duration of flow, menstrual blood loss, and severity of dysmenorrhea before and after receiving the first, second, and third doses of Covid19- vaccine, where the p-value of the test (0.000) was less than 0.05. **Conclusion:** The present study concluded that women who receive the Covid-19 vaccine may experience menstrual abnormalities, such as a significant difference in cycle length, flow duration, menstrual blood loss, and dysmenorrhea severity before and after receiving the first, second, and third doses of the vaccine. While no significant difference between different types of COVID-19 vaccines (Pfizer, Moderna, and Oxford/AstraZeneca) and menstrual abnormalities. **Recommendation:** In view of the newly emerging phenomenon known as "long haul COVID-19," we recommend prospective studies with larger sample sizes are required to examine the long-term consequences of the different types of COVID-19 vaccination on women's reproductive health.

**Keyword:** Menstrual Cycle, Change, Dysmenorrhea, Reproductive Age, COVID-19 Vaccines.

### Introduction:

A variety of COVID-19 vaccines have been released around the world, and many nations have issued emergency permits to deploy these vaccines on their populations. Two vaccines have been licensed for use in Saudi Arabia by the Saudi Food and Drug Authority (FDA) (Pfizer BioNTech and Oxford-AstraZeneca). The only way to combat the pandemic and lessen the associated illness and mortality is to immunize people with vaccinations that have already been approved. All countries are racing against the clock to vaccinate their citizens and residents as soon as feasible (Ahsan et al., 2021). Although the efficacy of both vaccinations has been proven in clinical research, data on their safety in real-world settings are scarce (Ahsan et al., 2021).

Both vaccinations have been related in clinical trials to a variety of mild to moderate side effects,

including soreness, redness, or swelling at the injection site, weariness, headaches, chills, muscle, and joint aches, and fever (Alhazmi et al., 2021). The recent revelation that some serious adverse effects, such as thrombosis, have been documented in Austria and Denmark after immunization with the Oxford-AstraZeneca vaccine has aggravated the issue and raised public concern about vaccinations (Ahsan et al., 2021).

Normal menstruation begins in adolescents aged 11 to 14 years old, with periods lasting 7 days or less and a cycle lasting 21 to 45 days with an average blood loss of 20-80ml (Rafique & Al-sheikh, 2018). Unfortunately, medical authorities' dismissal fanned more fears, as vaccination doubters and anti-vaccine groups began to combine the chance of menstrual irregularities that cause long-term reproductive problems (Lee et al., 2022).

Dysmenorrhea, premenstrual symptoms, menorrhagia, polymenorrhagia, atypical vaginal

bleeding, amenorrhea, oligomenorrhea, and irregular menstruation are all examples of menstrual disorder (**Rafique & Al-sheikh, 2018**). Monthly irregularities, such as severe menstrual bleeding (menorrhagia), frequent bleeding (metrorrhagia/polymenorrhea), and postmenopausal bleeding, were reported by some women after vaccination. Vaccine-induced thrombocytopenia could be one of the underlying causes (**Kurdoğlu, 2021**). Investigating the possible link between COVID-19 immunization and menstrual alterations is critical for maintaining public confidence in the vaccination program and, if a link is discovered, allowing people to plan for potential changes in their cycles (**Male, 2021**).

For most women, menstruation comes with a slew of unpleasant symptoms and inconveniences that disrupt daily living. MCSs (menstrual cycle-related signs and symptoms) are a collection of physical and/or emotional manifestations that occur before or during the menstrual cycle and are most typically characterized as PMS or dysmenorrhea. The most frequent menstrual disorders in women of reproductive age are these MCSs. MCSs are prevalent during menstruation in 16 to 91 percent of reproductive-age women. According to the first systematic study and meta-analysis of PMS, the global prevalence of PMS was 47.8%. Despite the fact that dysmenorrhea and PMS are temporary health disorders with symptoms that might go away without treatment, both symptoms can occur every monthly cycle for years (**Sutthibut et al., 2021**).

Menstrual discomfort is frequent and can be devastating in women of reproductive age. It is unknown how accurate self-reporting of menstruation discomfort is (Jukic et al., 2008). In a previous study by **Alvergne et al. (2021)**, which included 4989 vaccinated women who participate in an online survey to evaluate if the Covid-19 vaccines affect menstrual health, Following Covid-19 vaccination, 80 % of women reported no changes in their menstrual cycle, 6.1 % reported more disruption, 1.5 % reported less disruption, and 11.5 % reported other changes. Another study by **Laganà et al. (2022)** aimed to investigate menstrual irregularities after the first and second doses of the Covid-19 vaccine using a customized pilot questionnaire, which included 164 women who received the first dose of the Covid-19 vaccine and 135 women who received two doses of the Covid-19 vaccine, 50– 60 % of reproductive-age women who received the first dose of the Covid-19 vaccine reported menstrual cycle irregularities.

Menstrual irregularities that occurred after the first and second immunization doses were observed to disappear in nearly half of the cases after two months. Nurses are crucial in influencing the overall acceptance rate. They provide patients with more information than physicians and other healthcare providers, and they are frequently the first to contact patients and provide immunizations. Patients prefer nurses' care because studies demonstrate that, when compared to physicians, nurses deliver longer consultations, clearer information, more lifestyle recommendations, and better communication. As a result, they are more dependable and approachable to patients. They are the source of information about vaccine safety, benefits, and adverse effects because they are usually in charge of delivering vaccines (**Rabi et al., 2021**).

Despite growing recognition among clinicians that the menstrual cycle should be used as a vital sign of female health, that sex is a biological variable that should be considered in immunological studies, and that there have been reports of heavy, infrequent, or irregular menstrual bleeding following vaccination, there is still a lack of understanding among the public, this is still the case. Quantitative data for any such association between COVID-19 immunization and menstrual cycle disturbance and the factors mediating this relationship is critical for assessing how the pandemic has impacted female health (**Male, 2021**).

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that they interrupt menstrual cycles, resulting in unpleasant menstrual symptoms. As reported by **Male. (2021)** we discovered a link between the timing of immunization throughout the menstrual cycle and the start of the next period. In addition, some women experienced menstrual irregularities after immunization, including heavy menstrual bleeding (menorrhagia), frequent bleeding (metrorrhagia / polymenorrhea).

one in five women reported having menstruation issues after receiving the COVID-19 vaccine, according to (**Alvergne et al. 2021**).

There are a few studies to identify the impact of COVID-19 on the menstrual cycle. Therefore, this study was conducted to assess the effect of the

### **Aim of the study:**

The aim of the study is to assess the association between different types of covid-19 vaccines and menstrual cycle patterns among women of reproductive age.

### **Research question:**

Is there an association between different types of COVID-19 vaccines and menstrual cycle patterns among women of reproductive age?

### **Operational definition**

#### **Menstrual cycle patterns:**

Reflect on women's menstrual health status before and after receiving the first second, and third COVID-19 vaccine, like cycle length in days, duration of flow, and menstrual blood loss. Also, includes menstrual problems before and after each dose like the severity of dysmenorrhea, and if there are any menstrual disorders such as a history of amenorrhea, premenstrual symptoms, or history of abnormal vaginal bleeding.

#### **Reproductive-age women**

The women's reproductive age is from 18 to 44 years.

### **Materials and Method:**

#### **Research Design:**

A quantitative cross-sectional, descriptive design was used in this study.

different types of COVID-19 vaccines on the menstrual cycle among women of reproductive age

### **Study Setting:**

The information was gathered through online survey platforms (google forms). online surveys are one of the most widely utilized research techniques because it is less expensive, allow us to collect a big quantity of data in a short period of time, and can reach a wide geographical distance. The invitation link to participate in the study was shared across various social media sites (Twitter, Snapchat, WhatsApp, and Instagram).

### **Population and Sample:**

A purposive sampling was taken from an online self-administered survey, through the period from the 27<sup>th</sup> of February to the 27<sup>th</sup> of March. The sample size is over 500 participants, as calculated by a 5% margin of error, and the confidence level was 95%. The sample was recruited according to the following criteria.

#### **Inclusion Criteria:**

- Saudi women who received the COVID-19 vaccine.
- Women between the ages of 18-45.
- Women with a normal menstrual cycle (25-35 days) before vaccination
- Women who are free from endometriosis or polycystic ovarian syndrome.

#### **Exclusion Criteria:**

- Non-Saudi women.
- Unvaccinated women.
- Women over 45 or younger than 18.
- Women who have an irregular menstrual cycle.
- Women who have chronic diseases.
- Women who were pregnant and using intrauterine devices.

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**Tool for Data Collection:**

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An online self-administered survey was developed by researchers according to the literature review. The questionnaire consists of 36 items, and it includes four parts as the following:

**Part (1):** Sociodemographic data (3 items): This part aims to assess the demographic characteristic data of participants such as age, marital status, and BMI.

**Part (2):** Obstetric history (4 items): This part aims to assess obstetric history. We obtained participants' obstetric history for descriptive purposes, including gravidity, parity, breastfeeding, and use of hormonal contraception.

**Part (3):** Information on the COVID-19 vaccine (3 items): This part aims to assess the women's information on the COVID-19 vaccine as the type of vaccine, the number of doses, and if the vaccine affects their menstrual cycle or not.

**Part (4):** Menstruation experience before and after the COVID-19 vaccine (23 items): This part aims to assess the women's menstruation experience before and after the vaccine. It includes the cycle patterns like cycle length in days, duration of flow, and menstrual blood loss before and after each dose. Also, includes menstrual problems before and after each dose like the severity of dysmenorrhea, and if there are any menstrual disorders such as a history of amenorrhea, premenstrual symptoms, or history of abnormal vaginal bleeding.

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**Tool Validity:**

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To assess items' content validity, completeness, and clarity, 5 experts in the

nursing faculty at King Abdulaziz University will edit the data collection tool. The tools were adjusted based on the expert's opinions on the content's suitability, the sentences' clarity, and the order of the items.

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**Tool reliability:**

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The study questionnaires were subjected to a reliability analysis to determine internal consistency using the Alpha-Cronbach test. The reliability was done with Cronbach's Alpha coefficient test, which explained the present tool validity was 0.799.

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**Pilot study:**

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A pilot study was conducted with 10% of participants to assess the study's visibility and applicability and estimate the time required to complete the questionnaire. Then the tool was modified in accordance with it.

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**Data Collection Process:**

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The necessary approval was obtained from the faculty of Nursing at King Abdulaziz University to carry out the study. The study was implemented during the period from the 27<sup>th</sup> of February 2022 to the 27<sup>th</sup> of March. 2022. The current study was carried out in three phases (The preparatory phase, the implementation phase, and the evaluation phase).

**Phase I: Preparatory Phase**

In the beginning, the researchers reviewed the literature related to the current study, then prepared and designed tools for data collection. Participants gave their informed consent before completing the anonymous survey. The first page of the online questionnaire. Participants were

invited to complete and submit an online Google Form after ensuring the availability of internet access to ensure materials were accessible to participants. The invitation link was shared to participate in the study across various social media sites (Twitter, Snapchat, WhatsApp, and Instagram). Finally, a pilot study was carried out with 10% of the total study participants, who were subsequently excluded from the study sample. The pilot study was conducted to test the clarity of the study tools and estimate the required time to fulfill the questionnaire

### **Phase II: Implementation Phase**

The tool was uploaded online across various social media sites (Twitter, Snapchat, WhatsApp, and Instagram), Participants gave their informed consent before completing the anonymous survey. We clearly explained the procedure, and participants could interrupt or stop the survey at any time without explaining their reasons. Anonymity was confident as the complete questionnaire sheets were given a code number (not by name). The participants were ensured that the questionnaire form was used only for the purpose of the study and discarded at the end of the study. Data was gathered from all participants through online survey platforms (google forms). The invitation link was shared to participate in the study across various social media sites (Twitter, Snapchat, WhatsApp, and Instagram).

### **Phase III: Evaluation phase**

At the end of this phase, the researcher assessed the response rate, and the evaluation was done to ensure all questions were filled and no missing data to start data analysis.

### **Data Analysis:**

Statistical package for social studies (SPSS). The collected data was analyzed using Version 24. Descriptive analysis, mean, standard deviation, percent, and frequency were used to summarize the data. The relationship between variables was depicted using the Chi-square. To be declared statistically significant, the P-value was compared to the level of significance at 0.05.

### **Ethical consideration:**

Ethical approvals for this research went through two stages in the beginning, obtaining ethical approval was first approved by the Ethical Committee of the Nursing Faculty at KAUH in Jeddah (2B.73). The second permission from the participating women was obtained by signing a written informed consent paper attached to the data collection tool after receiving adequate information about the research study and before beginning the data collection process. All required elements are covered in the informed consent, which includes Information about the researcher, the study title and purpose, the investigation process,

the potential benefits and risks to participants, the usability of study findings, participant confidentiality, and anonymity.

## Results:

**Table (1):** shows the distribution of the study participants according to their age, marital status, and BMI. The table shows that 19.8% of the sample study age lies between 40 and 45 years. 52.6% of them were single. While (50.7%) of them have a normal weight.

**Table (2):** illustrates the distribution of the study participants according to their gravidity, parity, breastfeeding & hormonal contraception. The table shows that 60.1% and 60.5 % of the participants don't have gravidity and parity. Only 5.9% of them were breastfeeding. Most of the participants 80.8% don't use hormonal contraception in their life..

**Figure (1):** A, B, C: illustrates the distribution of the study participants according to the Covid-19 vaccine. The figure shows that 78.1% of the sample study said that Pfizer was the vaccine product did they receive. 65.6% of them said that they received three doses. 55.6% of them said that the COVID-19 vaccine doesn't affect their menstruation. While 44.4% of them said that COVID-19 vaccines affect their menstruation.

**Table (3)** displays that There was found a significant relationship between menstrual blood loss before and after receiving the first dose, second dose, and third dose of Covid19- Vaccine, where the p-value of the test (0.000) was less than 0.05.

**Table (4)** shows that there was found a significant relationship between the severity of dysmenorrhea before and after receiving the first dose, second dose, and third dose of Covid19- Vaccine, where the p-value of the test (0.000) is less than 0.05.

**Table (5)** illustrates that there was found a significant difference between cycle length before and after receiving the first dose, second dose, and third dose of the COVID-19 vaccine, and (0.001, 0.000, 0.000

respectively) where the p-value of the test (0.001) less than 0.05.

**Table (6)** Shows that no significant difference between the duration of the menstrual flow before and after receiving the first dose of the COVID-19 vaccine, where the p-value of the test (0.744) was greater than 0.05. But there was found a significant difference between the duration of menstrual flow before and after receiving the second dose and third doses of the COVID-19 vaccine, where the p-value of the test (0.000) was less than 0.05.

**Table (7)** displays that there was found no significant relation between cycle length, duration of flow, menstrual blood loss, menstrual cycle, the severity of dysmenorrhea, suffering from any menstrual disorder and problem after receiving the first dose of different type of COVID-19 vaccines (0.149,0.130,0.543,0.069,0.182 & 0.677 respectively) where the value of the test greater than 0.05

**Table (8)** indicates that there was found no significant relationship between cycle length, duration of flow, menstrual blood loss, menstrual cycle, the severity of dysmenorrhea, suffering from any menstrual disorder, and problems after receiving the second dose of different types of COVID-19 vaccines (0.895,0.503,0.753,0.142,0.606 & 0.417 respectively) where the value of the test greater than 0.05.

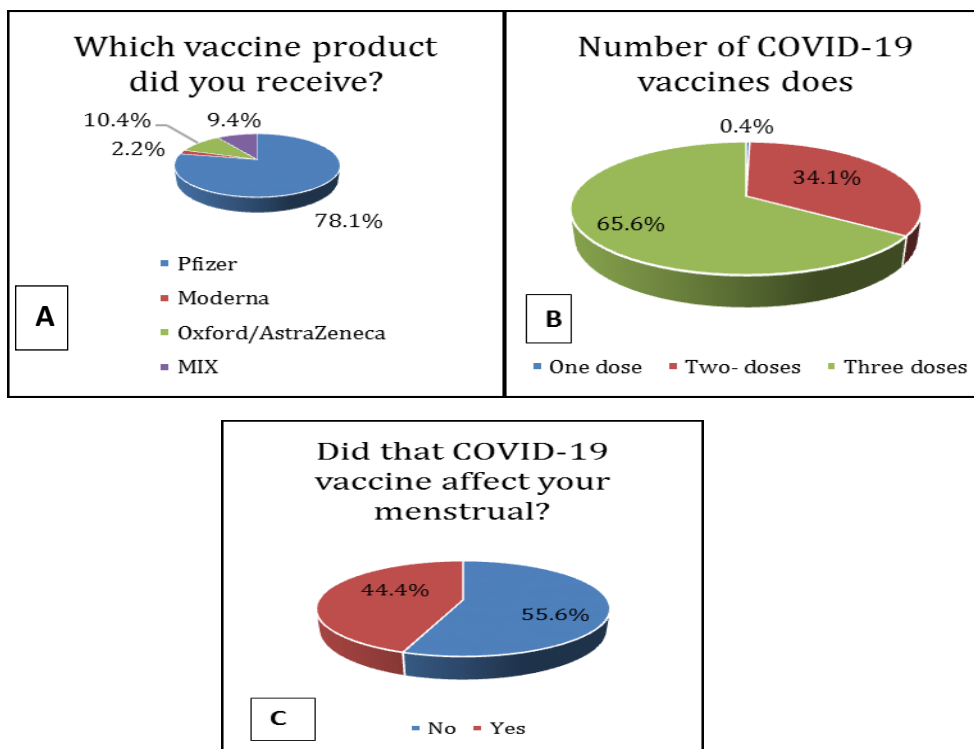
**Table (9)** illustrates that there was found no significant relationship between cycle length, duration of flow, menstrual blood loss, menstrual cycle, the severity of dysmenorrhea, suffering from any menstrual disorder, and problems after receiving the third dose of different types of COVID-19 vaccines, and (0.858,0.217,0.471,0.070,0.297 & 0.251 respectively) where the value of the test greater than 0.05.

Table (1): Sample distribution according to the participant's age, marital status, and BMI (n =511)

Sociodemographic Data		Number N=511	Percentage (%)
○ Age	- 18-<25	243	47.6%
	- 25-<30	61	11.9%
	- 30-<35	56	11.0%
	- 35-<40	50	9.8%
	- 40-45	101	19.8%
○ Marital status	- Married	219	42.9%
	- Single	269	52.6%
	- Divorced	18	3.5%
	- Widow	5	1.0%
○ BMI	- Underweight	63	12.3%
	- Normal weight	259	50.7%
	- Overweight	171	33.5%
	- Obese	18	3.5%

Table (2): Sample Distribution According to the Participants' Gravidity, Parity, Breastfeeding, and Hormonal Contraception (n =511)

Obstetric History		Number N=511	Percentage (%)
○ Gravidity	- Zero	307	60.1%
	- Primigravida	32	6.3%
	- 2-5	142	27.8%
	- 6-9	30	5.9%
○ Parity	- Zero	309	60.5%
	- 1-3	126	24.7%
	- 4-6	64	12.5%
	- 7-9	12	2.3%
○ Breastfeeding	- No	481	94.1%
	- Yes	30	5.9%
○ Hormonal contraception	- No	413	80.8%
	- Yes	98	19.2%



**Figure (1) (A, B, C):** Sample distribution according to the participants’ type of Covid-19 vaccine received, dose, and effect of the COVID-19 vaccine in the menstrual cycle. (n =511)

**Table (3):** Association between menstrual blood loss before and after the first, second, and third dose of the COVID-19 vaccines received. N=511

Menstrual blood loss		Before Covid19- Vaccine			Total	Chi-square	Sig.
		Light	Moderate	heavy			
○ First dose	- Light	36	49	8	93	140.484	0.000
	- Moderate	13	305	19	337		
	- Heavy	3	55	23	81		
○ Second dose	- Light	25	46	8	79	90.249	0.000
	- Moderate	22	308	18	348		
	- Heavy	5	55	24	84		
○ Third dose	- Not received	14	100	11	125	59.371	0.000
	- Light	20	46	6	72		
	- Moderate	13	220	15	248		
	- Heavy	5	43	18	66		
<b>Total</b>		52	409	50	511		



**Table (4): Association between severity of dysmenorrhea before and after first, second, and third doses of the COVID-19 vaccines received. N=511**

Severity of dysmenorrhea		Before Covid19- Vaccine			Total	Chi-square	Sig.
		Mild	Moderate	Severe			
○ First dose	- Mild	67	22	3	92	256.014	<b>0.000</b>
	- Moderate	31	240	22	293		
	- Severe	20	51	55	126		
○ Second dose	- Mild	62	20	4	86	233.484	<b>0.000</b>
	- Moderate	35	243	23	301		
	- Severe	21	50	53	124		
○ Third dose	- Not received	33	89	17	139	150.711	<b>0.000</b>
	- Mild	44	17	6	67		
	- Moderate	27	165	16	208		
	- Severe	14	42	41	97		
<b>Total</b>		118	313	80	511		

**Table (5): Comparison of the mean score of cycle length in days among participants before and after the first, second, and third doses of the COVID-19 vaccines received. N=511**

The cycle length in days	Mean	SD	difference	Lower	Upper	T	sig.
○ Before Covid19- Vaccine	1.930	0.771	-0.102	-0.161	-0.043	-3.391	<b>0.001</b>
○ After receiving the first dose	2.031	0.889					
○ Before Covid19- Vaccine	1.930	0.771	-0.115	-0.176	-0.055	-3.741	<b>0.000</b>
○ After receiving the second dose	2.045	0.842					
○ Before Covid19- Vaccine	1.930	0.771	0.333	0.235	0.431	6.664	<b>0.000</b>
○ After receiving the third dose	1.597	1.147					

**Table (6): Comparison of the mean score of the duration of flow in days among participants before and after the first, second, and third doses of the COVID-19 vaccines received. N=511**

Duration of flow in days	Mean	SD	difference	Lower	Upper	T	sig.
○ Before Covid19- Vaccine	2.859	0.617	-0.010	-0.069	0.049	-0.327	0.744
○ After receiving the first dose	2.869	0.714					
○ Before Covid19- Vaccine	2.859	0.617	-0.157	-0.216	-0.098	-5.208	<b>0.000</b>
○ After receiving the second dose	3.016	0.635					
○ Before Covid19- Vaccine	2.859	0.617	0.663	0.546	0.781	11.069	<b>0.000</b>
○ After receiving the third dose	2.196	1.332					

Table (7): Association between menstrual cycle pattern and problems after receiving the first dose of the different types of COVID-19 vaccines. N=511

Menstrual cycle patterns & problems		Which vaccine product did you receive?								Chi-square	Sig.
		Pfizer		Moderna		Oxford/AstraZeneca		MIX			
		N 399	%	N 11	%	N 53	%	N 48	%		
The cycle length in days	< 21 days	125	24.5%	5	1.0%	15	2.9%	10	2.0%	8.433	.491
	21 -27 days	169	33.1%	5	1.0%	23	4.5%	27	5.3%		
	28-35 days	77	15.1%	0	0.0%	10	2.0%	6	1.2%		
	> 35 days	28	5.5%	1	0.2%	5	1.0%	5	1.0%		
Duration of flow in days	< 2 days	21	4.1%	0	0.0%	3	0.6%	1	0.2%	17.541	.130
	2-4 days	65	12.7%	0	0.0%	11	2.2%	15	2.9%		
	5 -7 days	254	49.7%	9	1.8%	31	6.1%	29	5.7%		
	> 7 days	58	11.4%	2	0.4%	8	1.6%	2	0.4%		
	5.00	1	0.2%	0	0.0%	0	0.0%	1	0.2%		
Menstrual blood loss	Light	74	14.5%	2	0.4%	12	2.3%	5	1.0%	5.004	0.543
	Moderate	267	52.3%	7	1.4%	31	6.1%	32	6.3%		
	heavy	58	11.4%	2	0.4%	10	2.0%	11	2.2%		
Menstrual cycle	Regular	268	52.4%	11	2.2%	36	7.0%	28	5.5%	7.084	0.069
	Irregular	131	25.6%	0	0.0%	17	3.3%	20	3.9%		
Severity of dysmenorrhea	Mild	75	14.7%	1	0.2%	11	2.2%	5	1.0%	8.859	0.182
	Moderate	226	44.2%	10	2.0%	30	5.9%	27	5.3%		
	Severe	98	19.2%	0	0.0%	12	2.3%	16	3.1%		
Do you suffer from any menstrual disorders?	History of amenorrhea	33	6.5%	0	0.0%	6	1.2%	2	0.4%	9.301	.677
	Premenstrual symptoms	86	16.8%	3	0.6%	6	1.2%	10	2.0%		
	History of abnormal vaginal bleeding	18	3.5%	1	0.2%	4	0.8%	3	0.6%		
	None	250	48.9%	7	1.4%	33	6.5%	29	5.7%		
	Other	12	2.3%	0	0.0%	3	0.6%	3	0.6%		

**Table (8): Association between menstrual cycle patterns and problems after receiving the second dose of the different types of COVID-19 vaccines. N=511**

Menstrual cycle pattern and problems ( Second dose)		Which vaccine product did you receive?								Chi-square	Sig.
		Pfizer		Moderna		Oxford/AstraZeneca		MIX			
		N (399)	%	N (11)	%	N (53)	%	N (48)	%		
The cycle length in days	< 21 days	108	21.1%	3	0.6%	17	3.3%	10	2.0%	4.240	.895
	21 -27 days	188	36.8%	7	1.4%	23	4.5%	26	5.1%		
	28-35 days	78	15.3%	1	0.2%	10	2.0%	8	1.6%		
	> 35 days	25	4.9%	0	0.0%	3	0.6%	4	0.8%		
Duration of flow in days	< 2 days	24	4.7%	0	0.0%	4	0.8%	5	1.0%	5.325	.503
	2-4 days	0	0.0%	0	0.0%	0	0.0%	0	0.0%		
	5 -7 days	318	62.2%	9	1.8%	38	7.4%	39	7.6%		
	> 7 days	57	11.2%	2	0.4%	11	2.2%	4	0.8%		
Menstrual blood loss	Light	63	12.3%	0	0.0%	10	2.0%	6	1.2%	3.432	0.753
	Moderate	272	53.2%	9	1.8%	35	6.8%	32	6.3%		
	heavy	64	12.5%	2	0.4%	8	1.6%	10	2.0%		
Menstrual cycle	Regular	266	52.1%	10	2.0%	33	6.5%	27	5.3%	5.451	0.142
	Irregular	133	26.0%	1	0.2%	20	3.9%	21	4.1%		
Severity of dysmenorrhea	Mild	67	13.1%	2	0.4%	11	2.2%	6	1.2%	4.524	0.606
	Moderate	236	46.2%	8	1.6%	31	6.1%	26	5.1%		
	Severe	96	18.8%	1	0.2%	11	2.2%	16	3.1%		
Do you suffer from any menstrual disorders?	History of amenorrhea	37	7.2%	0	0.0%	7	1.4%	2	0.4%	12.359	.417
	Premenstrual symptoms	82	16.0%	4	0.8%	9	1.8%	13	2.5%		
	History of abnormal vaginal bleeding	21	4.1%	1	0.2%	3	0.6%	2	0.4%		
	None	246	48.1%	6	1.2%	34	6.7%	27	5.3%		
	Other	13	2.5%	0	0.0%	0	0.0%	4	0.8%		

**Table (9): Association between menstrual cycle pattern and problems after receiving the third dose of the different types of COVID-19 vaccines. N=511**

Menstrual cycle patterns and problems ( Third dose )		Which vaccine product did you receive?								Chi-square	Sig.
		Pfizer		Moderna		Oxford/AstraZeneca		MIX			
		N (399)	%	N (11)	%	N (53)	%	N (48)	%		
The cycle length in days	< 21 days	89	17.4%	3	0.6%	10	2.0%	13	2.5%	4.719	.858
	21 -27 days	139	27.2%	4	0.8%	18	3.5%	19	3.7%		
	28-35 days	59	11.5%	0	0.0%	10	2.0%	6	1.2%		
	> 35 days	21	4.1%	0	0.0%	4	0.8%	4	0.8%		
Duration of flow in days	< 2 days	13	2.5%	1	0.2%	2	0.4%	4	0.8%	11.938	.217
	2-4 days	61	11.9%	0	0.0%	10	2.0%	14	2.7%		
	5 -7 days	189	37.0%	5	1.0%	25	4.9%	21	4.1%		
	> 7 days	45	8.8%	1	0.2%	5	1.0%	2	0.4%		
Menstrual blood loss	Light	51	10.0%	1	0.2%	8	1.6%	12	2.3%	5.589	.471
	Moderate	196	38.4%	4	0.8%	26	5.1%	22	4.3%		
	heavy	53	10.4%	2	0.4%	4	0.8%	7	1.4%		
Menstrual cycle	Regular	179	35.0%	7	1.4%	23	4.5%	20	3.9%	7.054	.070
	Irregular	113	22.1%	0	0.0%	14	2.7%	21	4.1%		
Severity of dysmenorrhea	Mild	50	9.8%	1	0.2%	10	2.0%	6	1.2%	7.270	.297
	Moderate	167	32.7%	5	1.0%	17	3.3%	19	3.7%		
	Severe	70	13.7%	1	0.2%	10	2.0%	16	3.1%		
Do you suffer from any menstrual disorders?	History of amenorrhea	17	3.3%	0	0.0%	4	0.8%	5	1.0%	14.836	.251
	Premenstrual symptoms	65	12.7%	1	0.2%	6	1.2%	7	1.4%		
	History of abnormal vaginal bleeding	17	3.3%	1	0.2%	1	0.2%	1	0.2%		
	None	177	34.6%	5	1.0%	27	5.3%	23	4.5%		
	Other	14	2.7%	0	0.0%	1	0.2%	6	1.2%		

## Discussion:

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The menstrual cycle is a reflection of a woman's overall health, as women with inconsistent and lengthier menstrual cycles are more likely to die before they reach the age of 70. ([Wang et al., 2020](#)). This is partly due to the fact that women with inconsistent menstrual cycles are more likely to develop metabolic problems. As a result, menstrual irregularities present a substantial burden on the healthcare system, especially when considering the influence on women's everyday activities ([Muhaidat et al., 2022](#)). This stresses the significance of looking into menstruation problems after receiving the Covid-19 vaccine. Therefore, the purpose of the present study is to assess the effect of the different types of COVID-19 vaccines on the menstrual cycle among women of reproductive age.

In a cohort of over 500 menstruation women aged between 18 and 45 years, we estimated the prevalence and relative risk of menstrual abnormalities in relation to covid-19 immunization. In our study, a large part of the sample was taken from female university students. Therefore, the majority of the participants were aged between 18-24 years, unmarried, and have normal BMI, and this is the ideal status in which the menstrual cycle is supposed to be regular and without any disturbances.

According to our findings for the Saudi Arabia sample, menstruating women reported their menstrual cycle had not changed after receiving the COVID-19 vaccine. According to other studies ([Alvergne et al. \(2021\)](#)) in most menstruating women, menstrual alterations were not observed after the COVID-19 immunization. This provides encouraging information when discussing Covid-19 immunization and menstrual changes with reproductive-aged women.

On the other hand, in the present study, a menstrual disturbance was reported by those who received COVID-19 immunization, a number that exceeds the threshold for a "widespread" adverse event, according to international pharmacovigilance criteria. And according to [Alvergne et al. \(2021\)](#), following the COVID-19 vaccination, women experienced menstruation problems. This discrepancy in findings may be due to differences between the two studies in the sample size, time, and number of vaccine doses.

However, clinicians should discuss these potential menstrual side effects with women following COVID-19 vaccination, emphasizing the necessity of getting medical treatment if they are severe, last more than one cycle, or contain "red flag" symptoms. In our study, women who received the vaccine had their menstrual cycles lengthened, resulting in a disparity between before and after vaccination. [Edelman et al. \(2022\)](#) did nationwide research that a minor shift in cycle length is linked to Covid-19 vaccination. And this is fully consistent with our results. Both studies found that while alterations to the menstrual cycle do occur after immunization, they are minor in comparison to natural fluctuation and soon reverse.

Events leading to the recruitment and maturation of the dominant follicle during the follicular phase, mechanisms known to be affected by stress, changes in weight and exercise, and other major lifestyle changes all contribute to cycle length variability, which is common during the Covid-19 pandemic ([Nagma et al., 2015](#)).

According to our findings, after receiving the first, second, and third doses, women reported a substantially longer mean duration of menstruation compared to their pre-vaccine status, with a significantly lower mean after getting the third dosage. According to a study conducted by

**Muhaidat et al. (2022)**, there is a significant difference in the duration between before and after vaccination. And this is fully consistent with our results. However, cycle duration has been reported to vary. The bodily changes generated by the regular ups and downs of your reproductive hormones cause menstrual lengths. The average monthly flow lasts 3-5 days, although flows as little as 1 day and as long as 8 days can occur in a normal woman.

The pattern of menstrual blood loss is a key sign of menstrual health. In our study, there is no discernible difference in menstrual blood loss before and after receiving COVID-19 Vaccine doses. Our results contrast with a recent study conducted by **Lee et al. (2022)** study of 39,129 people in the United States, who reported more bleeding following immunization. However, there were differences between the two studies in the number of the sample size.

Our study indicates that there was a small difference in the severity of dysmenorrhea before and after the doses of the COVID-19 vaccination. On the other hand, a study conducted by **Sharp et al. (2021)** states that during the Covid-19 pandemic, women have experienced changes in their menstrual cycle including increment dysmenorrhea. However, the research specifies the cause of these changes is the COVID-19 infection. The difference is due to our search specifically for the COVID-19 vaccination and not including the COVID-19 infection.

The current study shows that more than three-quarters of the participant women said that Pfizer was the vaccine product did they receive. About two-thirds of them said that they received three doses. More than one-half of them said that the COVID-19 vaccine doesn't affect their menstruation. While more than two-fifths of them said that

COVID-19 vaccines affect their menstruation.

Our study illustrates that there was found no significant relationship between cycle length, duration of flow, menstrual blood loss, menstrual cycle, the severity of dysmenorrhea, suffering from any menstrual disorder, and problems after receiving the first, second, and third doses of different types of COVID-19 vaccines (Pfizer, Moderna, Oxford/AstraZeneca and mix). This result is consistent with the findings of the study by Kareem, et al (2022) "The effect of COVID-19 vaccination on the menstrual pattern and mental health of the medical students: a mixed-methods study from a low and middle-income country "

In addition, the current study findings also contradicted the findings of **Matar SG et al. (2023)** who stated that women who received the Moderna and Pfizer vaccines had average menstrual pain scores that were considerably greater than those who received other vaccines (6.43 and 5.94, respectively). In comparison to other vaccinations, they also had a significantly greater number of bleeding days (5.92 for Pfizer and 5.76 for Moderna). Johnson & Johnson had the highest percentage of menstrual irregularity, followed by Sinopharm, Moderna, and AstraZeneca ( $p = 0.022$ ). Similar to Pfizer, Sinopharm, AstraZeneca, and Moderna, Johnson & Johnson was connected to a higher percentage of significant bleeding with coagulations ( $p = 0.003$ ).

The difference may be due to only two vaccines approved by the Ministry of Health in Saudi Arabia where Pfizer is the most common vaccine for all participants followed by Oxford/AstraZeneca. In contrast, other types of vaccines are not approved. for this reason, there is a difference in the menstrual abnormalities experiences among vaccinated women from various MENA countries.

In conclusion, the COVID-19 vaccination did not cause menstrual changes in more than half of menstruating women. When discussing COVID-19 immunization and menstrual changes with reproductive-aged women, this is encouraging news. Nurses should advocate for period health by emphasizing the advantages of tracking menstrual health variables in terms of self-awareness and health management, as well as providing education about menstrual health using inclusive, compassionate language ([Sanchez & Maresh, 2021](#)).

### **Study limitation:**

Our research has certain limitations as well. First, the study used an online self-administered survey and selected participants with convenience sampling which leads to the majority of participants being female university students and which may limit the generalizability. Second, in order to evaluate the resolution of cycle length changes among women getting two doses per cycle, our dataset has a limited number of cycles post-vaccination. Additionally, we are unable to take into account the potential influence of COVID-19 infections on menstrual cycle outcomes that both vaccinated and non-vaccinated research women might have obtained.

### **Conclusion:**

This study provides preliminary evidence that women who receive the Covid-19 vaccine may experience menstrual abnormalities, such as a significant difference in cycle length, flow duration, menstrual blood loss, and dysmenorrhea severity before and after receiving the first, second, and third doses of the vaccine. Our research found that the COVID-19 vaccination affects the menstruation cycle length. We found that most women have

experienced longer cycle lengths after the first dose of the vaccine. Also, the number of women who were affected after the second and third doses were reduced compared to after the first dose. Secondly, the study showed that women reported a long menstrual duration after COVID-19 vaccination compared to their pre-vaccine status where the number of days was increased compared to their regular period days. Thirdly, there was found no significant relationship between cycle length, duration of flow, menstrual blood loss, menstrual cycle, the severity of dysmenorrhea, suffering from any menstrual disorder, and problems after receiving the first, second, and third doses of different types of COVID-19 vaccines (Pfizer, Moderna, Oxford/AstraZeneca and mix). Lastly, there was found a significant relationship between menstrual blood loss, the severity of dysmenorrhea, and cycle length before and after receiving the first, second, and third doses of the COVID-19 vaccine. While no significant difference between the duration of the menstrual flow before and after receiving the first dose of the COVID-19 vaccine but there was found a significant difference between the duration of menstrual flow before and after receiving the second dose and third doses of the COVID-19 vaccine.

### **Recommendation:**

Based on the study findings the following recommendations are suggested:

- In view of the newly emerging phenomenon known as "long haul COVID-19," we recommend prospective studies with larger sample sizes are required to examine the long-term consequences of the different types of COVID-19 vaccination on women's reproductive health

- It is essential to alert both women and healthcare workers about menstruation abnormalities following vaccination.
- We recommend that similar studies be conducted in other different countries to

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