



Can Covid-19 Vaccination Affect Menstrual Health of Females Working at Zagazig University after Covid-19 Vaccination?

Rasha Mohamed Ashraf¹, Hosnia Mohammed Ragab², Noha Osman Frere³, Amany Mohammed AbdAllah³

1-General Administration of Medical Services, Zagazig University, Zagazig, Egypt.

2-Community Medicine and Public Health Department, Faculty of Medicine, Zagazig University, Zagazig, Egypt.

3-Family Medicine department, Faculty of Medicine, Zagazig University, Zagazig, Egypt.

Corresponding author*

Rasha Mohamed Ashraf

Email:

rashaashraf593@yahoo.com

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ABSTRACT

Background: In 2020, global spread of the coronavirus pandemic began. Subsequently, various companies compete to develop numerous vaccines which have shown varying side effects. Assessing menstrual abnormalities post covid -19 vaccination can help understand whether the vaccine might influence menstrual health. We aim to assess the menstrual abnormalities after the COVID-19 vaccination among females working at Zagazig University. **Methods:** A cross-sectional study was conducted in the medical and administrative sectors at Zagazig University. The study included 346 females in the childbearing period from March to September 2023. A semi-structured questionnaire was divided into three sections: demographics, COVID-19 vaccination data, and data about the menstrual cycle. **Results:** The mean age of participants was 36.76 years. Of them, 67.9% worked in the medical field, and 92.9% received the COVID-19 vaccination. About 43% of vaccinated women subjectively identified changes in their menstrual cycle. There is a statistically significant relationship between change in menstruation after COVID-19 vaccination and the presence of minor adverse effects and the number of doses. Receiving two doses of vaccines non-significantly increased the risk of menstrual changes by 1.478 folds, while receiving three doses and experiencing minor adverse effects post-vaccination significantly independently increased the risk by 2.531 and 1.625 folds, respectively. **Conclusions:** About forty percent of vaccinated females reported menstrual changes post-vaccination. COVID-19 vaccination had effect on menstrual health which is linked to vaccination doses and immunologic response to vaccine. We recommend implementing screening programs in family health centers, and to limit number of doses to least effective ones.

Keywords: COVID-19 Vaccination; Side Effects; Menstrual Abnormalities

INTRODUCTION

In 2020, the world was hit by the coronavirus pandemic originating from China, the initial epicenter, leading to profound damage on multiple levels [1].

Since then, specialized companies have entered into competition, developing

numerous vaccines that are highly effective, significantly reducing the negative consequences of this pandemic [2].

As vaccination campaigns began worldwide, a spectrum of adverse events emerged, spanning from mild symptoms like fever, fatigue, chills, and nausea [3] to severe

outcomes, including life-threatening conditions like stroke [4].

Furthermore, studies have documented various menstrual irregularities after receiving the COVID-19 vaccination, including alterations in cycle length, duration, flow, dysmenorrhea, and abnormal uterine bleeding [5].

Menstrual irregularities can negatively affect the quality of life for affected women, deteriorate individuals' psychological well-being, and often necessitate increased medical consultations or tests [3,6].

So, the objective of our study was to assess the menstrual abnormalities after the COVID-19 vaccination among females working at Zagazig University.

METHODS

We conducted a cross-sectional study in the medical and administrative sectors at Zagazig University from March to September 2023. Study participants were females in the childbearing period who were vaccinated with any type of COVID vaccine. We excluded pregnant and lactating women and those who had a history of menstrual abnormalities 12 months before vaccination.

The sample size was calculated using the Open Epi program, assuming that the frequency of heavy bleeding after COVID vaccination was 33.3% [6], the total number of workers was 3307 females, and at 80% power and effect size = 1, the estimated sample was 310 females. We added 20% (62) to compensate for non-response, so the total sample was 372. The net participants were 346 (93% response rate). A simple random sampling technique was used to select the participants.

A semi-structured questionnaire was developed to collect the data. The questionnaire was composed of three parts. The first was an assessment of socio-demographic level using updated scale of Fahmy et al. [7]. Social class was categorized into high, medium, and low levels as follows:

those who scored at least 70% are high, those who scored 40 to less than 70% are medium, and those who scored less than 40% are low.

The second part of the questionnaire was clinical history data, including COVID-19 vaccination history (vaccinated or not), vaccine name, number of doses, and adverse events experienced just after the vaccine like fever, fatigue, chills, and nausea.

The third part was an assessment of menstrual abnormalities by taking a detailed history, including: Subjective assessment: Menstrual cycle regularity, duration, last menstrual period, heavy or light bleeding.

Objective assessment of menstrual bleeding (MBL) was done by using an index designed to estimate the menstrual blood loss and calculate a score (MBL-score); women were asked the exact start date of menstruation, the duration of menstruation, as well as the number of heavy blood loss days.

They were also asked the number and type of pads and/or tampons used during the day and night for the heaviest bleeding day. To estimate the MBL of the volunteers, each kind of pad and tampon was assigned a relative absorbance number according to the manufacturer's reported absorbency levels and multiplied by the number of units used reported by each subject. The absorbance numbers were for pads: mini-1, normal, 1.5, super 2, night/super plus 3; and for tampons: mini-0.5, regular 1, super 1.5, super plus 3.

The MBL score was calculated as follows: MBL score = (number of heavy days / number of days of menstruation) * MBL [8].

Ethics approval and consent to participate:

The study protocol was approved from IRB "institutional review board" (IRB through Letter Number 10394 dated January 25, 2023 at faculty of medicine Zagazig University. A written informed consent was completed from those who accept to participate in the study. They were reassured about the strict privacy of any given information and all study participants gave

written informed consent.

The statistical package for social sciences (SPSS), version 25, was used to analyze the data [9]. For quantitative data, mean ± standard deviations (SD) were used, and frequencies and percentages were used for categorical variables. The Chi-square test was used for categorical variables to compare the examined groups, and the Chi square for trend test was used to compare ordinal data between two groups. For quantitative data, the t-test was employed to evaluate normally distributed data, and the Mann-Whitney test was used to compare quantitative, not normally distributed data between two groups. Factors impacting menstrual changes were predicted using binary logistic regression. P < 0.05 and P < 0.001 were designated as the levels of statistical significance and high significance, respectively.

RESULTS

The study participants mean age was 36.76 years; of them, 67.9% working in the medical field. As regards education, about 60% of them had postgraduate studies. Married women represented 87.3% of the total sample. About 98% of them had high social class (Table 1).

About 92.5% of participants received the COVID-19 vaccination; the commonest type was Astra Zeneka (41.5%), followed by

Pfizer (22.8%), and 55.3% of participants received two doses (Table 2).

A larger percentage of participants had heavy bleeding in two days/cycle, and 28.9% changed three diapers per day, and 43.9% used very long diapers. About 70% had menses from 3 to <7 days. Among those who received contraception, 126 females (41.7%) used IUD (Table 3).

Regarding the menstrual symptoms post-vaccination of the studied participants, 43.4% reported that their menstruation changed. Of them, 39.6% reported that their menstruation got longer, and 35.3% had average bleeding (Table 4).

There is a statistically significant relationship between change in menstruation after COVID-19 vaccination and the presence of minor adverse effects reported after vaccination and the number of doses. There is non-significant relationship between change in menstruation after COVID-19 vaccination and either demographic data, previous COVID infection, MBL, or type of vaccine (Table 5).

Receiving two doses of vaccines non-significantly increases the risk of menstrual changes by 1.478 folds, while receiving three doses and experiencing minor adverse effects post-vaccination significantly independently increases the risk by 2.531 and 1.625 folds, respectively (Table 6).

Table (1):Distribution of studied participants according to demographic data.

	N=346	%
Education		
Secondary education	2	0.6%
University education	137	39.6%
Postgraduate	207	59.8%
Working in medical field		
No	111	32.1%
Yes	235	67.9%
Computer use		
Often	117	33.8%
Most times	117	33.8%
Rarely	112	32.4%

	N=346	%
Income		
Not enough with big loan	4	1.2%
Not enough with small loan	6	1.7%
Not enough with loan	5	1.4%
Enough	208	60.1%
Enough and saves	123	35.5%
Family size		
<5	188	54.3%
5 - 6	155	44.8%
≥7	3	0.9%
Marital status		
Single	32	9.2%
Married	302	87.3%
Widow/divorced	12	3.5%
Number of children (if married)	N=314	
Nil	7	2.22
One	32	10.1
Two	142	45.2
Three and more	133	42.3
Social class		
Medium	8	2.3%
High	338	97.7%
	Mean ± SD	Range
Age (year)	36.76 ± 4.82	23 – 49
Crowding index	1.33(1.25 – 1.6)	0.6 – 3.5

Table (2):Distribution of studied participants according to history of receiving COVID vaccine.

	N=346	%
COVID vaccine	320	92.5%
Adverse effects (fever, fatigue, chills, and arm pain)	133/320	41.5%
Type	320	
Astra Zeneka	133	41.5%
Sinopharm	45	14.1%
Sinovac	25	7.8%
Pfizer	73	22.8%
Sputnik	15	4.7%
IDK	15	4.7%
Other type	14	4.4%
Number of doses		
One	53	16.6%
Two	177	55.3%
Three	90	28.1%

Table (3):Distribution of studied patients according to menstrual history.

	N=346	%
Heavy bleeding days		
No	48	13.9%
One	35	10.1%
Two	128	37%
Three	97	28%
Four	26	7.5%
≥5 days	12	3.5%
Menstruation period		
≤2 days	16	4.6%
3 – <7 days	243	70.2%
7 – 10 days	81	23.4%
>10 days	6	1.7%
Diaper		
≤2	78	22.5%
3	100	28.9%
4	88	25.4%
>4	80	23.1%
Type of diaper		
Normal	41	11.8%
Long	108	31.2%
Very long	152	43.9%
Night	45	13%
Contraception	N=302	
No	93	30.8%
CCPs	47	15.6%
Intradermal implant	3	1%
Injections	2	0.7%
IUD	126	41.7%
Other	31	10.3%
	Median (IQR)	Range
MBL score	3.6(2 – 5)	0.27 – 27.5

Table (4):Effect of vaccine on menstruation among vaccinated participants.

	N=320	%
Effect on menstruation		
No	181	56.5%
Yes	139	43.4%
	N=139	%
Effect on duration		
Longer	55	39.6%
Shorter	35	25.2%
No change	49	35.3%

	N=320	%
Amount		
Spotting	20	14.4%
Average	50	36%
Heavy	39	28.1%
Hemorrhage	9	6.5%
No change	21	15.1%

Table (5):Relation between change in menstruation among vaccinated participants and the studied parameters.

	No change N=181 (%)	Change N=139 (%)	χ^2	P
Age:				
≤35 years	69 (60%)	46 (40%)	0.863	0.353
>35 years	112 (54.6%)	93 (45.4%)		
Education				
Secondary education	1 (50%)	1 (50%)	3.178 [§]	0.075
University education	63 (50.4%)	62 (49.6%)		
Postgraduate	117 (60.6%)	76 (39.4%)		
Working in medical field				
No	49 (50%)	49 (50%)	2.476	0.116
Yes	132 (59.5%)	90 (40.5%)		
Marital status				
Single	21 (70%)	9 (30%)	2.569	0.277
Married	154 (55.4%)	124 (44.6%)		
Widow/divorced	6 (50%)	6 (50%)		
Number of children	N=154	N=124		
Nil	5 (71.4%)	2 (28.6%)	1.111 [§]	0.293
One	14 (56%)	11 (44%)		
Two	72 (57.6%)	53 (42.4%)		
Three and more	63 (52.1%)	58 (47.9%)		
Social class				
Medium	5 (71.4%)	2 (28.6%)	Fisher	0.703
High	176 (56.2%)	137 (43.8%)		
Adverse effects				
Absent	115 (61.5)	72 (38.5%)	4.46	0.035*
Present	66 (49.6%)	67 (50.4%)		
Type				
Astra Zeneka	76 (57.1%)	57 (42.9%)	4.392	0.624
Sinopharm	29 (64.4%)	16 (35.6%)		
Sinovac	14 (56%)	11 (44%)		
Pfizer	35 (17%)	38 (52.1%)		
Sputnik	10 (66.7%)	5 (33.3%)		
IDK	8 (53.3%)	7 (46.7%)		
Other type	9 (64.3%)	5 (35.7%)		
Number of doses				
One	36 (67.9%)	17 (32.1%)	7.42 [§]	0.006*
Two	104 (58.8%)	73 (41.2%)		
Three	41 (45.6%)	49 (54.4%)		

	No change N=181 (%)	Change N=139 (%)	χ^2	P
Previous COVID infection				
No	43 (62.3%)	26 (37.7%)	1.111 ^s	0.292
Suspected	56 (56%)	44 (44%)		
Confirmed	82 (54.3%)	69 (45.7%)		
Contraception				
No	42 (47.2%)	47 (52.8%)	7.979	0.157
CCP	29 (67.4%)	14 (32.6%)		
Injections	0 (0%)	2 (100%)		
Intradermal implant	2 (66.7%)	1 (33.3%)		
IUD	64 (56.6%)	49 (43.4%)		
Others	17 (60.7%)	11 (39.3%)		
	Median (IQR)	Median (IQR)	Z	P
MBL	8(6 – 12)	9(6 – 12)	0.922	0.357
MBL score	3.33(2 – 5)	3.6(2 – 5.4)	0.366	0.715

Table (6): Binary regression analysis of predictors of menstrual changes among vaccinate participants.

	B	P	AOR	95% C.I.	
				Lower	Upper
Number of doses (single)		0.025*			
Number of doses (two)	0.391	0.241	1.478	0.769	2.843
Number of doses (three)	0.929	0.011*	2.531	1.238	5.176
Adverse effects	0.486	0.037*	1.625	1.031	2.563

DISCUSSION

In early 2021, there were informal accounts of menstrual cycle changes following the COVID-19 vaccination, which were shown on social media and through vaccine monitoring systems [10, 11]. Adverse menstrual events, including irregularities in the menstrual cycle, were reported following COVID-19 vaccination [12]. These reports have heightened public fearfulness regarding safety and potential side effects of COVID-19 vaccines [11]. We studied the nexus between COVID-19 vaccination and menstrual cycle abnormalities through a cross-sectional study conducted on females in the childbearing period working at Zagazig University.

The current study included females with a mean age of 36.76 years. About 92.5% of participants received the COVID-19 vaccination; the commonest type was Astra

Zeneka (41.5%), followed by Pfizer (22.8%), and 55.3% of participants received two doses.

Forty three percent of the participants reported that their menstruation changed after the COVID-19 vaccination. Of them, 39.6% reported that their menstruation gets longer; 35.3% had average bleeding.

Findings in line with our result were reported by **Wesselink et al.** study, which concluded that there is little evidence linking COVID-19 vaccination to changes in menstrual bleeding duration. Additionally, other menstrual cycle features such as regularity, intensity of bleeding, and menstrual pain did not show a strong association with the COVID-19 vaccination [13].

Bochard et al. found no significant differences in menstrual bleeding patterns or other parameters of the menstrual cycle following the COVID-19 vaccination, as 22% of participants in their study perceiving

changes in their cycles[14].

We not only assess perceived changes in menstrual blood loss (MBL), but also objective assessment of MBL was done. Yet, no significant difference was found between those who reported menstrual changes and those denied them. This suggests that perceived changes in menstruation may not always accurately reflect actual changes, likely because menstrual volume is challenging to objectively measure [14].

Another study provided preliminary evidence suggesting that females who received COVID-19 vaccines may experience menstrual irregularities, including longer menstruation durations and extended menstrual cycles. Such changes could impact daily activities and potentially diminish the overall quality of life for these individuals [15].

In our study, there is a statistically significant relationship between change in menstruation after COVID-19 vaccination and the presence of minor adverse effects reported after vaccination; experiencing minor adverse effects post-vaccination significantly independently increases the risk of menstrual changes by 1.625 folds.

This is in line with a study conducted in Middle East and North Africa (MENA) region by Muhaidat in 2022, which showed that menstrual abnormalities were notably more common among individuals who also reported other adverse effects from the COVID-19 vaccination, such as fever, fatigue, headache, nausea, and arm pain. Furthermore, there was a statistically significant correlation with the severity grade of the vaccine's general side effects [15]. The exact mechanism by which the vaccine could lead to menstrual symptoms is not yet understood. It is possible that these symptoms are related to an immune response, which could account for the significantly higher rate of menstrual irregularities observed in individuals who also experienced other adverse effects from the COVID-19 vaccination. Additional research is required to

clarify how the COVID-19 vaccination might cause menstrual abnormalities [15].

Muhaidat et al. showed that there were no significant associations between menstrual abnormalities and both demographic data and vaccination type, which is the same as our results [15].

In the current study, we observed that the impact of the COVID-19 vaccination on abnormal bleeding and menstrual cycle disruptions is relatively limited. However, there was a noticeable increase in these adverse effects with each booster shot. Like our results, **Namiki et al.** (2022) reported that the incidence of abnormal bleeding rose from 0.6% after the first dose to 1.0% after the second dose, and further to 3.0% after the third booster. Similarly, the rate of irregular menstrual cycles increased from 1.9% after the first dose to 4.9% and 6.6% following the second and third doses, respectively [16].

We reported a statistically significant relationship between changes in menstruation after the COVID-19 vaccination and the number of doses. Receiving two doses of vaccines non-significantly increases the risk of menstrual changes by 1.478 (0.769-2.843) olds, while receiving three doses significantly independently increases the risk by 2.531.

A positive and notable correlation was also found between the number of vaccine doses and the occurrence of menstrual changes, suggesting that these changes were more frequently observed in women who received two doses which comes [17].

In line with this, studies by **Polack et al.** and **Menni et al.** reported that systemic changes were more common among those who received two doses compared to those who received just one[18,19]. This was in line with our study, where we found no significant relation between change in menstruation after COVID-19 vaccination and type of vaccine. A study conducted in Saudi Arabia by **Qashqari et al.** in 2022 also confirmed that there were no significant associations between the type of COVID-19 vaccine and its impact on the menstrual cycle, whether for the first

dose or the second dose [20].

However, our findings regarding vaccine-specific differences contrast with those reported by **Lagana et al.**, who found that 64.3% of women who received Moderna, 62.5% who received AstraZeneca, and 46.9% who received Pfizer reported changes in their menstrual cycles [21].

This highlights variability in how different vaccines might impact menstrual health, which could be influenced by various factors such as study design, participant demographics, and timing of data collection relative to vaccine administration.

Our study had some limitations such as being cross-sectional study on a relatively small sample size and potential of recall bias. However, using objective assessment of MBL outweighs to some extent subjective evaluation of MBL. Also, it serves as preliminary step to identify potential effect of COVID-19 vaccination on women health.

Also, some studied females aged more than 45 years old and can be considered as perimenopausal states that may had menstrual irregularities, however we were concerned about changes in menses the experienced, not irregularities.

And we found statistically non-significant relation between age and menstrual changes post vaccination.

CONCLUSIONS

About forty percent of vaccinated females reported menstrual changes post vaccination. Receiving two doses of vaccines increased the risk of menstrual changes non-significantly while receiving three doses and experiencing minor adverse effects post-vaccination significantly independently increased the risk by 2.531 and 1.625 folds respectively. COVID-19 vaccination had effect on menstrual health which is linked to vaccination doses and immunologic response to vaccine.

We recommend large scale multicentric study to prove such effects, introducing educational programs in primary health care and family

health centers to promote awareness, to limit number of doses to least effective ones and explain common side effects of covid vaccine to improve quality of life of females.

Declaration of interest

The authors report no conflicts of interest.

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