

## Post Covid Vaccination Menstrual Abnormalities: A Cross-Sectional Study of Saudi Women

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## 1. Abstract

This study investigated the awareness of Saudi women regarding COVID-19 vaccination impacts on their menstrual cycle.

### 1.1. Aim

To investigate the impact of the post covid vaccination on menstrual abnormalities.

### 1.2. Methodology and Results

A cross-sectional study in March 2022 involved Saudi Arabian menstruating women aged from 15 years to above 40 years. The information was gathered through a self-reported questionnaire consisting of "15" questions under three main categories such as (a) demographics, (b) the number and types of vaccine doses, and (c) post-vaccination changes in the menstrual cycle. Out of the total 439 participants who received various COVID-19 vaccines, 255(58.8%) stated post-vaccination changes in their menstrual cycle, particularly after the first and second doses. Post-vaccination menstrual changes were higher in women who received the Pfizer vaccine. The results depict that COVID-19 vaccination can affect the menstrual cycle, and the changes could be associated with the type of vaccines and the number of received doses.

## 1.2. Conclusion, Significance and Impact of Study

The COVID-19 pandemic significantly affected Saudi Arabia. This study noticed that 58.8% of vaccinated women experienced menstrual cycle changes whereas it remained unchanged in 41.2% of vaccinated women. The vaccinated women also reported noticeable changes in the menstrual dates and intensity.

## 2. Introduction

The COVID-19 (SARS-CoV-2) pandemic has exerted dramatic impacts on the global population and led to a significantly high ratio of mortalities and illnesses. WHO reported (2020 to 2022) approximately 841,469 confirmed COVID-19 cases in Saudi Arabia, which caused 9,469 mortalities [1]. Multiple vaccines with varying modes of action were developed to counter the COVID-19 pandemic. However, all types of vaccines trigger the body to generate "memory" lymphocytes (T and B) to combat future viral infections [2]. The COVID-19 vaccines could also exert some side effects similar to other medications, which are not experienced by all the recipients. These side effects are mostly mild and could last up to a week, and might include injection site soreness, headache, fatigue, body aches, high temperature, nausea, and cold or hot feel-

ings for a couple of days' post-vaccination [3].

Numerous women have recently reported post-COVID-19 vaccination changes in their menstrual cycles [4,5]. Therefore, multiple studies are underway to assess the potential vaccination side effects on the menstrual cycle and to ascertain any possible correlation between menstrual disruptions and COVID-19 vaccination [6-10]. COVID-19 vaccination-linked menstrual abnormalities have been reported in various studies mainly including expanded length of menstrual cycle and longer duration of menstruation characterized by heavier bleeding than normal [5-14]. Multiple researchers have associated the type and doses of vaccines with menstrual disturbances.<sup>11,13</sup>The Pfizer-BioNTech vaccine has been reported to cause more side effects than AstraZeneca. In the case of the AstraZeneca vaccine, severe adverse effects have only been noted following the second dose [11,13]. Previous studies in Saudi Arabia have also explored similar factors [11,15]. However, this study aimed to further expand their outcomes by focusing on the post-COVID-19 vaccination impacts on the menstrual cycle of Saudi women. Moreover, the investigation established the relationship between different COVID-19 vaccines and associated abnormalities.

### 2.1. Aim

To investigate the impact of the post covid vaccination on menstrual abnormalities

## 3. Materials and Methods

### 3.1. Study Design and Population

A cross-sectional study, involving 439 females, was conducted in Saudi Arabia in March 2022. Females from various Saudi Arabian cities, aged from 15 to 40 years and above, participated in the study and provided their consent by answering the questionnaire. A self-reported questionnaire consisting of "15" questions under three main categories was uploaded in Google Forms/surveys. The main categories included [1] demographic Data, [2] COVID-19 vaccine history, and [3] COVID-19-vaccination and menstrual changes. The closed-ended questions asked about the "type and number of received doses". The questionnaire also contained questions related to post-vaccination observation, changes, and abnormalities in the menstrual cycle such as "Did you experience the changes in your menstrual cycle after vaccinations?", "When did you notice the changes?", "Did the menstrual date change after the vaccination?", "Is there any abnormal menstrual pain that you have never felt before vaccination", "Did you experience any changes in the intensity of periods after vaccination", and "Did you experience any increase or decrease in menstruation days after

vaccination". The questionnaire also contained two open questions such as "Did you suffer from any health problems?", and "Do you think that the menstrual changes were the after-effects of coronavirus vaccine?" depicting the participant's perspective.

## 4. Data Analysis

Data entry and quantitative statistical analysis were performed using SPSS-21 and descriptive statistics were computed (percentage, mean, and frequency). The chi-square test compared the demographic variables (age and social status), and values were considered statistically significant at  $P < 0.05$ . The vaccination status (type and the number of received doses) was initially investigated followed by the enlisting of post-vaccination changes in the menstrual cycle of the participants. Data were analyzed to elaborate on the significant association between COVID-19 vaccination (doses and types) and menstrual cycle changes.

## 5. Results

### 5.1. Demographic Characteristics and Post-Vaccination Changes in The Menstrual Cycle

Most individuals (244) out of the total 439 participants were aged between 15 to 20 years (55.6%). The age of other 103 (23.5%), 23 (5.2%), 21 (4.8%), 24 (5.5%), and 24 (5.5%) individuals ranged between 21-25, 26-30, 31-35, 36-40, and over 40 years, respectively. 342 (77.9%) participants out of the total 439 were unmarried. In terms of education level, 194 (44.2%) participants had a Bachelor's degree, 165 (37.6%) completed high school, 69 (15.7%) finished middle school, and 11 (2.5%) had an elementary education. The majority of the participants 406 (92.5 %) never suffered from chronic diseases and only 33 (7.5 %) individuals were chronic disease patients (asthma, heart, and diabetes) (Table 1). Data depicted a highly significant variation in the number of vaccine doses received by participants based on their demographic characteristics (Table 1). Most participants who received two doses were aged between 15 to 20 years ( $P < 0.05$ ). Moreover, COVID-19 vaccine administration significantly varied with the marital status where most of the single participants received more than one dose ( $P < 0.05$ ). 199 (78.03%) single participants experienced menstrual cycle changes and 113 (44.3%) of these individuals were highly educated. The vaccination impacts on the menstrual cycle significantly varied among married and single females. Out of the total 439 participants, 205 single and 39 married women reported changes in their menstrual cycle ( $P < 0.001$ ). Demographic characteristics revealed that most of the educated participants received two to three vaccine doses ( $P < 0.05$ ) (Table 1). Most of the two doses received participants aged between 15 to 20 years ( $P < 0.05$ ).

**Table 1:** Demographic characteristics of the participants, number of COVID-19 vaccine doses, and associated changes in the menstrual cycle.

Post-vaccination changes in the menstrual cycle	P value	Three Doses	Two Doses	One-Dose	Received Doses	
						<b>Age</b>
135 (52.9%)	<0.001	98 (22.3%)	138 (31.4%)	8 (1.8%)	244 (55.6%)	15-20
67 (26.2%)		0	103 (23.5%)	0	103 (23.5%)	21-25
13(5%)		8 (1.8%)	15 (3.4%)	0	23 (5.2%)	26-30
12 (4.7%)		0	21 (4.8%)	0	21 (4.8%)	31-35
12 (4.7%)		24 (5.5%)	0	0	24 (5.5%)	36-40
16 (6.26%)		0	24 (5.5%)	0	24 (5.5%)	40 and above
						<b>Marital status</b>
199 (78.03%)	<.001	130 (29.6%)	212 (48.3%)	0	342 (77.9%)	Single
56 (21.9%)		0	89 (20.3%)	8 (1.8%)	97 (22.1%)	Married
						<b>Educational level</b>
113 (44.3%)	<.001	65 (14.8%)	127 (28.9%)	0	194 (44.2%)	University
97 (38%)		65 (14.8%)	100 (22.7%)	0	165 (37.6%)	Secondary
37 (14.5%)		0	69 (15.7%)	2 (0.5%)	69 (15.7%)	Intermediate
8 (3.13%)		0	5 (1.1%)	6 (1.3%)	11 (2.5%)	Elementary
						<b>Chronic diseases</b>
					406 (92.5%)	NO
					33 (7.5%)	Yes

**5.2. Type and Number of COVID-19 Vaccine Doses**

Table 2 depicts that most participants (68.6%) received two doses of the COVID-19 vaccine whereas 29.6% of participants received three doses. However, 1.8% of participants received only a single dose. Out of the eight individuals who received only the first dose, five were vaccinated with Pfizer, two received AstraZeneca, and Moderna was administered to only one individual. The vaccine distribution in individuals who received two doses was as Pfizer to 255, AstraZeneca to 31, and Moderna to 9 individuals whereas four individuals received other vaccines. The vaccine distribution among individuals who were vaccinated thrice, 104 individuals received Pfizer, 23 received AstraZeneca, and 1 individual received Moderna whereas 2 individuals received another vaccine (Table 2).

**5.3. Post-Vaccination Menstrual Changes According to the Type of Vaccines**

Table 3 demonstrates that 255 participants (58.8%) experienced post-vaccination menstrual changes whereas 179 (41.2%) participants did not notice any changes. Most of those (135, 52.9%) who reported changes in their menstrual cycle were aged between 15 to 20 years. Out of the individuals (n: 255) who reported changes in their menstrual cycle following vaccination, 209 received the

Pfizer vaccine, 37 received the AstraZeneca vaccine, 5 received the Moderna vaccine, and 4 received other vaccines. 132 (45%) of these individuals noticed changes after the first dose of the vaccine, 133 (45.9%) after the second dose, and only 25 (8.6%) experienced these changes after the third dose (Table 3). Data revealed that Pfizer-vaccinated individuals experienced more menstrual changes than the individuals vaccinated with other types of vaccines. This variation was statistically significant (P=0.042), as shown in Table 3. Most participants who received 2 to 3 vaccination doses were single, aged 15-20 years, and highly educated (Table 3). The statistical differences between individuals who received two or three vaccine doses were non-significant (P=0.30). Contrarily, highly significant statistical differences were noted between the post-vaccination intensity of the menstrual cycle and the type of vaccines (P<0.001). The change in menstrual interval (P=0.001) was reported by 95% of individuals. Out of 255 participants, 207 reported changes in their menstrual cycle where 44.7% experienced a decrease in menstrual cycle, and 36.4% experienced an increased menstrual cycle intensity. Only a small proportion (18.8%) of participants did not experience any change in the menstrual cycle intensity. A significant difference (P=0.014) in the du-

ration of menstrual cycles was noted among participants who experienced menstrual changes. The menstrual cycle length increased in 29.4% of participants and decreased in 27.4% of participants whereas 43.3% of participants did not experience any change. 157 (61.5%) participants who experienced a changed menstrual cycle

also reported strange pain after the vaccination. However, statistical differences were not observed between strange pain and type of vaccination. 98 (38.4%) participants did not experience any pain ( $P=0.81$ ).

**Table 2:** Types and numbers of COVID-19 vaccine doses.

No. of Doses	Type of vaccine	Frequency
Type of the first dose only	Pfizer	5
	AstraZeneca	2
	Modern	1
	Other	0
	Total	8 (1.8%)
Type of the first and second dose	Pfizer	255
	AstraZeneca	31
	Modern	9
	Other	4
	Total	301(68.6%)
Type of the first, second, and third dose	Pfizer	104
	AstraZeneca	23
	Modern	1
	Other	2
	total	130 (29.6%)

**Table 3.** Post-vaccination menstrual changes according to the type of vaccines.

## 6. Discussion

COVID-19 vaccines have raised concerns among women regarding changes in their menstrual cycles [16,17]. The current and previous studies in various regions have demonstrated a strong correlation between COVID-19 vaccination and menstrual alterations [4-6]. The potential impacts of COVID-19 vaccines on the menstrual cycle have also been reported in multiple recent studies [18-24]. This study examines COVID-19 vaccination effects on the menstrual cycles of Saudi women. The results revealed that 255 (58.1%) out of 439 vaccinated individuals experienced different menstrual changes. These findings are in line with the previous studies in Saudi Arabia and other regions [11,12,25]. Some studies suggest that menstrual cycles are not affected by the COVID-19 vaccine whereas others could not establish a significant correlation between vaccination and the menstrual cycle [10,12]. However, some studies have revealed a possible correlation between post-vaccination menstrual alterations, age, and marital status after two doses.11 Similar results were noted during the current study where single participants experienced more menstrual issues than married females after two doses of vaccine. Data also demonstrated that menstrual cycle changes were non-significant after the first and second vaccine doses ( $p=0.30$ ) [13]. Have reported heavier and longer menstrual cycles as the most common changes after two vaccine doses. Contrarily [14], have depicted such changes only after the first vaccine dose whereas some other research-

ers noticed these alterations only after the second vaccine dose. The findings of this study highlight the impact of different types of COVID-19 vaccines on menstrual changes. Pfizer vaccine-receiving participants reported a significantly higher incidence of menstrual changes as compared to the participants vaccinated with other vaccines ( $P=0.042$ ), which is in agreement with the findings of [20]. Notably, most participants (364) of this study were vaccinated with the Pfizer vaccine, and only 135 received other types of vaccines. This aligns with a previous study in Saudi Arabia that has also reported more side effects of the Pfizer-BioNTech vaccine as compared to the AstraZeneca vaccine among a total of 4,170 participants.11 Other studies remained unable to establish a correlation between different vaccines (AstraZeneca or Pfizer), number of doses (1 or 2), and post-vaccination menstrual changes [12,15]. During this study, 207 out of 255 participants reported changes in their menstrual cycle where 44.7% experienced a decrease and 36.4% experienced an increase in the bleeding quantity. The remaining 18.8% of participants did not experience any menstrual change. A previous study has reported that 42% of participants with regular menstrual cycles experienced heavier bleeding after the vaccination whereas no changes were reported by 44% of respondents [4]. Other studies have also reported a notable rise in post-vaccination menstrual disturbances such as longer duration, shorter menstrual intervals, and heavier bleeding [5]. A significant number of participants (56.8%) expressed variations in the

duration of menstrual cycles whereas 43.2% did not experience any changes. These findings are in line with a previous study in the USA, which reported a high occurrence of longer menstrual cycles and a one-day delay in menses. However, these impacts were normalized during the next menstrual cycle. Moreover, the authors reported that other characteristics of the menstrual cycle (bleeding length, regularity, pain, and heaviness) did not present a strong association with COVID-19 vaccination [26-28]. Contrarily, another study had demonstrated that menstrual cycle length did not increase in 66.7% of vaccinated women, however, 33.3% of vaccinated women experienced an increased menstrual cycle length [23].

## 7. Conclusion

The COVID-19 pandemic significantly affected Saudi Arabia. This study noticed that 58.8% of vaccinated women experienced menstrual cycle changes whereas it remained unchanged in 41.2% of vaccinated women. The vaccinated women also reported noticeable changes in the menstrual dates and intensity. The situation necessitates a long-term study involving a large and diverse sample population for a more accurate elaboration of our results, which could be achieved through more detailed and specific questionnaires. Cohort studies could also further help to explore post-vaccination hormonal changes.

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