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Original Research Article

A PROSPECTIVE STUDY TO FIND OUT EFFECT OF COVID-19 VACCINATION ON MENSTRUAL PATTERN AMONG FEMALES OF REPRODUCTIVE AGE GROUP

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ABSTRACT

Background: Concerns have been raised regarding possible effects of COVID-19 vaccination on menstrual health. This study aimed to evaluate menstrual cycle characteristics, symptom patterns, and systemic effects following vaccination in women of reproductive age.

Materials and Methods: A cross-sectional observational study was conducted among 300 women aged 18–45 years who received at least one dose of a COVID-19 vaccine. Data on menstrual cycle regularity, cycle duration, duration of bleeding, perceived menstrual flow, dysmenorrhea, analgesic use, and interference with daily activities were collected and compared with self-reported pre-vaccination menstrual patterns. Descriptive and comparative analyses were performed.

Results: Following vaccination, menstrual irregularity increased from 8.9% pre-vaccination to 16.2% post-vaccination. A shift toward longer cycle durations was observed, particularly cycles of 32–35 days and >35 days. Duration of menstrual bleeding and perceived menstrual blood flow showed minimal variation after vaccination. Increased menstrual pain was reported by 16.9% of participants, 13.6% required analgesics, and 14.2% reported interference with daily activities. The majority of women (86.8%) did not report systemic post-vaccination symptoms; among those who did, fever, headache, and fatigue were the most common.

Conclusion: COVID-19 vaccination was associated with temporary alterations in menstrual regularity and cycle length, increased dysmenorrhea, higher analgesic use, and greater functional interference in a subset of women. Most systemic symptoms were mild and self-limiting. These findings support counseling women regarding possible transient menstrual changes following vaccination.

Keywords: COVID-19; Vaccination; Menstrual cycle; Dysmenorrhea.

INTRODUCTION

The COVID-19 pandemic has profoundly impacted global health and daily life over the past two and a half years. In response, several vaccines were developed and authorized within a year of the virus being identified, representing an unprecedented scientific achievement. Vaccination is recommended for all women, including those who are pregnant or planning pregnancy, as it reduces the risk of severe illness and confers protection to both the mother and fetus during gestation.[1-3] Despite these benefits, concerns about the potential influence of COVID-19 vaccination on the menstrual cycle have generated apprehension among women of reproductive age.

Reports have documented a wide range of post-vaccination adverse effects, spanning mild symptoms such as fever, fatigue, myalgia, headache, and localized pain, to serious complications including thrombosis and anaphylaxis.[4-7] More recently, evidence has emerged highlighting vaccine-related menstrual changes, including prolonged cycle length, abnormal uterine bleeding, and dysmenorrhea.[8] Since the menstrual cycle is regarded as a vital

indicator of women's overall health, such alterations merit careful evaluation. Women with irregular or prolonged cycles are at an increased risk of premature mortality, which has been partly attributed to a greater predisposition to metabolic disorders such as type 2 diabetes and dyslipidemia.[9,10] Furthermore, menstrual irregularities often interfere with routine activities, imposing both personal and healthcare-related challenges.[10]

The significance of monitoring menstrual health is further underscored by the American Academy of Pediatrics, which has recommended incorporating menstrual cycle assessment as a vital sign in adolescent females.[13] Considering the reported prevalence of menstrual disturbances,[11,12] exploring their association with COVID-19 vaccination is clinically relevant.[14] Understanding these patterns will not only aid in reassuring women and reducing vaccine hesitancy but also support healthcare providers in counseling patients and optimizing care strategies.

Therefore, this study was designed to investigate the occurrence of menstrual abnormalities following COVID-19 vaccination among women of reproductive age. Specifically, it aims to analyze variations in cycle length, duration of menstrual flow, quantity of bleeding, intermenstrual spotting, and menstrual pain. Given the scarcity of data from India, these findings will provide valuable insights into post-vaccination menstrual changes and help both women and clinicians prepare for potential alterations in menstrual patterns.

MATERIALS AND METHODS

Study design and setting: This was a cross-sectional observational study conducted at the COVID-19 vaccination site of Mahila Chikitsalaya, attached to SMS Medical College, Jaipur. The study was carried out over a period of nine months following approval from the Institutional Ethics Committee. Menstrual characteristics following COVID-19 vaccination were assessed and compared with participants' self-reported pre-vaccination menstrual patterns.

Study Population: Women aged 18–45 years attending the vaccination centers were screened for eligibility. Participants were enrolled after obtaining written informed consent.

Inclusion criteria

1. Women aged 18–45 years.
2. Women willing to provide informed consent and participate in the study.
3. Women with a history of three consecutive regular menstrual cycles prior to receiving the first dose of COVID-19 vaccine.
4. Non-pregnant women.

Exclusion criteria

1. Women with known hormonal or endocrine disorders.
2. Women on medications likely to affect the menstrual cycle.
3. Women unable to follow-up during the three-month follow-up period.
4. Women with a history of anaphylactic reaction to a previous COVID-19 vaccine dose.
5. Women with immediate or delayed hypersensitivity reactions to any vaccine, injectable drug, or food item.
6. Women with a history of coagulation disorders.
7. Women with premature menopause.
8. Women who had undergone hysterectomy or oophorectomy.

Sample Size: Sample size was calculated assuming a 50% prevalence of menstrual irregularities to achieve maximum variance, with a 95% confidence level and 10% absolute precision. The minimum required sample size was 100. To enhance statistical reliability, 300 participants were enrolled.

Data collection: Data were collected using a predesigned structured proforma. Information included sociodemographic characteristics, body mass index, obstetric history, comorbidities, prior COVID-19 infection, vaccine type received, and menstrual characteristics. Participants reported menstrual cycle regularity, cycle duration, duration of bleeding, perceived menstrual blood flow, dysmenorrhea, analgesic use, and interference with daily activities for cycles following vaccination, with reference to their pre-vaccination patterns.

Statistical analysis: Categorical variables were summarized as frequencies and percentages, while continuous variables were expressed as mean ± standard deviation. Since menstrual characteristics before and after vaccination were assessed within the same individuals, paired categorical comparisons were analyzed descriptively, and changes were interpreted cautiously. Associations between variables were explored using appropriate tests for categorical data. A p-value <0.05 was considered statistically significant. Statistical analysis was performed using MedCalc software version 16.4.

RESULTS

A total of 300 women of reproductive age were enrolled in the study. The majority of participants were between 25 and 34 years of age, with a mean body mass index (BMI) within the normal range. More than half of the women were married, and a substantial proportion were professionals or doctors, reflecting the vaccination-site-based recruitment. [Table 1].

Most participants had no significant comorbid conditions. Covishield was the most frequently administered vaccine (86.1%). A prior history of COVID-19 infection was reported by 26.8% of women, with only a small proportion requiring hospitalization [Table 2].

Table 1: Sociodemographic characteristics of study participants (n = 300)

Variable	Category	n	%
Age group (years)	18–24	51	16.89
	25–29	109	36.09
	30–34	95	31.46
	35–39	27	8.94
	≥40	20	6.62
Mean height (m)	1.61 ± 0.06	–	–
Mean weight (kg)	60.94 ± 9.61	–	–
BMI (kg/m²)	23.36 ± 3.36	–	–
Occupation	Professional	102	33.77
	Doctor	90	29.80
	Student	71	23.51
	Housewife	19	6.29
	Teacher	16	5.30
	Business	4	1.32
Marital status	Married	175	57.95
	Unmarried	127	42.05
Number of children	0	214	70.86
	1	56	18.54
	2	28	9.27
	3	4	1.32

Table 2: Clinical profile of study participants

Variable	Category	n	%
Comorbidity	None	284	94.04
	Asthma	4	1.32
	Coeliac disease	2	0.66
	Diabetes mellitus	4	1.32
	Hypertension	8	2.65
Vaccine received	Covaxin	36	11.92
	Covishield	260	86.09
	Pfizer	4	1.32
	Sputnik	2	0.66
COVID-19 infection history	No	221	73.18
	Yes	81	26.82
Hospitalization during COVID-19	No	71	23.51
	Yes	10	3.31

Comparison of pre- and post-vaccination menstrual patterns revealed an increase in reported menstrual irregularity, from 8.9% before vaccination to 16.2% following vaccination. Although the majority of women continued to have cycle durations between 28 and 32 days, a relative shift toward longer cycles (32–35 days and >35 days) was observed post-vaccination [Table 3].

The duration of menstrual bleeding showed minor variation after vaccination, with a slight increase in women reporting bleeding lasting 5–7 days; however, marked prolongation (>7 days) was uncommon. Perceived menstrual blood flow, assessed by the number of sanitary pads used, remained largely unchanged following vaccination.

Table 3: Menstrual characteristics before and after COVID-19 vaccination (n = 300)

Variable	Category	Pre-vaccination n (%)	Post-vaccination n (%)	p-value
Cycle regularity	Regular	275 (91.06)	253 (83.77)	<0.01
	Irregular	27 (8.94)	49 (16.23)	
Cycle duration	<28 days	80 (26.49)	77 (25.50)	<0.01
	28–32 days	188 (62.25)	156 (51.66)	
	32–35 days	28 (9.27)	51 (16.89)	
	>35 days	6 (1.99)	18 (5.96)	
Length of menstruation (days)	2–3	62 (20.53)	54 (17.88)	0.22
	3–5	196 (64.90)	187 (61.92)	
	5–7	44 (14.57)	59 (19.54)	
	>7	–	2 (0.66)	
Menstrual blood flow (pads used)	1–2	62 (20.53)	60 (19.87)	0.85
	2–3	113 (37.42)	107 (35.43)	
	3–4	50 (16.56)	58 (19.21)	
	>4	77 (25.50)	77 (25.50)	

Post-vaccination menstrual symptoms were reported by a subset of participants. Increased menstrual pain was reported by 16.9% of women, 13.6% required analgesics for symptom relief, and 14.2% experienced interference with routine daily activities [Table 4].

Table 4: Menstrual symptoms following COVID-19 vaccination

Symptom	n	%
More pain during menses	51	16.89
Pain medication required	41	13.58
Interference with daily activities	43	14.24

Most participants (86.8%) did not report systemic symptoms following vaccination. Among those who did, fever (5.3%), headache (2.7%), fatigue (2.3%), and localized pain at the injection site (2.0%) were the most commonly reported complaints. Other symptoms were infrequent [Table 5].

Table 5: Other systemic symptoms experienced after vaccination

Symptom	n	%
None	262	86.75
Fever	16	5.30
Headache	8	2.65
Fatigue	7	2.32
Weakness	6	1.99
Pain at injection site	6	1.99
Body/generalized pain	4	1.32
Malaise	2	0.66
Joint pain	2	0.66
Chills	2	0.66
Weight gain	2	0.66
Stress	2	0.66
Skin problems	2	0.66
Urinary infection	2	0.66
Anorexia	2	0.66

Multivariable analysis was performed to identify factors independently associated with post-vaccination menstrual irregularity. Age ≥30 years, higher body mass index, prior COVID-19 infection, vaccine type, and healthcare-related occupation were included in the logistic regression model. [Table 6]

None of the evaluated variables showed a statistically significant independent association with post-vaccination menstrual irregularity. Although women with prior COVID-19 infection (aOR 1.34, 95% CI 0.79–2.29) and healthcare workers (aOR 1.42, 95% CI 0.83–2.43) demonstrated higher odds of reporting menstrual irregularity, these associations did not reach statistical significance.

These findings suggest that post-vaccination menstrual changes were not strongly predicted by demographic, clinical, or vaccination-related factors, supporting the likelihood of a multifactorial and transient phenomenon rather than a specific high-risk subgroup.

Table 6: Multivariable logistic regression analysis of factors associated with post-vaccination menstrual irregularity (n = 300)

Variable	Adjusted Odds Ratio (aOR)	95% Confidence Interval	p-value
Age (≥30 years vs <30 years)	1.28	0.78 – 2.11	0.32
BMI (≥25 kg/m² vs <25 kg/m²)	1.19	0.69 – 2.05	0.52
Prior COVID-19 infection (Yes vs No)	1.34	0.79 – 2.29	0.28
Vaccine type (Covishield vs others)	1.11	0.56 – 2.22	0.76
Occupation (Healthcare worker vs others)	1.42	0.83 – 2.43	0.20

DISCUSSION

This study evaluated menstrual changes following COVID-19 vaccination among women of reproductive age. A proportion of participants reported alterations in menstrual regularity and cycle length after vaccination, along with increased dysmenorrhea and functional interference in a subset of women. However, the majority continued to experience regular cycles, and severe menstrual disturbances were uncommon.

The observed menstrual irregularities align with findings from other studies. For instance, a systematic review and meta-analysis reported that approximately 27.3% of women experienced abnormal cycle durations post-vaccination, with 22.1% reporting dysmenorrhea. Another study found that 52% of vaccinated women experienced significant menstrual irregularities, including changes in cycle length and flow. These studies support our observation of increased menstrual disturbances following vaccination.[15,16]

The biological mechanisms underlying post-vaccination menstrual changes remain incompletely understood. Proposed explanations include immune-mediated effects on the hypothalamic–pituitary–ovarian axis and inflammatory responses influencing endometrial function. These hypotheses remain speculative, and current evidence does not suggest permanent reproductive or fertility impairment.[17,18]

Despite the reported menstrual changes, the majority of symptoms were transient and resolved within a few cycles. This is consistent with findings from other studies, which noted that menstrual

disturbances following vaccination were generally short-lived.[19]

This study had several limitations. Being a single-center study, the findings may not be generalizable to all populations. Menstrual characteristics were self-reported, introducing potential recall bias. The absence of an unvaccinated control group limits causal inference, and confounding factors such as stress, occupational workload, and prior COVID-19 infection could not be fully accounted for. Objective hormonal or ultrasonographic assessments were not performed. The follow-up period was limited to three months, so long-term effects of COVID-19 vaccination on menstrual health could not be assessed. Future research should include multicenter, longitudinal studies with larger sample sizes and objective biomarkers to elucidate the underlying mechanisms of post-vaccination menstrual alterations. Additionally, investigating the impact of different vaccine types, dosing intervals, and timing within the menstrual cycle may help identify women at higher risk and guide evidence-based counseling.

CONCLUSION

COVID-19 vaccination was associated with menstrual alterations, including changes in cycle length, flow, and symptom severity, in a proportion of women. A significant number reported worsening dysmenorrhea, increased analgesic use, and disruption of daily activities, along with systemic effects such as fatigue, fever, and body ache. These findings underscore the importance of counseling women regarding potential but generally transient post-vaccination menstrual changes.

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