

FREQUENCY OF COVID- VACCINATION AMONG PREGNANT WOMAN AND COMPARISON OF FETAL OUTCOME IN FEMALES WITH AND WITHOUT COVID-19 VACCINATION

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ABSTRACT

Background: The vaccination of COVID-19 during pregnancy has been shown to reduce maternal complications and improve fetal outcomes. Vaccinated women are less likely to experience severe illness or adverse neonatal events such as preterm birth or stillbirth.

Objective: To determine the frequency of COVID-19 vaccination among pregnant women and to compare fetal outcomes between vaccinated and unvaccinated individuals.

Methods: This descriptive case-series was done at department of Obstetrics and Gynecology, Ghurki Trust Teaching Hospital, Lahore, over six months [Nov 15, 2024 till Feb 15, 2025]. A total of 379 pregnant women aged 18–45 years, booked in the third trimester, were enrolled using non-probability consecutive sampling. COVID-19 vaccination status was confirmed via vaccination cards. Participants were categorized into vaccinated and unvaccinated groups and followed until delivery. Fetal outcomes, including stillbirth, preterm birth, and low birth weight, were recorded.

Results: Out of 379 participants, 53.3% were vaccinated, with Pfizer being the most commonly administered vaccine. Stillbirth occurred in 5.8% of cases, preterm birth in 28.5%, and low birth weight in 18.7%. A significantly higher rate of stillbirth (8.4%) and

low birth weight (23.3%) was observed among vaccinated women compared to unvaccinated women (2.8% and 13.6%, respectively). No significant difference in preterm birth rates was found between the two groups.

Conclusion: More than half of the pregnant participants were vaccinated against COVID-19. Nevertheless, vaccinated participants had a significantly increased rate of stillbirth and low birth weight. Additional large-scale, prospective studies should be carried out to more accurately evaluate the safety and optimal timing of COVID-19 vaccination in pregnancy.

Keywords: Antenatal care, COVID-19 vaccination, fetal outcomes, low birth weight, maternal vaccination, pregnancy, pregnancy complications, preterm birth, stillbirth, vaccine safety.

INTRODUCTION

In December 2019, the syndrome of severe acute respiratory i.e. corona virus 2 (SARS-CoV-2) was initially found in Wuhan, China ¹. Up to October 27, 2022, over 6.5 million individuals have died and over 629 million had been infected across the world owing to its extremely infectious nature ². Complications related to pregnancy and increased likelihood of contracting a severe disease are associated with coronavirus disease 2019 ³. Actually, pregnant patients with COVID-19 have a higher chance of requiring invasive ventilation, oxygen therapy, extracorporeal membrane oxygenation, and intensive care unit (ICU) admission compared to nonpregnant women. They are also more likely to die ⁴. On December 2020, efficacy in COVID-19 vaccine was first recorded. Then, the entire population was vaccinated ⁵.

But COVID-19 vaccine trials was not considered initially for pregnant women due to uncertainty regarding the risks to the mother and fetus and the unfamiliarity with mRNA vaccines in this group ⁶. Consequently, there is currently only observational data available regarding the long-term efficacy and safety of the COVID-19 vaccinations among pregnant women. Pregnant women's hesitancy to receive vaccines has been compounded by this ignorance ⁷.

44% of pregnant women who visited prenatal clinics received the COVID-19 vaccine, while over half (56.0%, n = 227) did not, as per a study ⁸.

Of 1,051 postpartum women eligible for vaccination, 217 (20.6%) were not given the vaccination while 834 (79.4%) were given mRNA vaccine, primarily due to concerns regarding the potential impact of the vaccine on the developing baby ⁹.

The COVID-19 vaccine guards against adverse outcomes in both the fetus and mother. Pregnant individuals should get vaccinated as soon as possible and follow their COVID-19 vaccination roster. Further, in contrast to unvaccinated controls (preterm birth or PTB 9.4%, stillbirth or SB 0.6%; very low birth weight or VLBW 1.5%), vaccinated women had reduced rates of preterm birth (7.9% with $p < 0.0001$), stillbirth (0.3% with $p < 0.0002$), and very low birthweight newborn (1.0% with $p < 0.0001$) ¹⁰.

The aim of the present study is to find frequency of COVID- vaccination among pregnant woman and comparison of maternal outcome in females with and without COVID-19 vaccination. Pregnant women and their babies are at severe risk from the COVID-19 pandemic, and therefore, information on vaccine uptake and its effect on maternal health is crucial. Nevertheless, there exists a concerning shortage of demographic data relating to vaccinated pregnant women in Pakistan. Such lack of information highlights the real need for specifically targeted research as a matter of utmost priority. Considering that pregnant women are themselves more vulnerable to severe COVID-19 issues, knowing the vaccination frequency is of prime importance so as to maintain the health of the mother as well as that of the fetus.

MATERIALS AND METHODS

Study Design: Descriptive case series was used

SETTING: Department of Obstetrics and Gynecology, Ghurki Trust Teaching Hospital

Lahore.

Duration of the Study: The study was completed in six months after approval of synopsis [Nov 15, 2024 till Feb 15, 2025]

SAMPLE SIZE: A total of 379 females were enrolled in this study, the sample size was calculated using frequency of vaccination of COVID-19 as 44%,⁸ with 95% confidence level and 5% margin of error.

SAMPLING TECHNIQUE: Consecutive sampling (a type of non-probability)

SAMPLE SELECTION:

Inclusion Criteria:

- Pregnant women aged 18-45 years
- Booked cases in 3rd (after 28 weeks of gestation)
- Any parity

Exclusion Criteria:

- Females with previous C-section, and any known poor fetal and maternal outcome
- Known allergy of COVID-19 vaccine

DATA COLLECTION PROCEDURE:

COVID-19 vaccination was identified based on documentation on the COVID-19 vaccination card. Fetal outcome was evaluated in terms of stillbirth (SB), preterm birth (PTB), and low birth weight (LBW). SB was defined as the absence of signs of life in the baby after 22 weeks of gestation, measured through ultrasonography (USG). PTB was defined as delivery occurring before 37 weeks of gestation, assessed by USG. LBW was classified when the newborn's weight was less than 2.5 kilograms. Data from 379 females visiting the Department of Obstetrics and Gynecology, Ghurki Trust Teaching Hospital Lahore for antenatal checkups in the third trimester were collected after obtaining informed consent and the approval from Hospital Ethical Committee. Their demographic

information, such as age and contact details, was recorded. Their COVID-19 vaccination status was noted and cross-checked against medical records for accuracy (vaccination cards). Participants were categorized into vaccinated and unvaccinated groups based on their COVID-19 vaccination status and were followed until their pregnancy outcomes. Data were managed on an attached proforma. All collected data were entered in SPSS version 26. Mean and standard deviation were calculated for quantitative variables like age, BMI, and gestational age at enrollment. Frequency and percentage were calculated for categorical data such as COVID-19 vaccination status, stillbirth, preterm birth, and low birth weight. Data were stratified for age, parity, BMI, brand of vaccine, and number of antenatal visits until delivery (≤ 4 or more than 4). Post-stratification, the Chi-square test was applied, taking a p-value ≤ 0.05 as significant. Fetal outcomes were compared between the groups using the Chi-square test, and a p-value ≤ 0.05 was considered significant.

RESULTS

The mean age of the participants was 30.77 ± 7.39 years, with a range of 18 to 45 years. The average BMI was 30.28 ± 4.48 , ranging from 17 to 42. The mean gestational age at enrollment was 35.97 ± 1.97 weeks, with a minimum of 29 weeks and a maximum of 40 weeks.

Among the participants, 212(55.9%) had 4 or fewer antenatal visits, while 167(44.1%) had more than 4 visits. Regarding COVID-19 vaccination, 202(53.3%) were vaccinated, and 177(46.7%) were not. Among the vaccinated group, 132(34.8%) received the Pfizer vaccine, 48(12.7%) received Moderna, 15(4.0%) received AstraZeneca, and 7(1.8%) received other brands. A total of 177(46.7%) had no vaccination record and were categorized as not applicable (NA).

For fetal outcomes, 22(5.8%) experienced stillbirths and 357(94.2%) had live births. Preterm births were reported in 108(28.5%) cases, whereas 271(71.5%) had term deliveries. Low birth weight was observed in 71(18.7%) newborns, and 308(81.3%) had normal birth weight.

When fetal outcomes were compared based on vaccine status, the rate of stillbirth was significantly higher among vaccinated women (17(8.4%)) compared to unvaccinated women (5(2.8%)) with a statistically significant association ($\chi^2 = 5.393$, $p = 0.020$). Similarly, low birth weight was significantly more common in vaccinated individuals (47(23.3%)) than in unvaccinated ones (24(13.6%)) ($\chi^2 = 5.840$, $p = 0.016$). However, no significant association was found between preterm birth and vaccine status ($\chi^2 = 0.127$, $p = 0.722$).

Stratification

Further subgroup analysis indicated that stillbirth was significantly associated with non-obese status ($p = 0.007$) and more than 4 antenatal visits ($p = 0.019$). Low birth weight was significantly higher among women aged 30–40 years ($p = 0.003$), multiparous women with parity ≥ 3 ($p < 0.001$), non-obese participants ($p = 0.008$), and those with ≤ 4 antenatal visits ($p = 0.009$). In contrast, preterm birth was not significantly associated with any of the demographic or clinical factors examined, including age, parity, BMI, gestational age, or antenatal visits (all $p > 0.05$).

Lastly, the type of vaccine (Pfizer, Moderna, AstraZeneca, Others) was not significantly associated with stillbirth ($p = 0.201$), preterm birth ($p = 0.417$), or low birth weight ($p = 0.456$), suggesting no differential effect based on vaccine brand.

Table-1: Descriptive statistics of age (years), BMI and gestational age (weeks) at enrollment [n=379]

	Age (years)	BMI	Gestational age (weeks) at enrollment
Mean	30.77	30.28	35.97
S.D	7.39	4.48	1.97
Range	27.00	25.00	11.00
Minimum	18.00	17.00	29.00
Maximum	45.00	42.00	40.00

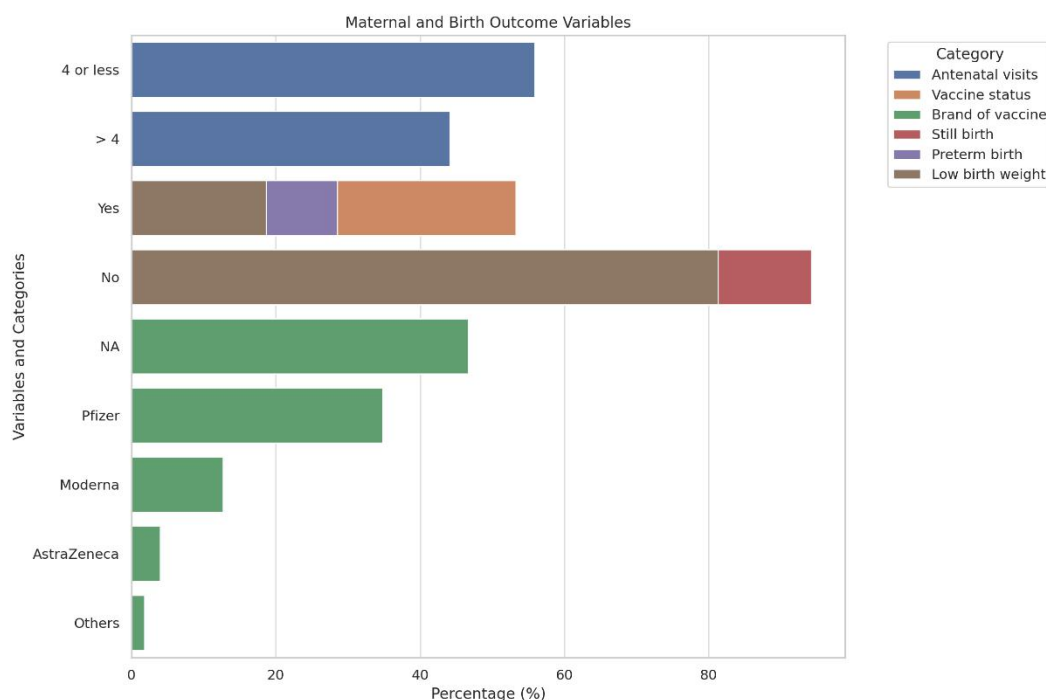


Fig-1:

Antenatal visits, vaccine status, brand of vaccine, and fetal outcome [n=379]

Table-3: Comparison of fetal outcome and vaccine status [n=379]

		Vaccine status		Chi-square	p-value
		Yes	No		
Still birth	Yes	17(8.4%)	5(2.8%)	5.393	0.020*
	No	185(91.6%)	172(97.2%)		
Preterm birth	Yes	56(27.7%)	52(29.4%)	0.127	0.722
	No	146(72.3%)	125(70.6%)		
Low birth weight	Yes	47(23.3%)	24(13.6%)	5.840	0.016*
	No	155(76.7%)	153(86.4%)		

***Significant**

Table-3: Comparison of Brand of vaccine with respect to still birth, preterm birth and low birth weight [n=202]

		Brand of vaccine				Chi-square	p-value
		Pfizer	Moderna	AstraZeneca	Others		
Still birth	Yes	15(11.4%)	2(4.2%)	0(0%)	0(0%)	4.634	0.201
	No	117(88.6%)	46(95.8%)	15(100%)	7(100%)		
Preterm birth	Yes	41(31.1%)	11(22.9%)	2(13.3%)	2(28.6%)	2.840	0.417
	No	91(68.9%)	37(77.1%)	13(86.7%)	5(71.4%)		
Low birth weight	Yes	31(23.5%)	13(27.1%)	3(20.0%)	0(0%)	2.607	0.456
	No	101(76.5%)	35(72.9%)	12(80.0%)	7(100%)		

DISCUSSION

This study explored the prevalence of COVID-19 vaccination among pregnant women and contrasted fetal outcomes among the vaccinated compared to the unvaccinated. The mean age of participants was 30.77 ± 7.39 years, and the mean BMI was 30.28 ± 4.48 . Of the total 379 participants, 53.3% were vaccinated, with Pfizer 34.8% being the most commonly received vaccine, followed by Moderna 12.7%, AstraZeneca 4.0%, and others 1.8%.

Fetal outcomes revealed 5.8% stillbirths and 94.2% live births. Preterm deliveries occurred in 28.5% cases, while 71.5% cases delivered at term. Low birth weight was reported in 18.7% newborns. Stratified analysis revealed that stillbirths were significantly associated with non-obese women ($p = 0.007$) and those with more than four antenatal visits ($p = 0.019$). Low birth weight was significantly associated with age 30–40 years ($p = 0.003$), parity ≥ 3 ($p < 0.001$), non-obesity ($p = 0.008$), and ≤ 4 antenatal visits ($p = 0.009$). Preterm birth was not significantly associated with any maternal demographic or clinical factor. Moreover, no significant association was observed between vaccine brand and fetal

outcomes—stillbirth ($p = 0.201$), preterm birth ($p = 0.417$), or low birth weight ($p = 0.456$). Although our study found a significant higher stillbirth rate among vaccinated women (8.4%) compared to unvaccinated women (2.8%) ($p = 0.020$). This findings was in contrast with a large multicenter study by Piekos et al. (2023), including 86,833 births from several U.S. states. The vaccinated cohort had a significantly lower rate of stillbirth ($p < 0.01$) compared to an unvaccinated group, but none of the PTB ($p = 0.35$), SGA ($p = 0.79$), or VLBW ($> 1,500$ g; 0.31) rates changed. In comparison to non-booster vaccinated individuals, boosted individuals had lower incidence of PTB ($p < 0.05$), stillbirth ($p < 0.01$), and VLBW ($p < 0.01$)¹¹. Based on these results, COVID-19 boosters must be given during pregnancy to enhance protection for both fetus and mother.

On contrary to our findings, 200 pregnant women—100 vaccinated and 100 unvaccinated—took part in a recent cross-sectional comparative study in Karachi, Pakistan. There were no differences between both groups regarding stillbirths or preterm birth, based on the research. Most of the vaccinated women had been administered Sinopharm or Sinovac, and there were no harmful correlations between maternal complications and the type of delivery. The results provide further evidence of the safety and impartiality of the COVID-19 vaccines with respect to local context¹².

In support of these findings, another study was performed at Hayat Medical Complex in Peshawar, involving 1,200 pregnant women (600 vaccinated and 600 unvaccinated), corroborated these results by indicating that the rate of preterm births (6.67% vs. 8.33%) and stillbirths (0.67% vs. 1.17%) was lower among the vaccinated compared to the unvaccinated, although not statistically significant. In addition, no detectable differences between the groups were found regarding infant mortality, respiratory distress syndrome, NICU admission, or low birth weight. This contributes to the growing body of evidence demonstrating that, even in regional areas, the COVID-19 vaccine does not have any adverse effects on perinatal outcomes¹³.

Furthermore, except for stillbirth, only in the unvaccinated group (3%), pregnancy complications were more in the unvaccinated group, as found in a retrospective cohort

analysis of women with prior COVID-19 diagnosis or an uncertain vaccination history. These observations were not, however, found to be statistically significant. There were no noticeable variations in newborn characteristics or issues across the groups, and women who had been vaccinated delivered at more advanced gestational ages and with slightly higher birth weights. These results further confirm that the COVID-19 vaccine is safe to take during pregnancy and can, in some cases, result in improved outcomes ¹⁴.

In a similar way, a large population-based cohort study from England and Wales, which compared information on 865,654 pregnant women, revealed that having COVID-19 was significantly associated with an increased risk of adverse outcomes such as preterm birth, very preterm birth, and stillbirth, especially in the 14 days and during the 3rd trimester. Risk was appreciably higher before immunization. Most importantly, their research discovered no association between the COVID-19 vaccination and a higher risk of adverse pregnancy outcomes. In fact, lower rates of preterm birth (HR 0.90), extremely preterm birth (HR 0.84), and stillbirth (HR 0.67), were associated with dosage 1 of the vaccine ¹⁵.

A Swedish-Norwegian population-based cohort study that undertook 196,470 infants further reaffirmed these findings by demonstrating there was no increased risk of adverse neonatal outcomes among infants whose mothers received mRNA COVID-19 vaccines during pregnancy. In fact, there was no difference between brands or timing of vaccines for the risk of infant mortality, hypoxic-ischemic encephalopathy, or nontraumatic intracranial haemorrhage. Even after adjusting for a variety of maternal and infant variables, these findings remained unchanged ¹⁶.

Additionally, the effect of the Sinopharm vaccine on pregnancy outcomes was examined meticulously in a retrospective cohort study that was carried out in Yazd, Iran. Even after adjusting for potential confounding factors such as maternal age, BMI, parity, and medical history, pregnancy outcomes in the vaccinated and unvaccinated groups were not significantly different in the 1222 pregnant women who participated in the trial. This concurs with the other research demonstrating the safety profile of COVID-19 vaccination during pregnancy, such as Sinopharm and other inactivated viral vaccines. ¹⁷.

Similarly, it was found in our analysis that the rate of low birth weight was higher in the vaccinated group (23.3%) than in the unvaccinated group (13.6%) ($\chi^2 = 5.840$, $p = 0.016$). However, a study done in Israel found that there was no identifiable difference in the average weight of children born to vaccinated mothers and those who were not ¹⁸.

Another factor to be tested was the relationship between pregnancy immunization and the risk of preterm delivery. Preterm delivery rates in the two groups were not significantly different ($\chi^2 = 0.127$, $p = 0.722$). In addition, a study comparing the maternal and newborn outcomes of 55 vaccinated and 62 unvaccinated pregnant women was conducted at Iran's Tabriz University of Medical Sciences. Although unvaccinated women experienced fewer preterm births compared to vaccinated women, this was not significant ¹⁹. Based on these findings, it is unlikely that the COVID-19 vaccine will increase the risk of premature delivery. Pregnancy within 12 months of immunization was also associated with reduced risk of extremely preterm delivery, term small-for-gestational-age births, and stillbirth, especially with mRNA vaccines, based on a new England-wide study that also explored pre-pregnancy COVID-19 vaccine. As per the study, although a slightly higher risk of venous thromboembolism with viral-vector vaccines, the risk was less than that of SARS-CoV-2 infection itself and was still safer than being unvaccinated ²⁰.

Some of our study findings are contrary to earlier studies that often imply that the COVID-19 vaccine has a neutral or protective effect on pregnancy outcomes. Selection bias or unmeasured confounders could have affected the reported associations. Such discrepancies could potentially be explained by comorbidities underlying, vaccination timing, or extraneous variables (e.g., stress or healthcare access). The cross-sectional design, single-center setting, lack of confounder control, and limited sample of poor outcomes are some of the limitations that limit the ability to make inferences regarding causality and generalizability.

CONCLUSION

More than half of pregnant women in this study were vaccinated with COVID-19. Despite

this, vaccinated participants were significantly more likely to experience stillbirth and low birth weight. Preterm birth or differences by vaccine type were not significantly different. These results are an indication of the necessity of further large-scale, prospective research in order to clarify the safety and timing of COVID-19 vaccination during pregnancy, controlling for potential confounders.

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