

Original Research Article

Acceptance of COVID-19 vaccine among pregnant women: a cross-sectional study in an urbanised village of East Delhi

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ABSTRACT

Background: It is well accepted that COVID-19 vaccinations combined with COVID-19 appropriate behavior are the most effective tools for individual protection and pandemic containment. Union Health Ministry announced the approval of COVID-19 vaccination for pregnant women on June 25, 2021, in India. The present study was conducted to assess COVID-19 vaccine acceptance and associated factors among pregnant women living in an urbanized village of Ghazipur, east Delhi.

Methods: A community-based cross-sectional study was conducted using a semi-structured pre-tested questionnaire to assess the estimated coverage of the COVID-19 vaccine among 226 pregnant women and various factors associated with it using a cluster sampling technique.

Results: Of the 226 participants, only 101 women took the COVID-19 vaccine during their pregnancy period with an acceptance rate of 44.7%; out of these 33 (14.6%) women received one dose, 63 (27.9%) received 2 doses and 5 (2.2%) received an additional booster dose of COVID-19 vaccine. Type of family, status of pre-existing medical conditions, knowledge of their COVID-19 vaccine eligibility and literacy status of participants are the factors associated with COVID-19 vaccination.

Conclusions: The proportion of pregnant women's acceptance of the COVID-19 vaccine during their pregnancy was low in our study. There is an urgent need to carry out IEC campaigns among pregnant women, health workers, and the community regarding the importance of COVID-19 vaccination during pregnancy and dispel myths about it.

Keywords: COVID-19, COVID-19 vaccine, Maternal vaccine, Vaccination

INTRODUCTION

COVID-19 caused by SARS-CoV-2, was officially declared a global pandemic by World Health Organization on March 11, 2020. With very rapid development of safe and effective COVID vaccines, it was accepted that COVID-19 vaccinations combined with COVID-19 appropriate behaviour are the most effective tools for individual protection and pandemic containment. Government of India started the national COVID-19 vaccination program in January 2021 and divided the vaccination distribution into phases.¹ But in any of the phases pregnant women were not included in vaccination

drive. In the first phase that started on January 16, 2021, vaccination was provided to healthcare and other frontline workers, people over the age of 60 years and people between 45 and 59 years with comorbidities. From May 1 2021 onwards, the vaccination was offered to adults aged 18 years and older. However, pregnant women were not included as beneficiaries of the vaccination drive. Later on, it was realized that effects of corona virus disease were more in pregnant women compared to nonpregnant women in terms of increased risk of hospitalization, intensive care unit stay, and death and a link had been found between COVID-19 and the risk of pre-term and cesarean deliveries.² Union Health Ministry thus,

announced the approval of COVID-19 vaccination for pregnant women on June 25, 2021 and in Delhi the same was started on 2nd July 2021 onwards.³ At that time only 3 vaccines; 2 replicating viral vector-based vaccines-Covishield and Sputnik V, and an inactivated vaccine-Covaxin had received approval for restricted use in emergency situation in India.

METHODS

Study sample

A thorough review of literature revealed that there were no studies available in India that tried to estimate the coverage of COVID-19 vaccine in pregnant females.

Using EpiInfo mobile application assuming approximate estimated coverage of COVID-19 vaccination in pregnant females to be 50% to get maximum sample size, with 8% absolute precision, at 95% confidence level, we obtained a sample size of 151.⁴ As the outcomes in our study were likely to be correlated, therefore a design effect of 1.5 was applied which gave the sample size of 226 ($151 \times 1.5 = 226$). Thus, the final sample size in the present study was 226.

Note on estimated coverage

COVID-19 vaccine was a new vaccine and was not available before 1st May, 2021 for adults (18 years above) in India. It subsequently became available for pregnant women from 2nd July, 2021 in Delhi. Therefore, pregnant women between 2nd October, 2020 to 2nd April 2022 became the first cohort of pregnant women who could receive COVID-19 vaccine. Therefore, upon asking women who had children in the age group ranging from 5 months to 18 months in the present study history of receipt of COVID-19 vaccination when these women were pregnant became an equivalent of the coverage of COVID-19 vaccination amongst pregnant women (Figure 1).

Pregnant women who received one dose of COVID-19 vaccine during pregnancy are considered partially vaccinated, and those who received two doses are considered fully vaccinated.

Sampling method

Cluster sampling was used, with each of the 10 ASHA workers in the catchment area considered as a cluster. A list of all 10 ASHA workers was prepared from study area and numbered 1-10. Three ASHAs (clusters) were then randomly selected using the lottery method. All pregnant women eligible for the COVID-19 vaccine, were included in the study across these three clusters (as on average one ASHA registers 90 pregnancies per year).

These women had delivered by the time of data collection (September 2022 to February 2023) and had children aged 5 to 18 months (Figure 1). These women were asked about their demographic and COVID-19 related details.

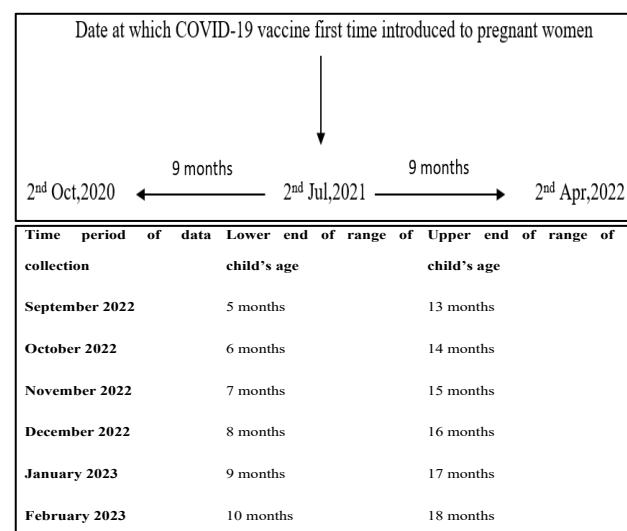


Figure 1: Vaccination among pregnant women.

Data management and statistical analysis

Data from the self-prepared proforma was entered into an MS Excel sheet and then transferred to SPSS version 20.0. Scoring and categorization were done, and descriptive tables were generated. The chi-square test was applied to assess the association between COVID-19 vaccine acceptance and various sociodemographic factors.

RESULTS

In total 226 pregnant women were included in this study. Among them majority of study participants were below 30 years (82.3%) of age and homemakers (98.2%) by occupation. Furthermore, among them, 71.3% stayed in nuclear family while 21.2% stayed in joint family. As per Modified Kuppuswamy Classification majority of the women (58%) belong to upper lower socio-economic status.

Among dichotomous variable type of family, status of pre-existing medical conditions and the knowledge of their COVID-19 vaccine eligibility (Table 2) were the factors that had statistically significant association ($p < 0.05$) with COVID-19 vaccine acceptance. Age and occupation of the participants, residential status, religion, caste, abortion status, gravidity status at the time of COVID-19 vaccine administration, were the dichotomous variables that did not have a statistically significant association with COVID-19 vaccine acceptance ($p > 0.05$) (Table 2).

Table 1: Antenatal characteristics, health related profile, and COVID-19 vaccination related profile among study participants.

Characteristics	Categories	Frequency (n=226)	Percent
Current physiological status	Pregnant	5	2.2
	Lactating for less than 6 months	31	13.7
	Non-pregnant and non-lactating	190	84.1
Pre-existing medical conditions	No comorbidity	212	94
	Anxiety	7	3.2
	Depression	2	0.8
	Hypothyroidism	2	0.8
	Hypertension	1	0.4
	Asthma	1	0.4
	Epilepsy	1	0.4
Tobacco intake	No	219	96.9
	Yes	7	3.1
Past history of abortions	No abortion	185	82
	1 abortion	27	11.9
	2 abortions	10	4.4
	3 abortions	3	1.3
	4 abortions	1	0.4
Td vaccination	Not taken	7	3.1
	Td 1 st dose	2	0.9
	Td 2 nd dose	154	68.1
	Td booster dose	63	27.9
Type of delivery	Full term	207	91.6
	Preterm	19	8.4
Complications during delivery	No	208	92.0
	Yes	18	8.0
History of COVID-19	History of COVID before pregnancy	3	75.0
	History of COVID in close contacts	1	25.0
Source of information about COVID-19 vaccine	ASHA	115	58.7
	Husband/family/friends/neighbours	89	45.4
	ANM/doctor	64	32.4
	TV/newspaper/radio	44	22.4
	Others	2	1
Knowledge about eligibility of COVID-19 vaccine	No	30	13.3
	Yes	196	86.7
COVID-19 vaccine received by pregnant women	No	125	55.3
	Yes	101	44.7
Availability of COVID-19 vaccine certificates	Not available	8	7.9
	Available on mobile phone	86	85.2
	Available as paper document	7	6.9
Number of doses of COVID-19 vaccine received	Did not receive any dose	125	55.3
	Received 1st dose only	33	14.6
	Received two doses	63	27.9
	Received booster dose in addition to second dose	5	2.2
Side effects experienced due to COVID-19 vaccine	No	49	48.5
	Yes	52	51.5
Type of side effects reported by vaccine acceptors (n=52)	Fever	42	80.7
	Body ache	21	40.3
	Pain at injection site	18	34.6
	Swelling at injection site	8	15.3
	Others	4	7.6

Table 2: Association of COVID-19 vaccine acceptance with dichotomous and polychotomous demographic variables (n=226).

Variables	Categories	Not COVID vaccinated (n=125) (%)	COVID Vaccinated (n=101) (%)	Test performed	Test statistic	P value
Age of the participants	<25 years	58 (59.8)	39 (40.2)	Chi-square test	1.382	0.240
	25 years and above	67 (51.9)	62 (48.1)			
Occupation of the participants*	Homemaker	123 (55.4)	99 (44.6)	Fisher's exact test		1.0
	Working for income	2 (50)	2 (50)			
Type of family	Nuclear	105 (59)	73 (41)	Chi-square test	4.589	0.032 [#]
	Joint	20 (41.7%)	28 (58.3)			
Pre-existing medical conditions*	No	113 (53.3)	99 (46.7)	Fisher's exact test		0.024 [#]
	Yes	12 (85.7)	2(14.3)			
Past history of abortions	No abortion	102 (55.1)	83 (44.9)	Chi-square test	0.013	0.911
	Abortions	23 (56.1)	18 (43.9)			
Gravidity status of participants at the time of COVID-19 vaccine administration	Gravida ≤2	75 (51.7)	70 (48.3)	Chi-square test	2.104	0.147
	Gravida >2	50 (61.7)	31 (38.3)			
Knowledge about eligibility of COVID-19 vaccination*	No	29 (96.7)	1 (3.3)	Fisher's exact test		<0.001 [#]
	Yes	96 (49)	100 (51)			
Literacy status of the participants	Illiterate	40 (65.6)	21 (34.4)	Chi-square for linear trend	3.910	0.048 [#]
	Upto middle school	26 (60.5)	17 (39.5)			
	Secondary school	36 (46.2)	42 (53.8)			
	Graduate and above	23 (52.3)	21 (47.7)			
Literacy status of spouses of participants	Illiterate	27 (65.9)	14 (34.1)	Chi-square for linear trend	1.584	0.208
	Upto middle school	25 (56.8)	19 (43.2)			
	Secondary school	43 (50)	43 (50)			
	Graduate and above	30 (54.5)	25 (45.5)			
Occupation of spouses of participants	Unskilled	11 (52.4)	10 (47.6)	Chi-square for linear trend	0.975	0.324
	Semi-skilled	53 (60.2)	35 (39.8)			
	Skilled	35 (55.6)	28 (44.4)			
	Arithmetic/professional	26 (48.1)	28 (51.9)			
Monthly income of the family	<9,307	24 (61.5)	15 (38.5)	Chi-square for linear trend	1.772	0.183
	9,308 to 27,882	89 (55.6)	71 (44.4)			
	≥27,883	12 (44.4)	15 (55.6)			
Socioeconomic status	Lower	84 (58.3)	60 (41.7)	Chi-square for linear trend	1.258	0.262
	Middle	34 (50)	34 (50)			
	Upper	7 (50)	7 (50)			

Cells show counts for each variable and percentage of row total in brackets.

*Fisher's exact test was performed for univariate analysis as more than 25% of cells had expected count less than 5.

[#]p value was found statistically significant (alpha =5%).

Among the polychotomous variables, four variables, namely the literacy status of spouses of participants, occupation of spouses of participants, monthly family income, and socio-economic status, were not found to have any statistically significant association with

COVID-19 vaccine acceptance ($p>0.05$). However, when the Chi-square analysis for trend was applied, the literacy status of the participants was found to be significant ($p<0.05$) (Table 2). This means that as the literacy of the participants increased, the acceptance of COVID-19 vaccine also increased in them (Figure 2).

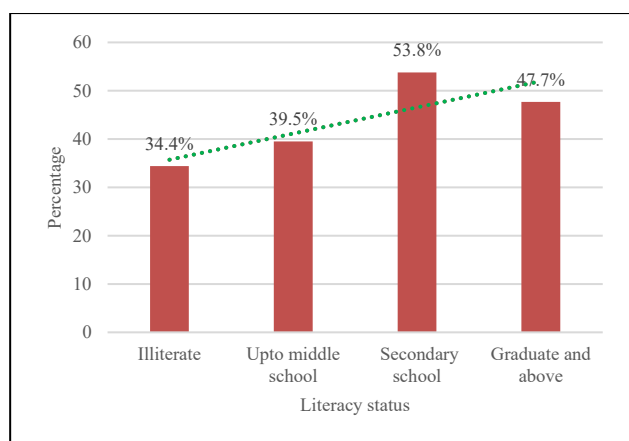


Figure 2: Association of COVID-19 vaccine acceptance with literacy status of the participants.

DISCUSSION

To the best of our knowledge, this was the first community-based study to investigate the estimated coverage and acceptance of the COVID-19 vaccine among pregnant women in an urbanized village in Delhi, India.

COVID-19 vaccine coverage and acceptance during pregnancy

Our study revealed low COVID-19 vaccine coverage among pregnant women, with only 30.1% receiving two or more doses during their antenatal period. Participants accepted COVID-19 vaccine with an acceptance rate of 44.7%. Among 101 vaccinated participants, about a third (32.6%) were vaccinated with the first dose while most (62.4%) had completed their vaccination with second dose, and a few (4.9%) had even gotten a booster dose effectively. Thus, most participants (55.3%) in our study had not accepted COVID-19 vaccine. A notable point is that Td coverage (Td2 doses/booster dose) was fairly high (96%) in these pregnant women. Thus, it was clear from our study that women were not against vaccination per se. It indicates that pregnant women understood necessity of tetanus vaccination during pregnancy, and its role in reducing fetal and maternal morbidity and mortality.^{5,6}

Reasons for low COVID-19 vaccine coverage may be related to some women migrating to their place of origin during second wave (delta) and obtaining vaccination there. Many working-class individuals left Delhi during delta wave, possibly including these women. Additionally, the availability of COVID-19 vaccines in metropolitan cities like Delhi was easier compared to rural areas. The limited initial availability of COVID-19 vaccines in urban areas may have hindered pregnant women in rural regions from getting vaccinated.^{7,8}

COVID-19 vaccination was started in India on 1st May 2021. At that time only healthcare and front-line workers were its beneficiaries.⁹ During the initial phase, vaccine

hesitancy among some doctors may have raised doubts in the general population about the COVID-19 vaccine's safety and efficacy.¹⁰ During the initial phase, there were concerns about COVID-19 vaccines affecting menstruation and fertility in India.¹¹ When COVID-19 vaccination started for pregnant women, this may have played a role in dissuading COVID-19 vaccine.

In the early vaccination phase, limited slots and mandatory registration on CoWIN/Aarogya Setu hindered vaccine administration. Concerns about the safety and efficacy of the COVID-19 vaccine for pregnant women led to a debate among obstetricians and gynecologists.¹² Therefore, the guidelines for COVID-19 vaccination for pregnant women came later than for general population.^{13,14} COVID-19 vaccine hesitancy among healthcare workers may have caused doubts and apprehension among some pregnant women, leading to lower acceptance rates in our study (43.2%).

The primary reason for non-acceptance was contradictory advice from doctors/healthcare workers, causing anxiety and confusion, leaving pregnant women unaware of their eligibility. Similar finding has been reported by other study.¹⁵ Most pregnant women in our study (64.2%), who were either primi or gravida ≤ 2 , were discouraged from vaccination due to concerns about the effects of the COVID-19 vaccine on their fetuses. Similar findings have also been reported by Singh et al in their study.⁶

Few studies reported higher acceptance than our study e.g., study conducted at Hindu Rao Hospital in Delhi with only 21% of women not receiving any type of COVID-19 vaccine.⁵ Other studies showing similar trends have been reported from Chandigarh and Ranchi, where COVID-19 vaccination uptake rate was 66.8% and 78.5%, respectively.^{16,17} The disparity in acceptance rates may stem from different settings, such as tertiary care hospitals, where pregnant women receive more direct healthcare interaction and accurate vaccination information, skewing results compared to the broader population.^{5,16,17}

In the village of Ghazipur, many people were initially hesitant about the COVID-19 vaccine. However, after observing others without major side effects, confidence in the vaccine's safety grew, and 44.7% of participants eventually chose to get vaccinated.

Nearly similar acceptance rate as in our study was also reported in a study conducted in US where 47% of pregnant women received ≥ 1 dose of COVID-19 vaccine during their pregnancy period.¹⁸ Other studies conducted in different parts of the world have also documented low vaccine acceptance rates among pregnant women.^{15,19} Contrasting findings have been cited in the literature regarding COVID-19 vaccine acceptance from studies in the USA, China, and Ethiopia reports high COVID-19 vaccine acceptance rates among pregnant women.²⁰⁻²²

Association of COVID-19 vaccine with various socio-demographic, antenatal characteristics

Type of family

Our study found that women in joint families were more likely to accept the COVID-19 vaccine compared to those staying in nuclear families. This is likely because joint family settings provide more opportunities for outside contact and shared information, which enhances health-seeking behaviour, including vaccine uptake among pregnant women. However, some studies reported no significant relationship between family type and vaccine acceptance.^{16,23}

Literacy status of study participants

Our study found that while overall COVID-19 vaccine acceptance was low (44.6%), acceptance rates increased with higher literacy levels among participants. This is in line with many health utilization studies in India and abroad where it has been shown that higher literacy rate leads to higher health services utilization.^{24,25}

This may be explained on the basis that as women's literacy increases, their awareness of health-related issues, such as family planning and immunization, also improves, reducing ignorance.

In India, the CO-WIN platform is used for COVID-19 vaccination. Beneficiaries need to register using a smartphone, so basic literacy is necessary. This may mean that more literate women have used the CO-WIN platform for registration. This finding has also been corroborated by a study conducted by Agarwal et al.²⁶

Pre-existing medical conditions

Although it's known that individuals with comorbidities are at higher risk for severe COVID-19 complications, our study found that women with pre-existing medical conditions had lower vaccine acceptance compared to those without such conditions. These findings are consistent with a study in Nepal which showed that individuals with a history of comorbidities were less likely to accept the COVID-19 vaccine.¹⁹ The authors explained that pregnant women with comorbidities might be concerned that the vaccine could harm their health and their babies' health, increasing the risk of adverse pregnancy outcomes.¹⁹ Contrasting results have been reported from a study in Trinidad and Tobago where pregnant women with comorbidities were more likely to take COVID-19 vaccine.²⁷

Knowledge of pregnant women's eligibility for COVID-19 vaccination

Our study found that pregnant women aware of their COVID-19 vaccine eligibility were more likely to get vaccinated. Lack of awareness prevented some women

from making an informed decision. Knowledge about eligibility increased curiosity and led them to seek reliable information, mostly from ASHA workers, followed by husbands, family members, and friends. As women learned more about the vaccine's benefits, they became more inclined to get vaccinated to protect themselves and their unborn child. Similar findings as of our study have been reported by Gupta et al from Manipur.²⁸ The authors of Manipur study demonstrated vaccine eligibility ($p=0.002$) as a significant predictor of vaccine acceptance.²⁸ It is known that COVID-19 vaccine clinical trials did not include pregnant women and thus, data on their safety and effectiveness in the population was not available in India. Thus, when pregnant women became eligible to receive the COVID-19 vaccination, some may not have been aware of their eligibility to get the vaccine. Additionally, some health workers may have been unaware of pregnant women's eligibility to receive the COVID-19 vaccine. Such policy gaps among healthcare workers have also been reported in Bangladesh study.²⁹ In our study a high majority (86.7%) pregnant women were aware of their eligibility of COVID-19 vaccination.

During the process of seeking information, healthcare professionals in our study may have provided information about their eligibility for COVID-19 vaccination and counselled them to take the COVID-19 vaccine. In the urbanised village of Ghazipur there are ten ASHAs who are highly motivated and who regularly make house visits. This may have helped women obtain information of COVID-19 vaccine and thus played a part in their getting vaccinated.

Our study assessed COVID-19 vaccination acceptance and coverage among pregnant women, the first cohort eligible cohort in India. This community-based, house-to-house survey provides a unique perspective compared to hospital-based studies, which involve a selective group. We have not only asked about vaccination history but also verified vaccination history through official certificates, mobile records, or local health staff. As limitation, this study was conducted in one urban village in Delhi, so the results might not apply to all of Delhi and could involve recall bias due to self-reported vaccination history.

CONCLUSION

The investigator concludes that there is an urgent need to carry out IEC campaigns among pregnant women, health workers, as well as community members regarding the importance and benefits of COVID-19 vaccination during pregnancy to spread awareness regarding COVID-19 vaccination among them and debunk any misconceptions surrounding it. More research is needed among pregnant women in diverse settings to better understand vaccine acceptance.

This study is not only applicable to COVID-19 vaccine but also for vaccines for future emerging diseases to

explore sociodemographic determinants associated with new vaccine acceptance/non-acceptance in any population.

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