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Covid-19 Vaccine Receptivity Among Antenatal and Postnatal Women

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A B S T R A C T

Introduction*:** The imperative to address the high mortality rates associated with coronavirus disease (COVID-19) prompted a swift development of vaccines. By 2021, multiple vaccines had been introduced. However, a lack of conclusive long-term evidence regarding their effectiveness, coupled with apprehensions about potential effects on pregnancy, contributed to a diverse public reaction.Aim*:** To assess the perception of pregnant and postpartum/ postnatal women with respect to the COVID-19 vaccine.***Materials and Methods*:** A cross-sectional study was conducted among antenatal and postnatal mothers at a tertiary healthcare center, with data collection initiated only upon securing consent from study participants. The study, determining a sample size of 373, administered a 33-item questionnaire to the selected participants. Subsequently, the collected data underwent analysis utilizing SPSS software version 24.0.***Results*:** The majority of participants in the study fell within the 28-32 age group (41.9%). When evaluating participant concern levels, 34.6% expressed moderate concern, with a notable association among those with college-level education. Notably, individuals testing positive for COVID-19 and those with COVID-19-positive family members displayed reduced likelihood of vaccine hesitancy. Concerns regarding the safety of COVID-19 vaccines emerged as a significant predictor of vaccine hesitancy. Moreover, participants exhibiting an enhanced sense of safety post-vaccination demonstrated a positive correlation with vaccine acceptance. ***Conclusion*:** COVID-19 vaccination acceptance remains suboptimal, with variations observed across demographic variables such as age, location, income, and occupation. Utilizing news and social media platforms can serve as effective tools to enhance perception and acceptance of the COVID-19 vaccine among pregnant women.

Keywords: COVID-19, Vaccine, Vaccine Hesitancy, Vaccine Acceptance, Vaccine Safety.

INTRODUCTION

In December 2019, individuals in the Wuhan district of China exhibited pneumonia of unknown origin, later linked to a seafood market in the region. Two years later, the global COVID-19 pandemic, instigated by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), had inflicted widespread devastation, resulting in 539,893,858 confirmed cases and 6,324,112 fatalities worldwide, as reported by the World Health Organization on June 23, 2022 [1, 2].The high morbidity and mortality that this condition was capable of had the world indoors for the best part of two years as well as put an incredible burden on the global healthcare infrastructure.

To combat this pandemic, researchers across the globe have worked tirelessly to develop a vaccine to control this disease and reduce the associated mortality. However, the COVID-19 vaccines were met with hesitancy,

unwillingness, and refusal which led to new concern variants of the disease [3]. Vaccine uptake eventually improved with uneven distribution across the globe with 70.6% of the population having shot at least one dose of a vaccine. A survey that consisted of 23 countries showed that vaccine acceptance increased by 5.2% from June 2021, with an overall global acceptance rate of 79.1% [4]. In India, initially approved vaccines included Covishield (Serum Institute of India Pvt Ltd) and Covaxin (Bharat Biotech, India). Sputnik V (Russia), and Moderna were later made available [5].

Factors contributing to vaccine refusal among individuals include insufficient safety information and concerns about potential side effects. These challenges are exacerbated by the limited long-term research on COVID-19 vaccines compared to well-established routine childhood vaccines, which enjoy greater acceptance among the population [6]. This hesitancy was even more profound among pregnant women as previously conducted research reported that pregnant women were more susceptible and faced higher rates of morbidity and mortality rate than their nonpregnant counterparts. This population was also considered a high-risk population due to its particularly worsened prognosis regarding viral infections as well as physiological changes during pregnancy which can cause a predisposition to more severe respiratory issues. A recently conducted meta-analysis has reported that pregnant women with COVID-19 infection suffered from poor prognosis which in turn required longer duration of admissions in intensive care units as well as encountered a higher preterm birth rate, preeclampsia, cesarean delivery, and perinatal death [7]. The main reason for pregnant women to refuse the vaccine was: (1) a lack of evidence on COVID-19 vaccine safety in the pregnant population, and (2) the possibility of harm to the fetus [8].

This study aimed to evaluate the perceptions of pregnant and postpartum women regarding the COVID-19 vaccine. Primary objectives included assessing vaccine acceptance among antenatal and postnatal mothers, identifying factors causing delay and hesitancy, and determining elements promoting vaccine acceptance. Secondary objectives involved evaluating socio-demographic factors influencing vaccine receptivity in antenatal and postnatal mothers, and exploring the potential use of this study to assess the impact of COVID-19 vaccine receptivity on healthcare programs.

MATERIALS AND METHODS

A cross-sectional study was undertaken among pregnant women at a tertiary healthcare center in Coimbatore, Tamil Nadu. Approval for the study was obtained from the Institute Human Ethics Committee (IHEC) under reference number PSG/IHEC/2021/Appr/Exp/229. The sample population comprised antenatal and postnatal mothers attending the Obstetrics OPD of the healthcare center, from whom data was collected with their consent. Inclusion criteria involved antenatal or postnatal status, while non-consenting antenatal and postnatal women were excluded. Participants were then selected based on these defined inclusion and exclusion criteria.

The sample size was determined based on findings from a study by Ayhan SC *et al*., where 37% of participants expressed a preference for COVID-19 vaccination. The precision level was set at 5%, and the sample size was calculated using the formula N=4PQ/d^2. Given the proportion from the previous study and the set precision level, a sample size of 373 was calculated for the current study.

The study spanned one year until the required sample size was achieved. A 33-item questionnaire, developed by the researcher and validated by subject experts, was administered to selected participants after translation into the local language (Supplementary file 1). Data obtained from this questionnaire underwent appropriate statistical analysis.

Statistical analysis:

The collected data was entered in excel sheets and analyzed using SPSS software v 24.0. The different variables were depicted in the form of frequency and percentages. The variables were analyzed for vaccine hesitancy and vaccine acceptance using logistic regression model and chi-square test was used to test for association. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Demographic details and preliminary analysis:

In this study involving 442 subjects, the majority fell within the age group of 28-32 years (41.9%), followed by 23-27 years (31.4%), as illustrated in Figure 1.

Regarding COVID-19 vaccination status, 60% of participants were not vaccinated, while 40% received the vaccine (Figure 2). Table 1 reveals that the majority of vaccinated participants were in the 23-27 age group (22.17%), whereas the non-vaccinated group had a higher representation in the 28-32 age group (26.92%).

Concern levels among participants were assessed, indicating that 34.6% were moderately concerned, and 32.6% were slightly concerned about COVID-19 (Figure 3).

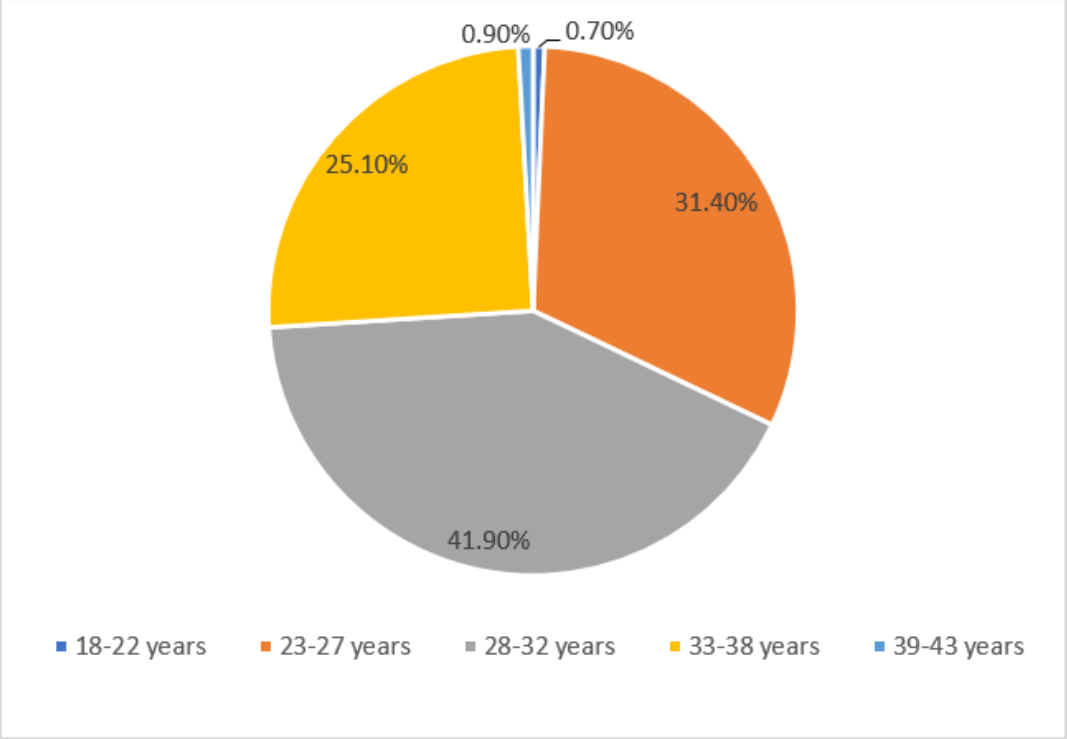

Figure 1: Distribution of participants based on age

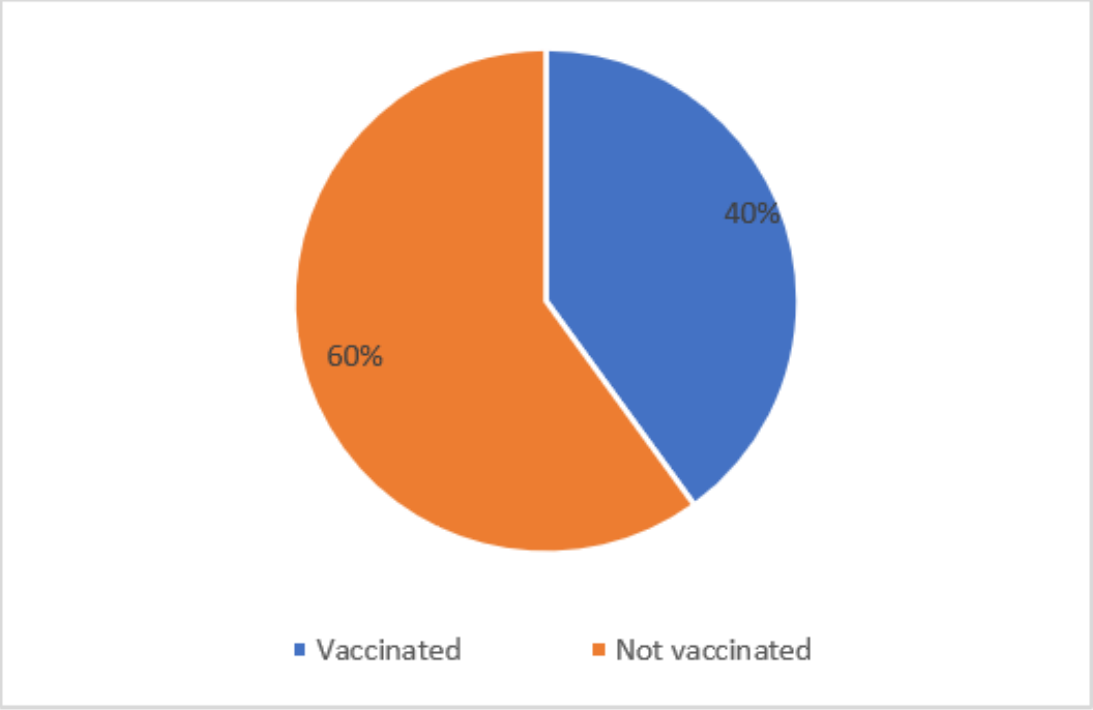

Figure 2: Distribution of Individuals Based on COVID-19 Vaccine Status

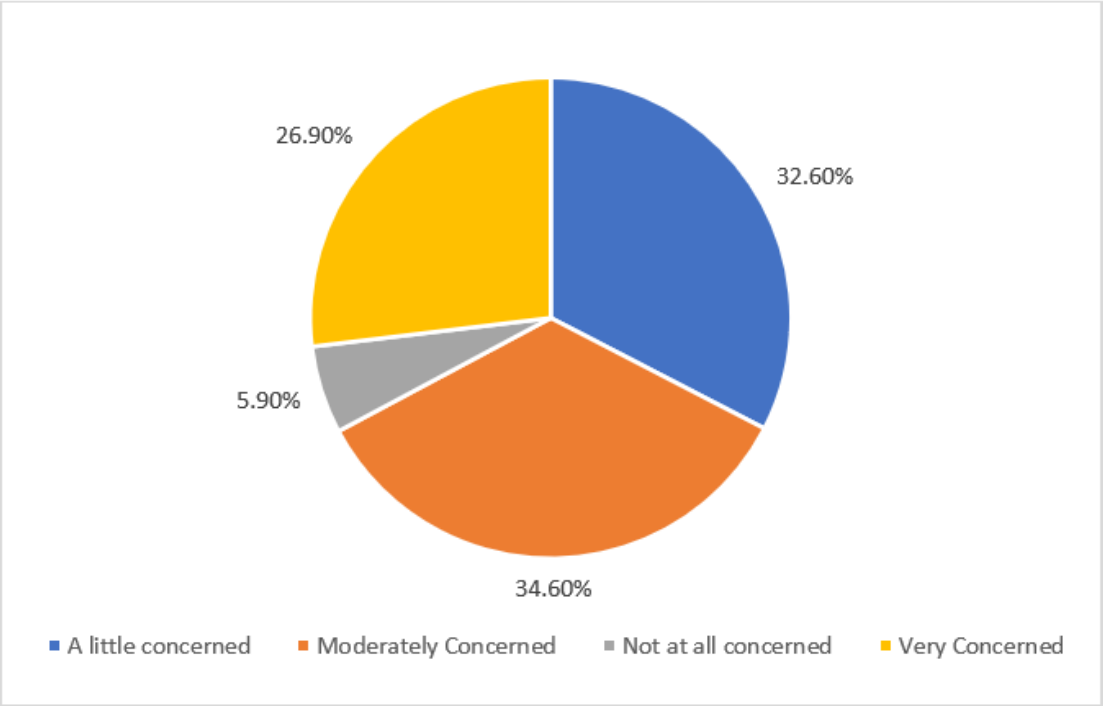

Figure 3: Level of concern about contracting COVID-19

Table 1: COVID-19 Vaccine Acceptance by Age Group

		Got COVID19 Vaccine			
		No		Yes	
		Count	(%)	Count	(%)
Age (years)	18 - 22	1	33.3	2	66.7
	23 - 27	41	29.5	98	70.5
	28 - 32	119	64.3	66	35.7
	33 - 38	102	91.9	9	8.1
	39 - 43	2	50.0	2	50.0

Factors associated with vaccine hesitancy and acceptance:

The analysis of factors influencing vaccine hesitancy revealed significant associations. Participants testing positive for COVID-19 (p=0.000) and those with COVID-19-positive family members (p=0.000) exhibited significantly lower levels of vaccine hesitancy, as indicated by highly significant negative coefficients. Concerns regarding the safety of COVID-19 vaccines were identified as a significant predictor of hesitancy, supported by a highly significant negative coefficient (p=0.000) (Table 2).

Table 2: Analysis of Factors Causing Delay or Hesitancy toward vaccination

	z value	P - value
Tested Positive for COVID19: Yes	-5.977	0.000
Family Members Positive: Yes	-6.213	0.000
Aware of Impact on Pregnancy Yes	-1.952	0.051
Know Pregnant Women Can Get Vaccinated: Yes	1.508	0.132
Concerned About Vaccine Impacting Pregnancy: Yes	-1.623	0.105
Concerned About Safety of COVID Vaccines: Yes	-3.83	0.000

Factors associated with vaccine status:

In examining factors linked to vaccine acceptance, a highly significant positive correlation was identified between participants' increased sense of safety post-vaccination (p=0.000) (Table 3).

Analyzing the association between different variables and COVID-19 vaccine status revealed highly significant associations with age (p=0.000), location (p=0.000), and income (p=0.000). Additionally, the association between occupation and vaccine status was found to be statistically significant (p<0.05) (Table 4).

Table 3: Analysis of Factors Causing acceptance toward vaccination

	Std. Error	P - value
Know COVID19 Symptoms: Yes	882.7442	0.987
Know Preventive Measures: Yes	1.36459	0.863
Know Severity of COVID19: Yes	0.55827	0.352
Concern About Contracting COVID19: Moderately concerned	0.32818	0.841
Concern About Contracting COVID19: Not at all concerned	0.65779	0.807
Concern About Contracting COVID19: Very concerned	0.35678	0.581
Feel Safer with Vaccine: Yes	0.50827	0.000
COVID Vaccination Compulsory: Yes	0.54711	0.861

Table 4: Association of COVID-19 vaccine status with various variables

		Got COVID19 Vaccine		P- Value
		No	Yes	
Age	18 - 22	1	2	0.000
	23 - 27	41	98	
	28 - 32	119	66	
	33 - 38	102	9	
	39 - 43	2	2	
Location	Rural	97	34	0.000
	Urban	168	143	
Education	College	219	132	0.071
	High School	29	36	
	Illiterate	5	1	
	Middle School	8	5	
	Primary School	4	3	
Occupation	Daily wage workers	7	8	0.048
	Entrepreneurial	2	3	
	Farmers	11	1	
	Homemakers	174	129	
	Private sector workers / office workers	71	36	
Income	> 7008	200	86	0.000
	1051 - 2101	5	7	
	2101 - 3503	16	12	
	3504 - 7007	44	72	

DISCUSSION

After over two years of the COVID-19 pandemic, the U.S. Centers for Disease Control and Prevention (CDC) have disclosed that pregnant women with COVID-19 experienced a heightened rate of hospitalization. They were three times more likely to be admitted to the ICU and required artificial ventilation. Past studies have demonstrated that vaccination significantly reduces COVID-19 cases, morbidity, and mortality. The consensus among most scientists is that vaccination constitutes a public health priority and is crucial for mitigating the pandemic [9-11].The present study was conducted to assess the COVID-19 vaccine hesitancy and acceptability as well as association with different variables among pregnant women.

Analysis of demographic distribution revealed a majority of participants falling within the 28-32 years age group, closely followed by the 23-27 years category. This aligns with findings from a study by Bagalb AS *et al*., where a majority of pregnant responders were aged between 25-29 years, as reported in a Pubmed article [12]. With regard to vaccination, only 40% participants were vaccinated against COVID-19. Multiple other studies reported level of acceptance with studies from Saudi reporting that 47.5% and 53.4% women were either vaccinated or planning to be vaccinated which was close to that obtained in the present study [12, 13]. A systematic review and meta-analysis reported that from the pool of selected articles, the COVID-19 vaccine acceptance among pregnant women was 53.46% which contrasted the results of the present study [14]. Global data revealed that the acceptance rate among pregnant women varied considerably, with some countries demonstrating significantly higher rates. For instance, a survey across 16 countries indicated an intention to receive the vaccine among 52% of pregnant women, while a specific study in India highlighted an acceptance rate as high as 80% [15]. The Indian acceptance rate obtained in the present study was half of that reported in the global level study. This difference was also observed in other Indian studies which reported an acceptance rate of 78.52% [2]. Another Indian study reported an acceptance rate of 7.3% during pregnancy and this was

much lower than that reported in the present study [16]. This difference in acceptance rates among pregnant women can be attributed to factors such as education levels, media exposure and the state of healthcare in different countries as well as the way the COVID-19 vaccine was perceived in each country [14, 16].

It is reported that most of the participants who had been vaccinated were aged between 23-27 years and those not vaccinated were between 28-32 years. Similar results were obtained by Kumari A *et al.*, wherein 73.93% participants willing to be vaccinated belonged to the age group of 21-30 years [2]. This similarity can be due to this age group being the common age at which women get pregnant. Contrastingly another study reported that majority women interested in vaccination were between 31-57 years of age which was greater than the obtained results [13]. This goes to show that age can influence the decision-making process regarding vaccination.

In the analysis of factors influencing hesitancy, participants who tested positive for COVID-19 ($p=0.000$) and had family members with positive tests ($p=0.000$) demonstrated a significantly lower likelihood of vaccine hesitancy. Concerns about the safety of COVID-19 vaccines were identified as a significant predictor of hesitancy ($p=0.000$). This contrasts with the findings of a prior study where a history of COVID-19 infection ($p=0.648$) and a family history of COVID-19 ($p=0.090$) were not associated with vaccine acceptance, as reported in a Pubmed journal [2].This difference can be explained by varying levels of education and knowledge related to COVID-19 that can exist among different populations.

Analysis of factors associated with vaccine acceptance showed that participants who exhibited an increased feeling of safety after vaccination showed a highly significant positive correlation with vaccine acceptance ($p=0.000$). This result was similar to that obtained in a survey conducted by Skjefte M *et al*., wherein confidence in vaccine efficacy and safety were found to be strong predictors of vaccine acceptance [15]. This reinforces the belief that knowledge and understanding of vaccines are essential in the decision-making process.

The association between vaccine status and various variables was analyzed of which age, location, and income were shown to be highly significantly associated with COVID-19 vaccination while occupation was also shown to be statistically significant. This result can be used to modify attempts to improve vaccine acceptance by increasing focus on particular groups. A Saudi-based study reported similar results with age and location both showing association with vaccine status ($p=0.000$) [13]. A study conducted by Tao L *et al.*, reported that acceptance rates reduced with increased age ($p<0.05$) while location and education were also associated with vaccine acceptance ($p<0.05$) [17]. This was reinforced by a study conducted by Kumari A which stated that education and socioeconomic status were associated with the vaccine status of pregnant women [18]. However, the results of certain studies contrasted with the results of this study [14, 19]. This variation in results can be researched and further studied to improve understanding of the factors associated with vaccine acceptance.

The present study was not without limitations, the single-centered nature of the study could lead to reduced generalisability of results. The questionnaire could have been designed to collect data on more variables like pregnant and lactating women which could be associated with vaccine hesitancy or acceptance. The implications of the results of this study include the need for educating pregnant women on the importance of vaccination against COVID-19 to ensure reduced chances of mortality. A study conducted by Gupta N *et al.*, reported that news (74%) was the major source of knowledge among pregnant women and around 60% women were not willing to receive the vaccine, mainly because of their fear of a harmful effect on pregnancy [16]. Social media was also found to be a way of spreading misinformation related to the COVID-19 vaccine [20]. This must change if the vaccination level is to increase and using the news and social media to change opinion can be a great way forward.

CONCLUSION

The study results lead to the conclusion that there is a continued need for improvement in COVID-19 vaccination acceptance levels. Variables such as a history of testing positive for COVID-19, family members testing positive, and safety concerns were associated with vaccine hesitancy, while pregnant women's increased sense of safety correlated with vaccine acceptance. Demographic factors including age, location, income, and occupation were linked to vaccination status. Utilizing news and social media platforms could enhance perception and acceptance of the COVID-19 vaccine among pregnant women.

DECLARATIONS

Human subjects: Consent was obtained by all participants in this study. Institutional Human Ethics Committee issued approval PSG/IHEC/2021/Appr/Exp/229.

Animal subjects: All authors have confirmed that this study did not involve animal subjects or tissue.

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Author Contributions

SDP and RR conceived, designed and wrote the first draft of the study. PC and LMS analysed the data, SDP, RR and PC commented and edited the manuscript. SDP, RR and PC worked on the iterations of the manuscript. All authors read and approved the final manuscript.

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