

# Knowledge, Attitude, and Practice regarding Health Effects of COVID-19 Pandemic and Preventive Measures including Vaccination among Pregnant Women from South India

Kalpana MM<sup>1</sup>, Smitha Sreenivas<sup>2</sup>, Smitha Santhosh<sup>3</sup>, Sasidharanpillai Sabeena<sup>4</sup>

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## ABSTRACT

**Purpose:** Pregnant women with coronavirus disease-2019 (COVID-19) are at an increased risk for preterm delivery, stillbirth, and severe acute respiratory illness which is mainly attributed to the physiological and immunological changes of pregnancy. The aim of this study was to assess the knowledge, attitude, and practice (KAP) regarding the health effects of the COVID-19 pandemic and preventive measures among pregnant women from South India.

**Materials and methods:** A descriptive cross-sectional study was carried out among 505 antenatal women at the Department of Obstetrics and Gynecology, Government Medical College, Kozhikode, Kerala, India from July 2021 to September 2021. After taking informed written consent, the study participants were enrolled using a standardized and validated questionnaire. The data were analyzed in Statistical Package for Social Sciences (SPSS), version 15.0, for Windows (SPSS Inc., Chicago, IL, USA).

**Results:** The mean age of the enrolled antenatal women was 26.53 years (SD  $\pm$  5.14). History of past or present COVID-19 was given by 97 (19.2%) study participants. The first and second doses of the COVID-19 vaccine were taken by 123 (24.3%) and 55 women (10.9%), respectively. About 491 women (97.2%) were perceived to have a piece of good knowledge, and 14 (34.7%) had a moderate knowledge. The attitudes of 468 (92.7%), 35 (6.9%), and two (0.4%) women were good, moderate, and poor, respectively. The preventive practice by all the participants was good.

**Conclusion:** This study concludes that the KAP of pregnant women from South India regarding COVID-19 health effects and preventive measures are good. Antenatal clinics must ensure regular informative sessions stressing the importance of COVID-19 preventive behaviors.

**Keywords:** Attitude, COVID-19, Knowledge, Pandemic, Pregnancy, Vaccination.

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## INTRODUCTION

The newly identified coronavirus known as SARS-CoV-2 causing COVID-19 has been reported from every continent of the world. The Director-General of the World Health Organization declared that the novel outbreak of coronavirus as a public health emergency of international concern (PHEIC) on 30 January 2020 when Germany, Japan, the United States of America, and Vietnam reported evidence of human-to-human transmission outside China and subsequently a pandemic on 11 March 2020. Since 2021, many viral variants have been reported including the most virulent Alpha, Beta, and Delta variants. India reported the first case of COVID-19 on 27 January 2020 who had a travel history from Wuhan to Kunming in China.

Even though COVID-19 in pregnancy does not result in high mortality unlike influenza, there is a greater risk of severe COVID-19 illness requiring intensive care unit (ICU) admission and mechanical ventilation.<sup>1-4</sup> Severity is more in pregnant women of advanced maternal age, overweight, and pre-existing medical conditions.<sup>5</sup> The Royal College of Obstetricians and Gynaecologists (RCOG) has recommended the COVID-19 vaccination to pregnant women based on the age and clinical risk on 16 April 2021. Women with high-risk medical conditions, gestational diabetes mellitus (GDM), body mass index (BMI) above 40, and age above 40 years, and health care workers are at a higher risk of severe disease.<sup>6</sup> Health care workers have to help pregnant women in making an informed choice regarding COVID-19 vaccination. Even after the vaccination, preventive measures such as social distancing, hand

<sup>1-3</sup>Department of Obstetrics and Gynaecology, Government Medical College, Kozhikode, Kerala, India

<sup>4</sup>Clinical Virologist, Allure Residency, Near The British School, Bagmati Province, Kathmandu, Nepal

**Corresponding Author:** Kalpana MM, Department of Obstetrics and Gynaecology, Government Medical College, Kozhikode, Kerala, India, Phone: +91 9847772458, e-mail: dr.kalpana@ymail.com

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hygiene, and face coverage have to be practiced. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)-infected women can be delivered vaginally unless there is an obstetric indication for caesarean delivery.<sup>7</sup> The International Federation of Obstetrics and Gynecology (FIGO) advises health care professionals to assist pregnant women in making an informed choice for vaccine uptake. The two-dose vaccine schedule has to be completed with the same vaccine product at a minimum of 14 days interval before or after administering any other vaccine.<sup>8</sup> Coronavirus is not a teratogenic virus, and the probability of transmission from mother to baby during delivery is extremely low. Based on a recent

systematic review, within the first 24 hours of birth, 1.9% of the neonates born to 4,907 infected pregnant women were tested positive.<sup>9</sup> There is a higher likelihood of severe respiratory illness if infected in the third trimester. Women with comorbidities, higher maternal age, and overweight are more prone to severe complications.

A descriptive cross-sectional study was carried out to assess the KAP regarding the health effects of the COVID-19 pandemic and vaccination among pregnant women between July 2021 and September 2021, during the second wave of the pandemic in Kozhikode, Kerala, South India. Better awareness and good attitude in pregnancy regarding the public health measures for preventing SARS-CoV-2 infection, enable pregnant women to make an informed choice for vaccination. This study will help the caregivers in understanding the knowledge attitude and practice gaps regarding the current pandemic among pregnant women.

## MATERIALS AND METHODS

This descriptive cross-sectional study was carried out at the Department of Obstetrics and Gynecology, Government Medical College, Kozhikode, from July 2021 to September 2021. Approximately 16,000–18,000 women from six northern districts of Kerala seek antenatal care at this tertiary care hospital annually. All the consenting pregnant women attending the out-patient department and inpatient wards were enrolled by purposive sampling after taking informed written consent.

Antenatal cases with severe medical complications such as eclampsia, grades III and IV heart diseases, intrauterine demise, pregnant women with COVID-19 – category C symptoms – and postnatal cases were excluded from the study.

### Sample Size Calculation

The sample size calculation was done using the following formula:

$$N = \frac{Z^2_{1-\alpha/2} p(1-p)}{d^2}$$

where

$N$  = sample size,

$p$  = anticipated prevalence,

$Z$  = reliability coefficient at 95% confidence interval (standard value: 1.96),

$\alpha$  = confidence level, 0.05%, and

$d$  = absolute precision, taken as 5%.

Anticipating a 10% prevalence of SARS-CoV-2 infection among pregnant women<sup>10</sup> at 95% confidence interval and 5% precision (absolute error), a minimum of 138 antenatal cases up to 36 weeks of gestational age had to be enrolled.

### Tool for Data Collection

An epidemiological datasheet was prepared after reviewing the literature thoroughly and in consultation with experts from Obstetrics and Gynecology. The information on age, BMI, education, occupation, marital status, age at marriage, obstetric history, medical complications, obstetric complications, and COVID-19 vaccination status were incorporated in the datasheet. A panel of experts from virology, infectious diseases, and public health analyzed the tool for qualitative validity of the content. The tool was pilot tested among 20 antenatal women for reliability.

### Operational Definitions

- Knowledge is the awareness of the participants regarding the effects of COVID-19 on the fetus, mother, and various preventive measures including vaccination.
- Attitudes are the feelings and beliefs regarding the current pandemic, impacts on maternal health, fetal health, and preventive measures.
- Practice denotes various actions that modify the risk of acquisition or transmission of SARS-CoV-2 infection.

The datasheet was divided into four sections. Section A included sociodemographic and obstetric variables. Section B of the datasheet contained eight multiple-choice questions (MCQs) to evaluate the knowledge about the modes of transmission, effects on mother and fetus, preventive options, including vaccination as per the 5-point Likert scale. In the attitude section (Section C), four statements were included according to the 5-point Likert scale. The practice section (Section D) included four questions and responses based on a 5-point Likert scale to assess the study participants' application of the current knowledge.

### Subject Recruitment

Inside the hospital setting, the eligible study participants were informed about the research work in the local language, and a patient information sheet in the local language was given. Women agreeing to participate were asked to sign a consent sheet in the local language. Using a structured questionnaire, face-to-face interviews were carried out. The predictor variables were age, marital status, parity, and associated chronic diseases. Three outcome variables such as knowledge, attitude, and practice were assessed in this study. At the end of each session, the study participants were educated about the recent updates.

### Ethical Considerations

The study was reviewed and approved by the Institutional Research Committee (Reference No. IRC/2021/Protocol/212) and Institutional Ethics Committee (IEC No. GMCKKD/RP 2021/IEC/152) of Government Medical College, Kozhikode, Kerala. Informed written consent in local language was obtained from study participants.

### Statistical Analysis

All data were computerized with unique identification numbers in the Microsoft Excel program. The data was coded and transported to SPSS, version 15.0, for Windows (SPSS Inc., Chicago, IL, USA). The categorical variables were represented by frequency and percentage. The responses with lower cumulative scores indicate better knowledge, a more positive attitude and better practices toward infection prevention. The demographic data and categorical variables were summarized using frequency and percentages. Continuous variables were denoted by mean with standard deviation (mean  $\pm$  SD) for normally distributed parameters and median with interquartile range (IQR) for parameters not normally distributed. The KAP scores were classified using Bloom's proposed cut-off point.<sup>11</sup> The association between the knowledge and various practices was evaluated by Chi-squared ( $\chi^2$ ) analysis considering a  $p$ -value less than 0.05 significant.

## RESULTS

During the study period, 505 pregnant women were approached, and all of them were willing to participate in the study with a response rate of 100%. The sociodemographic and obstetric

**Table 1:** Sociodemographic characteristics and obstetric variables of antenatal women (n = 505)

Variables	Frequency (n)	Percentage (%)
Age-group		
18 and below	3	0.6
19–25	234	46.4
26–34	231	45.7
35–40	33	6.5
41–45	3	0.6
46 and above	1	0.2
Mean age of study participants: 26.53 years ± 5.14		
mean age at marriage: 21.30 years ± 3.43		
Body mass index		
Underweight	17	3.4
Normal	347	68.7
Overweight	115	22.8
Obese	26	5.1
Religion		
Hindu	264	52.3
Muslim	232	45.9
Christian	9	1.8
Education		
Illiterate	2	0.4
Primary	1	0.2
Middle school	12	2.4
High school	81	16.0
Plus two	188	37.2
Graduate	182	36.0
Post graduate	39	7.8
Occupation		
House wife	407	80.5
Unskilled	5	1.0
Semi-skilled	22	4.4
Skilled	63	12.5
Professional	8	1.6
Age at marriage		
18 and below	104	20.6
19–25	354	70.1
26–35	46	9.1
36–40	1	0.2
Gravida		
Primigravida	200	39.6
Second gravida	173	34.2
Third gravida	93	18.4
Fourth and above	39	7.8

(Contd...)

**Table 1:** (Contd...)

Variables	Frequency (n)	Percentage (%)
Parity		
0	222	44.0
1	187	37.0
2	79	15.6
≥3	17	3.4
Living children		
0	228	45.2
1	183	36.2
2	77	15.2
≥3	17	3.4
Gestational age (weeks)		
Up to 13	26	5.1
14–27	135	26.7
28 and above	344	68.2
Mode of delivery		
Vaginal delivery	182	36.0
LSCS	93	18.4
Both	7	1.4
Not applicable	223	44.2
Place of delivery		
Home	0	0.0
Hospital	282	55.8
Not applicable	223	44.2
Preeclampsia		
No	467	92.5
Yes	38	7.5
GDM		
No	416	82.4
Yes	89	17.6
Anemia		
No	466	92.3
Yes	39	7.7
Present/past history of COVID-19		
No	408	80.8
Yes	97	19.2
COVID-19 vaccination		
Not taken	327	64.8
Received first dose	123	24.3
Received second dose	55	10.9

LSCS, lower segment caesarean section

variables are presented in Table 1. The literacy rate of the study participants was 99.6%. Amongst the enrolled women, 465 (92.1%) women were in the age-group of 19–34 years. In this study, 366 (72.5%) women from Kozhikode district, 135 (26.7%) women from neighboring Malappuram district, 2 each from Palakkad and Kannur

**Table 2:** The knowledge of the pregnant women regarding health effects of COVID-19 and preventive measures

S.No.	Knowledge questions	Responses N (%)				
		Very likely N (%)	Somewhat likely N (%)	Not sure/may be N (%)	Unlikely N (%)	Very unlikely N (%)
1	COVID-19 disease is spread from person to person with close contact	400 (79.2)	42 (8.3)	20 (4.0)	7 (1.4)	36 (7.1)
2	Possibility of fetus getting affected if mother is having COVID-19	120 (23.8)	45 (8.9)	88 (17.4)	38 (7.5)	214 (42.4)
3	Safety of baby if mother is vaccinated at pregnancy	291 (57.6)	51 (10.1)	109 (21.6)	26 (5.2)	28 (5.5)
4	Will facemask protect mother and fetus from COVID-19?	442 (87.5)	52 (10.3)	6 (1.2)	4 (0.8)	1 (0.2)
5	Will hand hygiene lead to improved protection in pregnancy?	453 (89.7)	43 (8.5)	5 (1.0)	3 (0.6)	1 (0.2)
6	Will there be increased risk of severe lung infection pregnancy?	336 (66.5)	33 (6.5)	98 (19.4)	14 (2.8)	24 (4.8)
7	Effectiveness of COVID-19 vaccine against severe disease in pregnancy	353 (69.9)	49 (9.7)	81 (16.0)	8 (1.6)	14 (2.8)
8	COVID-19 in pregnancy leads to preterm deliveries	98 (19.4)	23 (4.6)	218 (43.2)	18 (3.6)	148 (29.2)

districts participated. The mean age of the enrolled women was 26.53 years (SD ± 5.14). About 81 (16%) women had studied up to high school, and 12 (2.4%) women studied at least up to middle school. There were 182 (36%) graduates, 39 (7.8%) postgraduates, and 2 (0.4) illiterates among the study participants. A total of 407 (80.5%) women were homemakers. The working women included 8 (1.6%) professionals; 63 (12.5%) skilled, 22 (4.4%) semi-skilled, and 5 (1%) unskilled workers. In terms of the obstetric history, 344 (68.2%) antenatal women were in the third trimester, and 135 (26.7%) women were in the second trimester. As shown in Table 1, 200 (39.6%) enrolled women were primigravida. Comorbidities such as preeclampsia, GDM, and anemia were reported by 38 (7.5%), 89 (17.6%), and 39 (7.7%) pregnant women, respectively. In this study, 123 (24.3%) antenatal women had taken the first dose of the COVID-19 vaccine. Fifty-five (10.9%) study participants had taken both doses. History of the past or the present COVID-19 was given by 97 (19.2%) study participants, and none were vaccinated.

The mean knowledge score of the study participants was 15.55 (SD ± 3.6). The mean attitude score was 7.09 (SD ± 2.5), and the mean practice score was 4.04 (SD ± 0.272). The cumulative knowledge score varied between 8 and 40, and lower scores point toward better awareness. Meanwhile, the scores indicating the attitude and practice ranged between 4 and 20. The study participants' scores ranging 8–23, 24–31, and 32–40 were considered to have good knowledge, moderate knowledge, and poor knowledge, respectively. Attitude and practice scores ranging between 4 and 11 were taken as a good attitude and good practice. The scores between 12 and 15 indicated moderate attitude and practice. The scores of more than 16 indicated poor attitude and practice. In this cross-sectional study, 491 (97.2%) and 14 (2.8%) antenatal women were observed to have good knowledge and moderate knowledge, respectively. None were found to have poor knowledge. Out of the 409 women who had attended the college, 384 (93.9%) had good knowledge, 24 (5.9%) had moderate knowledge, and one participant (0.2%) had poor knowledge, which was not statistically significant ( $\chi^2 = 15.51, p = 0.215$ ).

The attitudes of four 468 women (92.7%) were good. A total of 35 (6.9%) women had moderate attitudes, and 2 (0.4%) had poor attitudes. All the enrolled antenatal cases were following good preventive practice measures. This study demonstrated that 400 (79.2%) pregnant women knew that COVID-19 is spread from person to person with close contact (Table 2). About 291 (57.6%) women were aware that vaccination in pregnancy is safe for the fetus. A total of 442 (87.5%) and 453 (89.7%) study participants knew the protective role of face masks and hand sanitization, respectively.

As shown in Table 3, 495 (98%) women suggested that pregnant women have to avoid crowded places, 378 (74.9%) women had positive attitudes toward COVID-19 vaccination during pregnancy, and 352 (69.7%) women stated a higher risk for COVID-19 in pregnancy. Meanwhile, 234 (46.3%) had positive attitudes regarding barrier nursing if the mother had COVID-19. Almost all the study participants were found to use hand sanitizers, face masks, and practice social distancing (Table 4). Out of the 97 antenatal cases with a past or a present history of COVID-19, a total of 95 (97.9%) women were found to have good knowledge, and 91 (93.8%) participants had good attitudes. However, there was no statistically significant association of past or present history of COVID-19 with good knowledge ( $\chi^2 = 0.225, p = 0.635$ ) and good attitude ( $\chi^2 = 0.589, p = 0.745$ ).

## DISCUSSION

This cross-sectional study observed good knowledge, good attitude, and good practice among antenatal women attending a tertiary care hospital in South India. Even though a very high literacy rate was observed, most of the study participants were homemakers. About two-thirds of the antenatal cases were in the third trimester. A one-fourth of the enrolled women had obstetric comorbidities such as preeclampsia and GDM. The most common medical comorbidity observed in our study was the past or previous history of COVID-19, which was reported by almost a one-fifth of the antenatal women followed by anemia. All the enrolled women were observed to be following good preventive measures, which might be attributed to

**Table 3:** Distribution of the attitudes of the pregnant women regarding COVID-19 (n = 505)

S.No.	Attitudes	Responses				
		Strongly agree N (%)	Agree N (%)	Neutral N (%)	Disagree N (%)	Strongly disagree N (%)
1	Pregnant women have to avoid crowded places during the COVID-19 pandemic	495 (98.0)	8 (1.6)	1 (0.2)	0 (0)	1 (0.2)
2	Pregnant and lactating women can be vaccinated against COVID-19	378 (74.9)	27 (5.3)	66 (13.1)	5 (1.0)	29 (5.7)
3	Increased risk of COVID-19 during pregnancy	352 (69.7)	19 (3.8)	41 (8.1)	21 (4.2)	72 (14.2)
4	Women with COVID-19 can breastfeed after wearing masks and safety measures	234 (46.3)	20 (4.0)	101 (20.0)	12 (2.4)	138 (27.3)

**Table 4:** The distribution of preventive practices during COVID-19 (n = 505)

S.No.	Preventive practices	Responses				
		Always N (%)	Almost always N (%)	Often N (%)	Sometimes N (%)	Never N (%)
1	Do you use face masks while going out?	505 (100)	0	0	0	0
2	Do you wash your hands with soap and water when you reach home?	504 (99.8)	1 (0.2)		0	0
3	Do you use hand sanitizers while going out for shopping or other activities	504 (99.8)	1 (0.2)	0	0	0
4	Do you maintain a distance of 1 m from others?	495 (98.0)	8 (1.6)	1 (0.2)	1 (0.2)	0

the high literacy of the study population. This can be attributed to the theory of planned behavior, which was introduced as the theory of planned action in 1980.<sup>12,13</sup> About three-fourths of the antenatal women stated that COVID-19 vaccination in pregnancy protects the mother from severe disease. A one-half of the study participants considered COVID-19 vaccination is safe for the fetus.

Meanwhile, a study from Turkey reported that insufficient safety data and fear of possible harmful effects on the fetus are the main reasons for low vaccine acceptance among pregnant women.<sup>14</sup> We observed that about one-fourth of the enrolled women were given at least one dose of the COVID-19 vaccine. National Technical Advisory Group on Immunization (NTAGI) and Ministry of Health and family welfare (MoHFW), Government of India, approved COVID-19 vaccination for pregnant women on 2 July 2021. The main reasons for the low vaccine coverage were the shortage of vaccines and fear of harmful effects on the fetus.

There exists a limited number of published studies regarding KAP about the COVID-19 pandemic among pregnant women.<sup>15-21</sup> A higher level of awareness concerning COVID-19 was observed among pregnant women in China and India.<sup>15-17</sup> The study carried out among pregnant women from a low-resource setting in South Africa reported low awareness and negative attitudes about the COVID-19 pandemic. However, women with education were more likely to follow preventive public health behaviors.<sup>18</sup> Meanwhile, the adoption of preventive practices was poor among pregnant women with adequate knowledge from Ethiopia and Ghana.<sup>19,20</sup> Another study among postnatal women from Nepal reported adequate knowledge and good practices even though most of the enrolled women used cloth masks.<sup>21</sup> Recently published KAP study among pregnant women from seven low and middle income

countries including India reported low awareness about the safety and efficacy of COVID-19 vaccination.<sup>22</sup>

Currently available limited data from animal studies do not imply harmful effects of vaccines on the developing embryo, fetus or mother.<sup>23,24</sup> No increased risk for miscarriage among women receiving an mRNA COVID-19 vaccine (Moderna or Pfizer-BioNTech) during pregnancy was reported.<sup>25</sup> Vaccination was observed to lower the risk of COVID-19 in pregnancy as per the study from Israel conducted among 7,530 antenatal cases.<sup>26</sup>

**LIMITATIONS**

As this was a hospital-based study, study findings do not reflect the KAP at the community level. Almost all the enrolled women were well educated and major proportion were residing in urban areas attending the government tertiary care facility for antenatal services. Our findings may not reflect the exact situation in rural and remote areas.

**CONCLUSION**

This study concludes that the KAP of pregnant women from South India regarding COVID-19 health effects and preventive measures are good. Regular informative sessions for antenatal cases are necessary to sustain the adherence to preventive health behaviors. During the initial years of the pandemic interruptions to maternal services and lack of access to emergency care resulted in higher maternal mortality globally. Although the COVID-19 vaccines were introduced in the later half of 2021, the knowledge about the safety and efficacy of vaccination among pregnant women is highly variable. Clinicians have the responsibility to reinforce the patient





understanding and improve attitude as the COVID-19 pandemic is predicted to become endemic in the coming years.

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## ORCID

Kalpna MM <https://orcid.org/0000-0002-0226-0282>

Smitha Sreenivas <https://orcid.org/0000-0002-3975-8893>

Smitha Santhosh <https://orcid.org/0000-0002-0337-7386>

Sasidharanpillai Sabeena <https://orcid.org/0000-0002-2099-9312>

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