

Coronavirus Pandemic

Knowledge, attitude and practice of COVID-19 preventive measures among pregnant women in antenatal clinics in western Kenya

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Abstract

Introduction: Coronavirus disease 2019 (COVID-19) infection among pregnant women can lead to an increased risk of adverse pregnancy outcomes. Preventive measures are essential as there is no definite cure. This study determined the knowledge, attitude and practice of COVID-19 preventive measures including COVID-19 vaccine uptake, among pregnant women attending antenatal clinics in western Kenya.

Methodology: A mixed-methods study was conducted during the fourth wave of COVID-19 in Kisumu and Siaya counties in Kenya from December 2021 to January 2022. Fishers' Exact/Chi-square tests were used to determine the association between variables, and multinomial logistics regression were used to identify the predictors of knowledge, attitude and practice. Thematic analyses were used to describe qualitative findings.

Results: Of the 385 women interviewed, 99.7% and 100%, had good and above knowledge and attitude respectively, while 23%, had adequate practices. COVID-19 vaccine uptake was 28%. Respondents from households with 3-5 and 6-8 members were 2.11 and 2.58 times more likely to have poor practices, whereas respondents with tertiary level of education were 0.48 times less likely to have poor practices. Focus group discussions revealed that poor COVID-19 vaccine uptake was caused by vaccine myths and misconceptions, whereas the cost of masks, the smell of soaps and sanitizers and inadequate space in the clinics and workplaces were identified as barriers to COVID-19 prevention practices.

Conclusions: Although knowledge and attitude scores towards COVID-19 preventive measures were high, this did not reflect in pregnant women engaging in adequate preventive practices and vaccine uptake.

Key words: knowledge; attitude; practice; COVID-19; vaccine; pregnant women.

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Introduction

Coronavirus disease 2019 (COVID-19) is a novel acute respiratory infection caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). SARS-CoV-2 is the seventh coronavirus known to infect humans and is a group of enveloped ribonucleic acid (RNA) viruses [1]. COVID-19 can be transmitted from one person to the other through respiratory droplets, handshake, and fecal-oral routes, and has an incubation period of between 2 and 14 days [2].

While everyone is susceptible to infection, pregnant women, who have unique immune suppression and cardiopulmonary changes caused by the pregnancy, are considered a high risk group [3,4]. They are more likely to be admitted to the intensive care unit as compared to non-pregnant women when infected with COVID-19

[5]. A systematic review by Wei *et al.* suggested that SARS-CoV-2 infection in pregnancy was associated with risk of preeclampsia, stillbirth, preterm birth and new-born intensive care unit admission [6]. In addition, cases of COVID-19-related complications such as intrauterine fetal deaths and hydrops fetalis as a result of SARS-CoV-2 virus vertical transmission have been reported [7].

There is no cure for COVID-19 yet and medical management is largely supportive. While several drugs have been tested including azithromycin, hydroxychloroquine, lopinavir-ritonavir, and remdesivir, none has been proven to be curative [8,9]. The World Health Organization (WHO) recommended a series of preventative measures such as wearing of face masks in public, frequent handwashing with soap

and water and physical/social distancing to prevent the spread of COVID-19 infection [10]. However, the virus continues to spread with more than 540 million confirmed cases and more than 6 million deaths worldwide as of 21 June 2022 [11].

In order to contain the spread, the Kenyan government implemented several containment measures, including the closure of international borders, learning institutions, places of worship, bars, and restaurants, a ban on social gatherings, a dawn-to-dusk curfew, mandatory wearing of masks in public places, physical distancing guidelines, vaccination and restrictions on movement into and out of counties with high infection rates [12]. Despite these proactive interventions, the infection still spread throughout the country, with more than 330,000 confirmed cases and 5,000 deaths as of 21 June 2022 [11].

Prevention, knowledge, attitude and practice are critical in public health. Inadequate knowledge may cause a delay in diagnosing highly infectious conditions and increasing infection dissemination [13]. Furthermore, people's knowledge, attitudes and practices about COVID-19 infection have a significant impact on their adherence to COVID-19 preventive measures [14]. However, there is paucity of data on knowledge, attitude and practice of COVID-19 preventive measures, including COVID-19 vaccination uptake during pregnancy. In this study, we sought to determine the knowledge level, attitude and practice towards COVID-19 preventive measures and COVID-19 vaccination among pregnant women in western Kenya.

Methodology

Study design, setting, and population

A concurrent mixed-method study was conducted among pregnant women attending Ante-Natal Care (ANC) in Kisumu and Siaya Counties, Kenya in 12 selected health facilities from December 2021 to January 2022. These facilities were chosen because they are major health centers in their respective sub-counties where women are attended for antenatal follow-up and immunization during pregnancy. A non-probability purposive sampling technique was used to select the health facilities (one health facility per sub-county with the highest numbers of first ANC attendance). The study population was recruited using the ballot method of simple random sampling after verbal consent was obtained.

Facilities selected for Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) were purposively sampled for qualitative study aspects. At

first, we selected one high volume facility from each county, then, we selected one low volume facility for each county in a rural setting to balance the selection of high-volume facilities which are urban based. Participants chosen to join FGDs and KIIs were also selected purposively.

Sample size determination

The sample size was calculated using the formula described by $N = Z^2 pq/d^2$ [15]. Where N is the minimum sample size. Z is the standard normal distribution value at 95% CI which is equal to 1.96, p is the estimated proportion of pregnant women with adequate knowledge from a previous study set at 60.9% [16], d is the margin of error taken as 5%, and 10% contingency for nonrespondents. The minimum sample size was 422 pregnant women while 387 women were recruited into the study.

Data collection procedures

Four hospital volunteers from the health facilities were recruited and trained to support the recruitment of study participants and to conduct the interviews. A pretested structured interview questionnaire was used to collect quantitative data based on the specific objectives using simple language, understandable to the respondents. Safety precautions against the pandemic were implemented when conducting the interviews. The survey questionnaire was piloted before use to ensure comprehensibility.

Four FGDs and four KIIs were conducted in parallel to the individual interviews using an open-ended questionnaire guide. The FGDs consisted of 8-12 participants (one of whom served as the moderator and one person who was an investigator of the current study and served as an assistant moderator). The FGD participants were pregnant women who did not take part in the questionnaire survey, wherein KIIs participants were hospital managers/nurses in charge of the maternal and child health (MCH) clinic, who interacted with pregnant women.

Data analysis

The survey questions were divided into four main sections: Sociodemographic characteristics, knowledge, attitudes and practices towards COVID-19 preventive measures. Completed questionnaires were checked for completeness and compiled into an excel spreadsheet. Statistical analysis was done using R. Data was presented as frequency and percentages. Percentage scores for knowledge and attitude between 0-50% were considered as poor, scores between 51-

80% were considered as good and scores above 80% were considered as very good, whereas scores for practice between 0-80% were considered as inadequate and scores above 80% considered as adequate. Fishers’ Exact/Chi-square tests (where indicated) were used in determining the association between socio-demographic characteristics and the knowledge level, attitude level and practice level respectively. Normality of data was tested using Shapiro-Wilk normality test. Multinomial logistics regression was used to identify the predictors of knowledge, attitude and practice. The inference was made using a 95% confidence interval and a *p* value < 0.05.

The FGD and KII questionnaire guide was divided into four main sections: general information and social demographic characteristics, knowledge, attitudes and practices towards COVID-19 preventive measures. FGDs and KIIs were transcribed verbatim and translated from Luo or Swahili to English. A thematic framework was developed in line with the set objectives with a reflection of a strong knowledge basis regarding the knowledge level, attitude and practices of COVID-19 prevention measures. The thematic framework was used to create a codebook in Nvivo 12 [17].

Ethical considerations

Ethical clearance was obtained from the Jaramogi Oginga Odinga Teaching and Referral Hospital Ethics Review Committee (IERC/JOOTRH/538/21) and a permit was obtained from the National Commission for Science Technology and Innovation (NACOSTI) (License No: NACOSTI/P/21/14088). Informed consent was obtained from each study participant before participating in the study.

Results

A total of 422 questionnaires were distributed among antenatal attendees, of which 387 were correctly filled and used for analysis; thus, the response rate was 92%.

Majority of the respondents were 21-30 years old (62%) and more than half of the household (57.1%) had

Table 1. Sociodemographic characteristics of respondents

Characteristics (N = 387)	Total (%)
Age category in years	
10-20	69 (17.8)
21-30	240 (62.0)
31-40	73 (18.9)
> 40	51 (1.3)
Number of people in the household	
< 3	10 (2.6)
3-5	221 (57.1)
6-8	98 (25.3)
9-12	58 (15.0)
Level of education	
None/primary level	136 (35.1)
Secondary	164 (42.4)
Tertiary level	87 (22.5)

3 to 5 members. An estimated 22.5% of the participants had attained a tertiary level of education (Table 1).

The proportions of respondents with good and above knowledge and attitude were 99.7% and 100%, respectively, while (23%) had adequate practices (Figure. 1). Table 2 summarizes participant knowledge, attitude and practice scores with respect to COVID-19 preventive measures.

Pearson’s Chi-square/Fisher’s exact tests indicated that respondents’ age was significantly associated with knowledge (*p* = 0.026) and attitude (*p* = 0.042), but not with practices. In addition, educational level was associated with knowledge, attitude and practice (*p* < 0.05) (Table 3).

The multinomial logistics regression analysis showed that, respondents with tertiary level of education were 3.54 times more likely to have very good knowledge as compared to those with primary level of education, whereas respondents from households with 3-5 and 6-8 members were 2.11 and 2.58 times more likely to have poor practices relative to good practices than respondents from household with less than 3 members. In addition, respondents with tertiary and secondary level of education were 0.48 and 0.49 times less likely to have poor practices as compared to those with primary level of education (Table 4).

Figure 1. Overall proportion of respondents: knowledge, attitude, and practice.

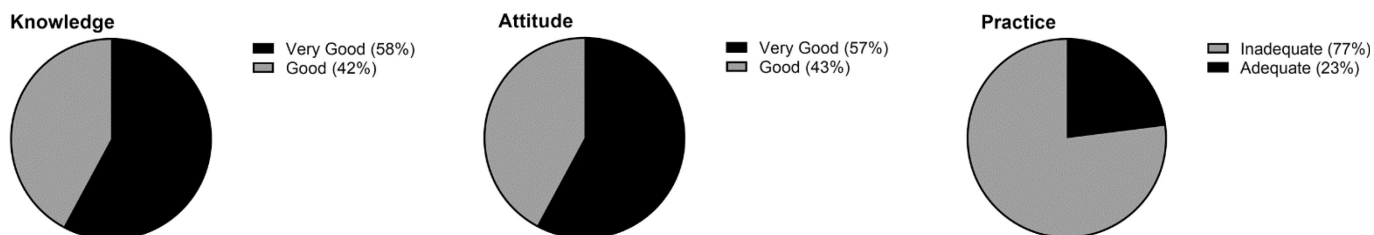


Table 2. Frequency scores for knowledge, attitudes and practice items (N = 387).

Knowledge items	Total (%) Correct	Knowledge items	Total (%) Correct
Have you heard about COVID-19 infection?	386 (99.7)	Wearing a facemask is important.	381 (98.4)
Is there a cure for COVID-19?	193 (49.9)	When should a face mask be worn?	254 (66.3)
COVID-19 can be spread from one person to another.	376 (97.1)	Do you know the correct way to put on a face mask?	385 (99.4)
COVID-19 is caused by a virus.	310 (80.1)	Client knows the correct procedure to put on a face mask.	325 (84.0)
COVID-19 incubation period.	237 (61.2)	It is alright to recycle the surgical masks?	134 (34.6)
COVID-19 can affect anybody.	296 (76.5)	Correct distance for social distancing.	303 (78.3)
Is there a cure for COVID-19 infection?	193 (49.9)	Should the cloth masks be washed daily?	353 (91.2)
Expectant mothers are more prone to getting infected.	292 (75.4)	In suspecting infection with COVID-19, I should avoid unnecessary daily activity.	371 (95.9)
Asymptomatic individuals can spread COVID-19.	326 (84.2)	Do you know the correct steps in hand washing?	368 (95.1)
Is there a COVID-19 infection vaccine?	371 (95.8)	Describe the correct steps in hand washing.	211 (54.5)
In suspecting infection with COVID-19, avoid touching eyes and face.	278 (71.8)	Can social distancing help prevent the spread of the COVID-19 virus?	385 (99.4)
Having a sore throat is a symptom of COVID-19 infection.	300 (77.5)	Washing hands with water and soap can help prevent the transmission of COVID-19.	386 (99.7)
Fever is a symptom of COVID-19 infection.	368 (95.1)	Coughing is a symptom of COVID-19 infection.	357 (92.2)
Body pain is a symptom of COVID-19 infection.	293 (75.7)	Chest pains, a runny nose and difficulty breathing are signs of COVID 19 infection.	360 (93.0)
Diarrhoea or constipation are symptoms of COVID-19 infection.	114 (29.5)	Having a headache, is a symptom of COVID-19 infection.	332 (86.0)
Measure fever when suspecting infection with COVID-19	334 (86.3)	Can a person contract COVID-19 infection through shaking hands?	358 (92.5)
Do you know what personal protective equipment (PPE) is?	281 (72.6)	COVID-19 is very severe in co-morbid and elderly people.	281 (72.6)
Attitude items		Practice items	
Do you believe COVID-19 infection still exists?	382 (98.7)	Do you always wear a face mask when in public?	292 (75.5)
Do you think wearing a face mask can prevent COVID-19?	384 (99.2)	Do you wash your hands several times a day with soap and water?	330 (85.3)
Do you think frequent handwashing can prevent COVID-19?	381 (98.4)	Do you spend at least 20 seconds washing hands?	222 (57.4)
Do you think following handwashing steps is a good thing?	382 (99.2)	Do you always maintain social distance when in public?	221 (57.1)
Do you think social distancing can prevent COVID-19?	383 (98.7)	Is it easy to acquire the PPE for mothers in your area?	83 (21.4)
Do you think the COVID 19 vaccine can prevent COVID-19?	369 (95.3)	Has anyone in your household been vaccinated against COVID-19?	275 (71.1)
Are you willing to take the COVID-19 vaccine?	307 (79.3)	Have you been vaccinated against COVID-19?	109 (28.2)
Do you think use of PPE is an effective way to avoid COVID-19?	304 (78.6)	If not vaccinated, do you intend to be vaccinated when it is available to you?	222 (69.4)
Practice items		If vaccinated, did you receive both the first and the second doses?	29 (32.6)
Do you own any Personal Protective Equipment besides the face mask?	93 (24.0)	Does anyone in your household own personal protective equipment besides the face mask?	90 (23.3)
Do you have a handwashing unit for visitors at your home?	337 (87.1)	Do visitors to your home observe the steps in handwashing?	190 (49.2)

Table 3. Association of socio-demographic factors with knowledge, attitude, and practices among the respondents towards COVID-19 preventive measures.

Variables	Knowledge				Attitude			Practice		
	N- (387)	Good N = 163 (%)	V-good N = 224 (%)	p value	Good N = 163 (%)	V-good N = 224 (%)	p value	Inadequate N = 298 (%)	Adequate N = 89 (%)	p value
Age				0.026*			0.040*			0.065
10-20	69	39 (23.0)	30 (13.4)		39 (24.0)	29 (13.0)		60 (20.1)	9 (10.1)	
21-30	240	93 (57.1)	147 (65.6)		93 (57.1)	142 (63.4)		175 (58.7)	65 (73.0)	
31-40	73	28 (17.2)	45 (20.1)		28 (17.2)	44 (20.0)		59 (19.8)	14 (15.7)	
> 40	5	3 (1.8)	2 (0.9)		3 (1.8)	29 (13.0)		4 (1.3)	1 (1.1)	
Family size				0.300			0.200			0.120
9-12	10	4 (2.5)	6 (2.7)		4 (2.5)	6 (2.7)		6 (2.0)	4 (4.5)	
3-5	221	89 (54.6)	132 (59.0)		89 (54.6)	128 (57.1)		175 (58.7)	46 (51.7)	
6-8	98	50 (30.7)	48 (21.4)		50 (30.7)	47 (21.0)		78 (26.2)	20 (22.5)	
< 3	58	20 (12.3)	38 (17.0)		20 (12.3)	36 (16.1)		39 (13.1)	19 (21.3)	
Education level				< 0.000*			< 0.001*			0.001*
High school	164	72 (44.2)	92 (41.1)		72 (44.2)	90 (40.2)		114 (38.3)	50 (56.2)	
Primary	133	68 (41.7)	65 (29.0)		68 (41.7)	61 (27.2)		116 (38.9)	17 (19.1)	
Tertiary	87	21(12.9)	66 (29.5)		21 (13.0)	65 (29.0)		66 (22.1)	21 (23.6)	

V-good: very good; * statistically significant.

Focused group discussion and key informant interviews outcomes

Overall, the findings from focused group discussion and key informant interviews concurred with the questionnaires results; however, a few additional ideas were expressed.

Knowledge assessment

The study participants were aware of the existence of COVID-19 and that transmission was through touching surfaces contaminated with the virus and droplets from coughs. They also understood that prevention was primarily accomplished through social distancing and maintaining hygiene, particularly through hand washing and proper face mask use. This is further explained in the following quotes:

“Yes, they know it can be transmitted when an infected person coughs without protecting herself, like without wearing a mask or when you touch infected surface, and you don’t clean yourself.” KII_02_B.

In terms of vaccination, the pregnant women were aware that it was provided in hospitals; however, one of the key informants went on to explain that the vaccination issue in pregnancy had not been well received, as most pregnant mothers felt forced to take the vaccine, although they had little knowledge about it. This was supported by the quote below:

“They are aware that government hospitals provide vaccines to pregnant women, but they do not know when the vaccine is administered, so they ask such questions.” KII_02_B.

Respondents’ sources of information, as mentioned in the focused group discussion, were primarily the mainstream media and social media; other sources included political and church gatherings and funerals.

Furthermore, as mentioned in the quote below, one of the key informants added that pregnant women get information through health talks at the health facility and internet searches.

“They mostly get COVID-19 information through mass media, radios, and televisions, and most of them right now have smartphones, so they Google and when they come to the clinic they interact with the nurses and also ask the nurses on duty.” KII_02_B.

Attitude assessment

The focused group discussants believed that social distance and other preventive measures were beneficial in protecting them from COVID-19. However, they felt like lockdowns and curfews had a negative impact on their businesses and ANC attendance, and that they were used by those in authority to extort money from citizens as expressed by one of the key informants in the following quote:

“Lockdown and curfew were not embraced well by pregnant women because they were affecting them. You know a pregnant woman can get an emergency at night but fear to come to the hospital, so they will just stay at home and come the next day when they are seriously sick, and then they will tell you that there was a curfew and so I could not leave the house.” KII_03_C_40 Years.

Furthermore, two key informants cited politicians and ongoing media debriefings as factors that influenced pregnant women's attitudes toward COVID-19 prevention measures. This was supported by the quotation below:

“I believe my first point will be politicians. Our politicians are holding meetings with large crowds, but they are not maintaining social distance, they are not

Table 4. Multinomial logistics regression for predictors of knowledge attitude and practice scores.

Variable	Knowledge				Attitude		Practice			
	RRR Poor	p value	RRR V-good	p value	RRR V-good	p value	RRR Poor	p value	RRR V-Good	p value
Age					Reference					
10-20					0.78	0.718	1.15	0.655	2.15	0.247
21-30	1.80	0.992	1.53	0.141	1.56	0.638	1.17	0.670	1.45	0.634
31-40	1.33	0.844	1.86	0.083	0.13	0.995	4.93	0.172	9.09	0.991
> 40	5.43	0.999	1.01	0.995						
Household numbers					Reference					
< 3					0.77	0.943	2.11	0.043*	1.19	0.755
3-5	0.60	0.995	1.00	0.995	0.90	0.977	2.58	0.022*	2.22	0.213
6-8	1.24	0.994	0.69	0.305	1.86	0.993	0.40	0.418	0.30	0.252
9-12	0.43	1.000	1.02	0.981						
Education level					Reference					
Primary					1.94	0.248	0.49	0.004*	0.84	0.716
Secondary	1.70	0.713	1.36	0.200	2.66	0.255	0.48	0.004*	1.45	0.499
Tertiary	3.54	0.994	3.16	0.001*						

Good: base outcome; V-good: very good; * statistically significant; RRR: relative risk ratio.

putting on masks, the crowd is not putting on masks, so when we tell our clients to put on masks, they say, the politicians were here the other day with a large crowd and they were not putting on masks, why are they not getting COVID-19?” KII_02_B.

“The continuous COVID-19 debriefings by government officials also had an impact. When the COVID-19 deaths were high, most pregnant mothers followed the COVID-19 preventive measures; however, when the number of deaths decreased, pregnant mothers relaxed their adherence to the COVID-19 preventive measures.” KII_03_C.

Practice assessment

The respondents had poor practices towards COVID-19 preventive measures. They mentioned that face masks were expensive and uncomfortable to wear. In terms of hand washing and use of sanitizers, the respondents reported that most of the soaps and sanitizers had a strong smell, so they avoided using them. In addition, the respondents mentioned that keeping social distance was a problem because of inadequate space especially at the clinic and workplaces. These were further described in the quotes below:

“The face mask is not welcomed, let me just be honest, with the pregnant mothers. Sister we are not breathing, they are very uncomfortable, and you know sister these masks are very expensive.” KII_01_A_26 Years.

“Speaking about sanitizer and hand washing, you know if someone is pregnant, she has a challenge on some things for example sanitizer, we are not comfortable with it, the smell makes it difficult to use it.” FGD_04_D_R4_23 Years.

“Keeping social distance is difficult even at the antenatal clinic because of the huge population, and you know most of our facilities, churches, homes are very small. It is good to keep social distance but sometimes there is no space because we are many even the space to occupy is small.” FGD_03_C_R6_25 Years.

Furthermore, respondents were opposed to the idea of vaccination during pregnancy. They believed that it was linked to facial deformation one year after vaccination. Some believed that vaccines could cause disability or illness, while others believed that it was a method of family planning and that it would reduce libido in men. Some of the key informants further explained with the following quotes:

“Their attitude is wanting, because I think they have that notion that when they get the vaccine, their children are going to be born with problems, most of them want

it after their delivery but a few maybe two out of ten are coming for it during their pregnancy.” KII_02_B.

“So, they believe if you are given the vaccine and you are pregnant, the baby will be deformed and if you are given when you are not pregnant you will not be pregnant, men also believe that you will not be sexually active and that you will die after 2 years; you are going to die after 1 year (laughs)” KII_04_D_37 Years.

Further comments and recommendations by participants

The study participants made a few recommendations regarding low vaccine uptake and the use of face masks. One of the key informants recommended that when communicating about COVID-19 preventive measures the messaging should be tailored in a way that the pregnant mothers can understand for example using the local language to prepare Information Education and Communication (IEC) Materials.

“The first, as I believe I mentioned, is that preventive materials should be made available in different languages so that mothers can understand” KII_03_C.

Another key informant added in the quote: “I am trying to think of any way to improve vaccine uptake, I think mobilization as far as COVID-19 vaccine is concerned for pregnant mothers, like if it comes to TV, that pregnant mothers are supposed to get the vaccine maybe they will come because most of the people are watching TV, yeah there should be a clip that shows a pregnant woman getting the COVID vaccine they will come.” KII_02_B.

Discussion

COVID-19 infection is a public health issue, and effective management requires widespread public awareness. It has been established that proper knowledge is required for the formation of preventive beliefs and a positive attitude, and the promotion of disease-prevention practices [18]. This study is important as pregnancy is considered a vulnerable period with a high possibility of transmission of coronavirus to mother and fetus [19].

In our study, majority of the participants had good knowledge of COVID-19 infection. This level of knowledge is consistent with previous findings in Nigeria [20] among healthcare workers and in China [21] among Chinese residents. The high level of knowledge could be attributed to the study being conducted during the fourth wave of the pandemic (December 2021 to January 2022) when there were

numerous informational resources about the pandemic on social media. This was evident in this study as mainstream media (radio or television) and social media played a significant role in disseminating the knowledge on prevention and control of COVID-19 as mentioned by the FGDs and KIIs. Similarly, studies conducted in Kenya among the general population and among the youths [22,23] mainstream media and social media were the main sources of information for COVID-19. It is therefore critical to ensure that the media provides accurate, and easily available information for the pregnant women. This is because outbreaks are associated with a variety of misconceptions, which can be spread via social media and cause panic and confusion and this can influence the adoption of preventive measures [24].

In our study respondents who had tertiary level of education were likely to have very good knowledge as compared to those with primary level of education. This finding is consistent with reports from studies conducted in Ethiopia and Iran [25,26] where a higher proportion of pregnant women who had higher educational status were found to have good knowledge. In addition, a study conducted in Kenya [20] among the general population showed that education level had a significant association with participant level of knowledge. This is because women with a higher education have access to information from a variety of sources and, they have the capacity to understand that information. In contrast, in a study conducted in India there was no significant association of knowledge score with education level [27].

Overall, the respondents had a good attitude toward COVID-19 preventive measures. They believed in the value of frequent hand washing, wearing a face mask and social distancing. This is similar to other studies conducted in Nigeria [28] and China [21]. FGDs and KIIs revealed that continuous COVID-19 media briefings by government officials were one of the factors influencing positive attitudes toward COVID-19 preventive measures. This is consistent with a study among the youth in Bangladesh [29] and also supported by our finding since social media was the commonest source of information. However, one key informant stated that politicians had a negative influence on the pregnant women's attitudes toward preventive measures because they were not following the COVID-19 rules during their rallies, and thus the respondents did not take the measures seriously. It is therefore important for the government to ensure that there is a policy that holds politicians responsible when they hold rallies and campaigns during a pandemic. This will

ensure that their actions do not influence the public's willingness to follow any preventive measures put in place.

In the current study more than half of the study participants had poor practices towards COVID-19 preventive measures. This finding was similar to observations from studies conducted in Ethiopia [30,31]. The low regularity of COVID-19 preventive practices according to one of the KII was because the face masks were expensive, unaffordable and they made them uncomfortable as they could not breathe well when using them. Furthermore, the focus group discussants stated that the smell of soaps and hand sanitizers was too strong for them, so they avoided washing or sanitizing their hands in public places. Another reason for poor practices was inadequate space in facilities, homes, and most public places, making it difficult to observe social distance. Therefore, the government should ensure that hand sanitizer manufacturers improve their labeling techniques so that pregnant women can distinguish between scented and unscented sanitizers. Finally, the government should supply free and quality surgical masks to ANC clinics, specifically for pregnant women.

Wearing a face mask, social distancing and frequent hand washing using soap and water have proven to be effective in the prevention and control of COVID-19. However, vaccination is the most promising solution. In our study, the majority of the participants knew about the availability of the COVID-19 vaccine, however only 28% of respondents had been vaccinated at the time of data collection. This could be due to the several myths and misconceptions about COVID-19 vaccine as revealed by respondents from FGDs and KIIs. The respondents mentioned that COVID-19 vaccination was associated with facial deformation, libido reduction in men and was being used as a family planning method. However, there is scientific evidence that demonstrate that COVID-19 vaccines are safe and effective. Despite their rapid development, the vaccines have gone through the same rigorous licensing process as other vaccines, meeting all safety standards [32]. Consequently, the study advocates for the implementation of a focused campaign involving policymakers, religious leaders, and politicians to demystify the myths and misconceptions about the COVID-19 vaccines.

Although our study found low regularity of good COVID-19 preventive practices, having a secondary and tertiary level of education were positively associated with adequate practices on COVID-19. This study revealed that respondents with secondary and

tertiary level of education were less likely to have poor practices. This is attributed to educated women who are more likely to be exposed to health information, and, consequently, are more likely to take active steps to protect themselves from disease [33]. In addition, respondents living with less than three members were less likely to have poor practices as compared to those living with more than three to eight members. This could be explained by the higher ability of respondents from small families to afford preventive measures such as face masks than respondents from large families who have greater expenses on family needs like meals and have little money left to spend on preventive measures. It is worth noting that one of the barriers to COVID-19 prevention practices was the cost of the face mask.

The use of a mixed method allowed for a more in-depth understanding of the factors associated with low COVID-19 preventive practices and low vaccine uptake among pregnant women. However, the study was hospital-based, and it may not explain the community's level of knowledge, attitude, and practice of COVID-19 preventive measures.

Conclusions

In this study, most of the study participants had good knowledge and attitudes towards COVID-19 preventive measures while the practices and vaccine uptake were low in the population. The cost of face masks, smell of soaps and sanitizers and inadequate space in the health facilities, public places and most homes were some of the barriers to adequate COVID-19 preventive practices. In addition, poor COVID-19 vaccine uptake during pregnancy was due to several myths and misconception about the vaccine. As a result, strategies to improve COVID-19 preventive practice adherence should focus primarily on the barriers to COVID-19 preventive practices identified in our study. Further the government should ensure dissemination of accurate information about taking the COVID-19 vaccine during pregnancy.

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