

Knowledge, Attitude, Acceptance, and Perceived Risks of COVID-19 Vaccines among Pregnant Women: Findings and Implications

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Abstract

Original Research Article

Introduction: COVID-19 vaccines are essential in reducing symptoms and severity of the disease as well as preventing infection with COVID-19. Vaccination of pregnant women against COVID-19 has been recommended globally. In Zambia, there is a paucity of information on the knowledge, attitude, acceptance, and perceived risks of COVID-19 vaccines among pregnant women. Therefore, this study assessed the knowledge, attitude, acceptance, and perceived risks of COVID-19 vaccination among pregnant women attending antenatal care at Women and Newborn Hospital (WNH) of the University Teaching Hospitals (UTHs) in Lusaka, Zambia. **Methods:** This was a descriptive cross-sectional study conducted from August 2023 to October 2023 among 300 pregnant women attending antenatal care at Women and Newborn Hospital in Lusaka, Zambia. Data were collected using a structured questionnaire and analysed using Statistical Package for Social Science (SPSS) version 23.0. The Chi-square test was used to test the relationship between the dependent and independent variables. The statistical significance was at a 95% confidence level. **Results:** Of the 300 participants, 186 (62.0%) were aged between 24 and 34 years and 185 (61.5%) were aware that the COVID-19 vaccine was recommended in pregnancy. Overall, 284 (94.7%) had good knowledge, 258 (86.0%) had a positive attitude, and 186 (62.0%) were vaccinated. Additionally, 20 (17.5%) who were not vaccinated were willing to be vaccinated. Furthermore, most of the participants felt that COVID-19 vaccines were safe to use in pregnancy. The results show a lower vaccine acceptance compared to the knowledge and attitude levels. Having good knowledge and a positive attitude was associated with education status ($X^2=33.011$, $p=0.001$ for knowledge level) and ($X^2=9.132$, $p=0.029$ for attitude level). **Conclusion:** This study found that pregnant women attending antenatal care at WNH had good knowledge, positive attitudes, good perceptions, and high acceptance of COVID-19 vaccines. The results of this study provide benefits to the healthcare system regarding the knowledge, attitude, acceptance, and perceived risks of COVID-19 vaccination among pregnant women. Additionally, the results provide useful information that may help to develop and implement strategies to educate pregnant women on the benefits of vaccinations and address vaccine hesitancy among hesitant women.

Keywords: Attitude; COVID-19 vaccines; knowledge, pregnant women; vaccine acceptance; vaccine hesitancy; Zambia.

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INTRODUCTION

The severe acute respiratory syndrome coronavirus 2 (SARS-COV-2) has been identified as the causative agent responsible for the highly contagious disease known as COVID-19 [1, 2]. The initial cases of

the viral infection were reported in Wuhan City, China in December 2019 [3]. The World Health Organization (WHO) declared the pandemic a global threat on March 11, 2020 [4]. The pandemic resulted in a significant number of deaths and morbidity worldwide, with close

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to two hundred million deaths reported globally [3]. The pandemic also had a profound impact on mental health, leading to anxiety, depression, and post-traumatic stress disorder in many individuals [4, 5]. Efforts have been made to develop safe and effective vaccines to combat COVID-19 [3].

The low levels of COVID-19 vaccine knowledge, attitude, acceptance, and uptake have been associated with concerns about the vaccine's adverse effects, compounded by perceptions of its safety and benefits [5–7]. This problem has been worsened by perceived vaccine safety and benefits [8]. Vaccine hesitancy is very prevalent among pregnant women [8]. Notably, COVID-19 vaccine trials for pregnant women had lagged behind those for the general population, exacerbating safety concerns in this specific group [7, 9]. Uncertainties about the virus's effects during pregnancy significantly impact pregnant women's decisions regarding COVID-19 immunisation, which causes hesitation about vaccination [8, 10, 11]. It is imperative to comprehend vaccination behaviour and hesitancy, particularly among pregnant women, to address these concerns and improve vaccine uptake [8, 12].

Due to their concerns about infertility and mortality, pregnant women's reluctance to receive the COVID-19 vaccines is a serious concern [13]. They also believe that the vaccines are unsafe for their unborn children, unnecessary because they already have immunity, and potentially harmful [14–16]. Poor experiences with the healthcare system and widespread mistrust of governments, particularly in Africa, further exacerbate this hesitancy and foster a climate that encourages vaccine reluctance [17, 18].

Studies in sub-Saharan Africa (SSA) have shown a low acceptance of COVID-19 vaccines among pregnant women [19, 20], similar to other populations [21]. For instance, a scoping review reported an acceptance rate of 14.4 % up to 28% [19]. The low acceptance of COVID-19 vaccines in the SSA region has been attributed to be due to misinformation about the vaccines [22].

In Zambia, some studies on COVID-19 vaccine awareness, acceptance and hesitancy have been done among healthcare workers [23], pharmacy students [24], adolescents and youths [25, 26], and the general population [27]. Additionally, a study reported on COVID-19 infections among pregnant women in Zambia [28], however, there is little information regarding the knowledge, attitude, acceptance, and perceived risks of the COVID-19 vaccines among pregnant women attending antenatal care in healthcare facilities in Zambia. Therefore, this study aimed to assess the knowledge, attitude, acceptance, uptake, and perceived risks among pregnant women attending antenatal at the University Teaching Hospitals (UTH) in Zambia.

MATERIALS AND METHODS

Study Design, Site, and Period

This was a descriptive cross-sectional study that was conducted from August 2023 to October 2023 among pregnant women attending antenatal care at the University Teaching Hospital (UTH) in Lusaka. The UTH is a national referral hospital situated in Lusaka, Zambia. This site was chosen because it is where most pregnant women and postnatal mothers go for their antenatal and postnatal care in Lusaka. To be eligible, every pregnant woman was to provide informed and written consent. The study excluded all pregnant women who were on referral to the University Teaching Hospitals and those who did not consent to participate in the study.

Sample Size Determination and Sampling Criteria

The sample size was determined using Cochran's formula as reported by Charan and Biswas [29]. We used a 95% confidence level ($z=1.96$) and a margin of error of 5% (0.05). Additionally, with no previous study to obtain a prevalence value from, we used a conservative prevalence of 50% and obtained a sample size of 384. This study utilised a simple random sampling method to select the participants.

Data Collection Tool

A data collection tool was adapted from recent studies on COVID-19 vaccine knowledge, attitude, acceptance, uptake and perceived risks [30, 31]. The questionnaire contained closed-ended questions and comprised four sections, namely; Section A: Socio-demographic information, Section B: Participant's Knowledge and Attitude on COVID-19 vaccines, Section C: Participant's Acceptance and Uptake of COVID-19 vaccine, Section D: Participant's perceived risks of COVID-19 vaccines.

Statistical Analysis

The Questionnaires were double-checked for accuracy by the field supervisor to ensure there were no errors. The data were then entered and cleaned in Microsoft Excel and then exported to Statistical Package for Social Sciences (SPSS) version 23 for statistical analysis. Subsequently, the analyzed data was presented in tables and charts. In the analysis, each correct answer carried one point and each wrong or "I don't know" carried zero points [32–35]. Knowledge questions were five, translating into a total score of 5, while the attitude questions were four, translating into a score of 4. After calculating the knowledge and attitude scores, participants who scored 60% and above were considered to have good knowledge and those who scored 50% and above were considered to have a positive attitude as classified by studies elsewhere [32, 33, 35]. Cross-tabulation with Fisher's exact test and Chi-square was used to determine the relationship between participants' sociodemographic characteristics and their knowledge and attitude towards the COVID-19 vaccine. All

statistical significance of the findings was conducted at a 95% confidence level ($p=0.05$).

Ethical approval

Ethical approval was sought from the University of Zambia Health Sciences Research Ethics Committee (UNZAHSREC) with a protocol approval number of 202301270011. This study was a questionnaire-based study in which there was a direct or physical interaction with the participants. The objectives of the study were explained to the participants in the information sheet and consent form, and participation was voluntary. All information that was collected was kept confidential and restricted to the investigators only. Questionnaire coding (for anonymity purposes) was used to avoid collecting participants' names. There were no direct benefits for being a participant in that no payments were given to the participants. Nevertheless, this

information is highly beneficial to Zambian policymakers in initiating and implementing vaccination programs among pregnant women, especially when faced with epidemics such as the COVID-19 pandemic.

RESULTS

Sociodemographic Characteristics of Study Participants

Of the 300 participants recruited, it was found that the majority were aged between 25-34 years old [186 (62.0%)] and married [248 (82.7%)]. Additionally, it was found that most participants stayed in urban areas, reached the secondary level, and were employed representing 268 (89.3%), 170 (56.6%) and 192 (64.0%), respectively. The details of the participant's sociodemographic characteristics are presented in Table 1.

Table 1: Sociodemographic Characteristics of Participants

Variables	Attribute	Frequency	Percentage	p-value
Age	18-24	28	9.3	0.001
	25-34	186	62.0	
	35 \geq	86	28.7	
Marital status	Married	248	82.7	0.001
	Unmarried	52	17.3	
Residential area	Rural	32	10.7	0.001
	Urban	268	89.3	
Educational status	No education	2	0.7	0.001
	Primary	15	5.0	
	Secondary	170	56.6	
	Tertiary	113	37.7	
Employment status	Employed	192	64.0	0.001
	Unemployed	108	36.0	

Knowledge and Attitude of Participants on COVID-19 Vaccines

Most participants [294 (98.0%)] had heard about the COVID-19 vaccine; 185 (61.5%) were aware that the COVID-19 vaccine was recommended during pregnancy; and 199 (66.3%) were willing to be

vaccinated without any fear. However, 180 (60.0%) felt that there was less information on the COVID-19 vaccine in pregnancy and 201 (67.0%) felt that the vaccine has side effects. The details of the participants' knowledge and attitude on the COVID-19 vaccine are presented in Table 2.

Table 2: Knowledge and Attitude of Participants on the COVID-19 Vaccines

Knowledge questions	Attribute	Frequency	Percentage	p-value
1. Have you heard about the COVID-19 vaccine?	Yes	294	98.0	0.001
	No	6	2.0	
2. Are you aware that COVID-19 vaccines are recommended during pregnancy?	Yes	185	61.7	0.001
	No	115	38.3	
3. Do you think it is important for everyone to get the COVID-19 vaccine, including women?	Yes	267	89.0	0.001
	No	33	11.0	
4. Do you think there is adequate safety information on COVID-19 vaccines in pregnancy?	Yes	114	38.0	0.001
	No	180	60.0	
	Don't know	6	2.0	
5. Do you think the use of COVID-19 vaccines has side effects?	Yes	201	67.0	0.001
	No	88	29.3	
	Don't know	11	3.7	
Attitude questions				
6. Taking the COVID-19 vaccine is important for our health.	Yes	257	85.7	0.001
	No	34	11.3	

Knowledge questions	Attribute	Frequency	Percentage	p-value
	Don't know	9	3.0	
7. I will take the COVID-19 vaccine without any fear.	Yes	199	66.3	0.001
	No	101	33.7	
8. I will encourage my family/friends to take the COVID-19 vaccine.	Yes	243	81.0	0.001
	No	56	18.7	
	Don't know	1	0.3	
9. I support the current recommended COVID-19 vaccine campaigns and programs.	Yes	257	85.7	0.001
	No	41	13.7	
	Don't know	2	0.7	

4.1.3 Acceptance and Uptake of COVID-19 Vaccines among Participants

Most participants [186 (62.0%)] were vaccinated against COVID-19, compared to those who were not vaccinated [114 (38%)]. Of the unvaccinated pregnant women, only 17.5% (n = 20) were willing to be

vaccinated. However, 196 (65.3%) felt that the vaccine was beneficial for a pregnant woman and 188 (62.7%) felt that the vaccine was as safe as the older vaccines. The details of participants' acceptance and uptake of the vaccine COVID-19 are shown in Table 3.

Table 3: Acceptance and Uptake of COVID-19 Vaccines among Participants

Acceptance and uptake questions	Attribute	Frequency	Percentage	p-value
1. Are you vaccinated against COVID-19?	Yes	186	62.0	0.001
	No	114	38.0	
2. If not, are you willing to be vaccinated against COVID-19?	Yes	20	17.5	0.001
	No	94	82.5	
3. How many COVID-19 vaccine doses have you received?	0	114	38.0	0.006
	1	74	24.7	
	2	112	37.3	
4. Getting vaccinated during pregnancy is a benefit for pregnant women.	Yes	196	65.3	0.001
	No	75	25.0	
	Don't know	29	9.7	
5. Do you think that these vaccines are as safe as the older ones?	Yes	188	62.7	0.001
	No	73	24.3	
	Don't know	39	13.0	

Over all Knowledge and Attitude of Participants on COVID-19 Vaccines

Most participants [284 (94.7%)] had good knowledge and 258 (86.0%) had a positive attitude towards COVID-19 vaccines. Most of the pregnant women who had good knowledge and positive attitudes were aged between 25 and 34 years.

Perceptions of Participants Regarding COVID-19 Vaccines

Most participants [215 (71.7%)] felt that the vaccine is safe and does not cause infertility; 182 (60.75%) felt that the vaccine is not harmful during pregnancy; and 176 (58.7%) felt that the vaccines in Africa were the same as those in Europe. The details of the participant's perceptions regarding COVID-19 vaccines are presented in Table 4.

Table 4: Participants COVID-19 Vaccine Perception

Perception questions	Attribute	Frequency	Percentage	p-value
1. The vaccine is not safe and causes infertility	Yes	41	13.7	0.001
	No	215	71.7	
	Don't know	44	14.7	
2. The vaccine is harmful during pregnancy	Yes	71	23.7	0.001
	No	182	60.7	
	Don't know	47	15.7	
3. The vaccines in Africa are less effective than vaccines available in Europe	Yes	80	26.7	0.001
	No	176	58.7	
	Don't know	44	14.7	

Relationship between Participant's Sociodemographic Characteristics and Level of Knowledge on COVID-19 Vaccines

There was no statistically significant relationship between knowledge and the participant's age ($p=0.501$), marital status ($p=0.746$), residential area

($p=0.683$) and employment status ($p=0.286$) (Table 7). Intriguingly, there was a statistically significant relationship between education status and knowledge ($p=0.001$) (Table 5), meaning that knowledge levels were dependent on the participant's educational status.

Table 5: Shows a Correlation between Participant's Sociodemographic Characteristics and level of Knowledge on COVID-19 Vaccines

Variable	Characteristics	Attributes	Good n (%)	Poor n (%)	χ^2	p-value
Knowledge	Age	18-24	25 (8.33)	3 (1.00)	2.038	0.501
		25-34	178 (59.33)	8 (2.67)		
		35 \geq	81 (27.00)	5 (1.67)		
	Marital status	Married	235 (78.33)	13 (4.33)	0.024	0.746
		Unmarried	49 (16.33)	3 (1.00)		
	Residential area	Urban	254 (84.67)	14 (4.67)	0.060	0.683
		Rural	30 (10.00)	2 (0.67)		
	Educational status	No education	1 (0.33)	1 (0.33)	33.011	0.001
		Primary	10 (3.33)	5 (1.67)		
		Secondary	160 (53.33)	10 (3.33)		
Tertiary		113 (37.67)				
Employment status	Employed	184 (61.33)	8 (2.67)	1.438	0.286	
	Unemployed	100 (33.33)	8 (2.67)			

Relationship between Participant's Sociodemographic Characteristics and Level of Attitude toward COVID-19 Vaccines

Cross-tabulation with a Chi-square and Fisher exact test was done to determine the relationship between participants' sociodemographic characteristics and their attitude levels towards COVID-19 vaccines. There was no relationship between the participant's age, marital status, residential area and employment status with attitude levels since their p-values were all above 0.05

showing that attitude levels were independent of these characteristics. However, a significant association was observed between educational status and attitude levels, with a p-value of 0.029, indicating that attitude levels were dependent on participants' educational status. The detailed correlation between participants' sociodemographic characteristics and their attitude levels toward COVID-19 vaccines is presented in Table 6.

Table 6: Shows a Correlation between Participant's Sociodemographic Characteristics and level of Attitude toward COVID-19 Vaccines

Variable	Characteristics	Attributes	Positive n (%)	Negative n (%)	χ^2	p-value
Attitude	Age	18-24	22 (7.33)	6 (2.00)	3.264	0.202
		25-34	165 (55.00)	21 (7.00)		
		35 \geq	71 (23.67)	15 (5.00)		
	Marital status	Married	212 (70.67)	36 (12.00)	0.317	0.666
		Unmarried	46 (15.33)	6 (2.00)		
	Residential area	Urban	234 (78.00)	34 (11.33)	3.600	0.100
		Rural	24 (8.00)	8 (2.67)		
	Educational status	No education	2 (0.67)	0 (0.00)	9.132	0.029
		Primary	9 (3.00)	6 (2.00)		
		Secondary	146 (48.66)	24 (8.00)		
Tertiary		101 (33.67)	12 (4.00)			
Employment status	Employed	165 (55.00)	27 (9.00)	0.002	1.000	
	Unemployed	93 (31.00)	15 (5.00)			

DISCUSSION

To the best of our knowledge, this was the first study to assess the knowledge, attitude, acceptance, uptake, and perceived risks concerning COVID-19 vaccines among pregnant women attending antenatal

care at UTH in Lusaka, Zambia. We found good knowledge, positive attitudes, high acceptance, and good perceptions regarding COVID-19 vaccines among pregnant women.

This study found that most pregnant women (94.7%) had good knowledge of COVID-19 vaccines. Having good knowledge about COVID-19 vaccines was associated with a higher educational level. These findings are similar to those reported in a study in India that found good knowledge (97.2%) [36], although slightly higher than what was found in the present study. The knowledge reported in our study was higher than that in a study in Indonesia which reported low-good knowledge (55.5%) [37]. Consequently, similar studies reported poor knowledge of COVID-19 vaccines among pregnant women, with a study in Saudi Arabia having reported 63% poor knowledge and 81.12% poor knowledge in Northwest Ethiopia [6, 35]. These differences could be because the current study was conducted later compared to the one done in Saudi Arabia and Ethiopia which were conducted at a time when there was little information about COVID-19 vaccines.

Our study further revealed that most of the pregnant women (86%) had a positive attitude towards the COVID-19 vaccines. Having a positive attitude towards COVID-19 was statistically significantly associated with educational status ($p=0.029$). Our findings are lower than the 92.7% positive attitude reported in a study in India but higher than the 60.6% reported in Indonesia [36, 37]. In contrast to our study findings, studies in Saudi Arabia and northwest Ethiopia reported 73% and 61.5% negative attitudes toward COVID-19 vaccination respectively [6, 35].

However, due to the high literacy rate, it was observed that most participants attended secondary and tertiary 283 (94.3%). This finding is in line with the study findings in India (99.6%) [36] and China [38]. Also, it was observed that most participants 268 (89.3%) stayed in urban areas. This could be the reason for finding good knowledge and a positive attitude since the participants can read and get firsthand information from any source of information due to their location and literacy levels.

Additionally, most participants 180 (60.0%) felt that there was inadequate safety information on COVID-19 vaccines in pregnancy which was similarly reported in studies that were done in Italy, Saudi Arabia and China [31, 39, 40]. The findings showed that after the introduction of COVID-19 vaccines in pregnancy in Zambia, 185 (61.7%) participants were aware of the benefits of vaccination. These observations were in line with the results from studies done in Barcelona, Spain, West Indies (78.3%) and Northwest Ethiopia (62.04%) [30, 35, 41]. However, a study that was done in China reported that most of the participants were unaware of the recommendations for the COVID-19 vaccine during pregnancy as compared to this study's findings [40].

Most participants, 201 (67.0%) felt that the vaccine had side effects, others reported feeling sick, and fatigued after receiving the vaccine which prevented

them from getting the second dose of the vaccine, 257 (85.7%) felt that the vaccine was important for their health, 199 (66.3%) would take the vaccine without any fear, 243 (81.0%) would encourage family/friends to take the vaccine, and 257 (85.7%) supported the current recommended COVID-19 vaccine campaigns and programs. However, in a study that was done in Cameroon, when asked whether they would accept a COVID-19 vaccine if it was available and offered today, 46% of participants responded "definitely no", 10% responded "definitely yes" and 44% responded "not sure" or "maybe" which is opposite to the findings of this study [42]. The difference in the findings was that most participants in the Cameroon study reported great uncertainty about vaccine safety during pregnancy, the impact of the vaccine on fertility, and vaccine efficacy and felt that the vaccines in Africa were less effective than those in Europe [42].

In this study, 186 (62.0%) were vaccinated against COVID-19. Of the 114 (38%) who were not vaccinated, 20 (17.5%) were willing to be vaccinated. The uptake of the vaccine among our study participants was higher than the one reported in Ethiopia in which only 14.4% of pregnant women were vaccinated against COVID-19 [43]. These findings on the acceptance of COVID-19 among pregnant women are in line with those that were reported from studies that were conducted in South Africa (63.3%) [44], Saudi Arabia (68%) [45], Southwest Ethiopia (70.7%) [46], Canada (57.5%) [47]. However, a global meta-analysis from 32 countries reported that about 54% of the participants accepted the uptake of the COVID-19 vaccines [48]. Although in a multi-methods study in the UK, participants who were pregnant at the time of the survey were more likely to oppose the idea of getting a COVID-19 vaccination while expecting a child, 62.1% of participants said they would unquestionably accept or were leaning towards accepting a future COVID-19 vaccine for themselves [49]. Low acceptance of the COVID-19 vaccine among pregnant women has been reported in France [16] with a 29.5% acceptance rate and in Sudan with a 2.7% acceptance rate [50]. Other low vaccine acceptance rates among unvaccinated pregnant women have been reported in other studies [42, 51]. The hesitancy to receive a COVID-19 vaccine among pregnant women has been due to fears of the vaccine being harmful to the fetus and a lack of safety information about the vaccine during pregnancy [16].

However, the low vaccine acceptance among unvaccinated participants was due to various factors, which included fear of the vaccine's safety, concerns about incomplete drug development and clinical trials, doubts regarding its effectiveness and potential harm to the fetus and pregnant women, as well as misconceptions about the vaccine being intended solely for African use and causing harm. Additionally, misinformation from social media about severe side effects, such as thrombosis, has contributed to vaccine hesitancy. The

lack of side effects or fatalities among those who had received the COVID-19 vaccine, however, led some unvaccinated participants to express their willingness to receive it.

Additionally, a study that was done in 16 countries reported that among pregnant women, 52.0% intended to receive COVID-19 vaccination during their pregnancy if an efficacy of 90% was achieved [13]. COVID-19 vaccine acceptance level was above 80% for pregnant women in Mexico and India; and below 45% for the US, Australia and Russia [13]. Confidence in the safety or effectiveness of vaccines, concern over COVID-19, belief in the significance of vaccinations for one's nation, adherence to masking instructions, faith in public health organizations and health science, as well as attitudes toward routine vaccinations, were the strongest predictors of vaccine acceptance [13].

Most participants received 2 doses 112 (37.3%), 1 dose 74 (24.7%) and those that were not vaccinated 114 (38.0%) which was different from a study that was done in Saudi Arabia where 2 doses (14.6%), 1 dose (42.5%) and those that were not vaccinated (42.9%) [52] were reported.

In this study, the majority 196 (65.3%) felt that getting the vaccine during pregnancy was of benefit and 188 (62.7%) felt that the COVID-19 vaccines are as safe as the older ones. However, a study in Cameroon showed a persistent lack of acceptability where only 31% accepted to receive the COVID-19 vaccine as many participants cited concerns about vaccine safety [42]. Other reasons for the refusal to accept the COVID-19 vaccine were due to fear of side effects, the vaccine might be ineffective, the vaccine might turn into COVID-19, using other methods of COVID-19 prevention and the vaccine might affect my fetus according to a study that was done in Southwest Ethiopia [46]. In a study that was done in Canada, most participants cited the desire to protect themselves and their family members from COVID-19 disease, however, the most common reason for not accepting COVID-19 vaccination during pregnancy was a concern about the safety of the vaccine, for either self or fetus while others did not trust the vaccines in general [47].

The current study found that most participants felt that the COVID-19 vaccines were safe and did not cause infertility. Additionally, 182 (60.7%) participants felt that COVID-19 vaccines were not harmful during pregnancy and 176 (58.7%) of the participants felt that the COVID-19 vaccines in Africa were as effective as those in Europe. A study in Cameroon reported that most participants expressed uncertainty about vaccine efficacy (55%), vaccine safety during pregnancy (61%), the

impact of vaccination on fertility (73%), and whether the vaccine could cause fetal harm during pregnancy (31%). However, most of the participants in Cameroon felt that the COVID-19 vaccines that would be developed in Africa would be more effective and they could agree to be vaccinated than those manufactured outside of Africa [42]. Consequently, 85% of pregnant women in Cameroon felt that COVID-19 vaccines that were available in Africa were less effective than those available in Europe [42]. Another study in Japan reported that potential negative effects on the fetus (85.3%), adverse reactions at the time of injection (83.6%), anxiety about potential negative effects on the breastfed infant (67.6%), and the trustworthiness and reliability of the vaccine (49.1%) were concerns of participants towards COVID-19 vaccination [53].

However, the differences in our study findings with other study findings might be due to the difference in the study period between this study and that of others. Also, the possible justification might be that since most of our study participants stay in urban areas where there is exposure to different social and mass media platforms; it is easy to have access to information concerning COVID-19 vaccines and their benefits.

We believe that to enhance the acceptance and uptake of COVID-19 vaccines, governments and health authorities must strengthen educational activities and awareness campaigns on the benefits of being vaccinated.

We are aware that our study had some limitations. This study was conducted at one healthcare facility in Zambia. Hence, the generalization of the findings must be done with caution. However, our study findings are significant as they focus on a vulnerable population of pregnant women whose use of medicines and vaccines must be monitored carefully.

CONCLUSION

This study demonstrated that pregnant women attending antenatal care at WNH had good knowledge, positive attitudes, high acceptance, and goods of COVID-19 vaccines. Consequently, the acceptance of the COVID-19 vaccines among pregnant women was slightly lower compared to their knowledge and attitude scores. This study found that knowledge and attitude levels were dependent on the educational status of participants. However, there is a need to provide sensitisation programs on social and mass media targeted at pregnant and non-pregnant women with an emphasis on safety information on COVID-19 vaccines and their benefits in pregnancy, especially among the vaccine-hesitant women.

DATA COLLECTION TOOL

Part I: Sociodemographic characteristics of pregnant women		
SN	Questions	Answers/choice
1	Age	18-24 25-34 35≥
2	Marital status	Married Unmarried
3	Residential Area	Urban Rural
4	Educational status	No formal education Primary education Secondary and above
5	Employment status	Employed Unemployed
Part II: Knowledge and attitude questions about the COVID-19 vaccine [circle the correct answer]		
1	Have you ever heard about the COVID-19 vaccine?	1. Yes 2.No
2	Are you aware that COVID-19 vaccines are recommended during pregnancy?	1. Yes 2.No
3	Do you think it is important for everyone to get the COVID-19 vaccine, including women?	1. Yes 2.No
4	Do you think there is adequate safety information on COVID-19 vaccines in pregnancy	1. Yes 2.No
5	Do you think the use of COVID-19 vaccines has side effects?	1. Yes 2.No
6	Taking the COVID-19 vaccine is important for our health.	1. Yes 2.No
7	I will take the COVID-19 vaccine without any fear.	1. Yes 2.No
8	I will encourage my family /friends to take the COVID-19 vaccine.	1. Yes 2.No
9	I support currently recommended COVID-19 vaccine campaigns and programs.	1. Yes 2.No
Part III: acceptance and uptake questions about the COVID-19 vaccine[circle the correct answer]		
1	Are you vaccinated against COVID-19?	1. Yes 2. No
2	If not, are you willing to take the COVID-19 vaccine?	1. Yes 2. No
3	How many COVID-19 vaccine doses have you received?	1. One dose 2. Two doses
4	Are you willing to get the COVID-19 vaccine?	1. Yes 2. No
5	Getting vaccinated during pregnancy is a benefit for the pregnant woman	1. Yes 2. No
6	Do you think that these vaccines are as safe as older ones?	1. Yes 2. No
Part IV: COVID-19 vaccine perceptions		
1	The vaccine is not safe and causes infertility	1. Yes 2.No
2	The vaccine is harmful during pregnancy	1. Yes 2.No
3	The vaccines in Africa are less effective than vaccines available in Europe	1. Yes 2.No

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