Covid-19 Vaccine Acceptance and Predictors of Hesitance among Antenatal care Booked Pregnant in North West Ethiopia 2021: Implications for Intervention and Cues to Action

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Abstract: Despite efforts to decrease the burden, vaccine hesitancy is increasing worldwide and deterring efforts to control the spread of COVID-19 after the approval *of SARS-CoV-2* vaccines. This study aims to assess levels of COVID-19 vaccine acceptance and predictors of hesitancy for pregnant women attending antenatal care in Ethiopia.

Methods: Facility-based cross-sectional study was employed among 336 pregnant women from April 7 to June 10, 2021. The systematic random sampling technique was used to select pregnant from three health centers. Epi-Data version 3.2 and STATA/14 software were used for both data entry and analysis, respectively. A Logistic regression model was used to identify predictors of COVID-19 vaccine hesitance. Adjusted odds ratio (AOR) with a 95% confidence interval was used to estimate the strength of association at P<0.05.

Result: This study included 336 pregnant mothers who were booked ANC in three health centers. The overall levels of COVID-19 vaccine acceptance among pregnant mothers were 79.17 %(95%CI: 74.5 --83.2). Whereas, having poor attitude towards COVID-19 vaccines (AOR=9.4; 95%CI: 3.7--21.1, P<0.001), monthly income ≤118.5 US dollar (AOR =6.3; 95%CI: 2.9--12.2, P<0.002), Mother who are illiterate and started ANC (AOR=9.5; 95%CI: 4.6--22.6, P<0.001), Being unplanned pregnant (AOR =7.5; 95%CI: 3.6-11.2, P<0.002), first time ANC initiated (AOR =4.2; 95%CI: 2.9--15.1, P<0.001), and pregnant didn't used social media (AOR= 6.0: 95%CI: 2.5--14.6, P< 0.02) were significantly associated with COVID-19 Vaccine hesitance.

Conclusion: The acceptability of the COVID-19 vaccine among pregnant mothers was insufficient compared with previous research. Health care workers should provide health education during ANC visits to change their negative attitude and reassurance for the safety and effectiveness of the COVID-19 vaccine.

Keywords: COVID-19 vaccine hesitance, pregnant mother, ANC Booking, Ethiopian.

INTRODUCTION

Coronavirus disease 2019 (COVID-19) emerged from Wuhan, China, in December 2019 as a novel respiratory illness caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Subsequently, it was declared a pandemic that is a threat for every country in mid-March 2020 by the World Health Organization (WHO) [1, 2]. Globally, 185,858, 870 population were infected; of these, 4,017,939 were died as of July 8, 2021, 07:28 GMT WORLD METER reported [3]. The risks of death by COVID-19 were higher among adults and older population groups, especially those who had a chronic medical illness and immune-compromised patients [4]. Pregnant women are the vulnerable double group for COVID-19 and high risk for adverse pregnancy outcomes of preterm birth, caesarian section, and death. COVID-19 had a 4-fold higher risk of high blood pressure and preterm birth for increased adverse outcomes due to SARS-CoV-2 may bring vasoconstriction and stimulate an inflammatory response affecting blood vessels companies [5].

As the number of cases of coronavirus cases and public impact rocketed, promising COVID-19 vaccine candidates are being produced, necessitating consideration of its potential demand, distribution, and adoption to optimize their desired effects has a great issue [6]. Different companies developed the COVID-19 vaccine based on different modalities. However, the Oxford Astra-Zeneca vaccine is a double-stranded DNA vaccine that has been used in many countries[7]. Ethiopia had endorsed and implemented Astra Zeneca COVID-19 vaccine immunization for high-risk populations in addition to the Pfizer-Biotech vaccine [4]. Vaccination should be offered to pregnant women at the same time as the rest of the population, based on age and clinical risk [8]. The Society for Maternal-Fetal Medicine (SMFM) and other leading organizations, including the National Academy of Medicine, has consistently advocated for pregnant and lactating

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women in vaccination trials. There is no biological plausibility for the exclusion of lactating women from these trials. As of January 27, 2021, The American College of Obstetricians and Gynecologists (ACOG) and the Society for Maternal-Fetal Medicine (SMFM) are aware of the World Health Organization's (WHO) recommendation to withhold COVID-19 vaccines from pregnant individuals unless they are at high risk of exposure. Finally, ACOG and SMFM continue to prove and stressed that both COVID-19 vaccines currently authorized should not be withheld from pregnant individuals who choose to receive the vaccine and endorsed and make aware for all health instituting [9]. Despite efforts made to decrease the burden of COVID-19 pandemic or infections, vaccine hesitancy or reluctance is increasing worldwide and deterring efforts to control the spread of COVID-19 [10]. Despite categorizing pregnancy as a high-risk condition for severe COVID-19, hospitalization, and mortality, it remains excluded for participation in vaccine trials [11, 12]. ACOG and SMFM recommend that pregnant individuals be free to make their own informed decisions regarding COVID-19 vaccination [13]. In fact, in Ethiopia, after the endorsement of the COVID-19 vaccine and started implementation, data of Advocacy and implementation for pregnant women's intention to accept it is lacked [14]. This study aimed to assess levels of COVID-19 vaccine acceptance and predictors for hesitancy among pregnant women attending antenatal care in northwest Ethiopia 2021.

METHODS

Study Setting, Study Area, Periods

A facility-based cross-sectional study was conducted in Metekel zone Pawe woreda, North West Ethiopia, from April 7 to June 10, 2021. Pawe woreda is one of the seven woredas found in the metekle zone in North West Ethiopia, located 364 km from the regional capital city of Assosa &565km from Addis Ababa [15]. According to the 2019 national population projections, this woreda has an estimated 98,821 population, with 46,494 men and 52 327 women [16]. Besides, there are three functional health centers and one regional hospital standing for daily health care service [17]. People living around border areas in Ethiopia are at high risk for COVID-19-related death. Districts and zones in the Benishangul-Gumuz, Gambela, and Afar were highly vulnerable for COVID-19 infection and associated death [18, 19].

Source of Populations and Inclusion Criteria

All pregnant women booked (initiated) ANC care in a three-health center were a source of populations. Women who come for antenatal care from April 7 to June 10, 2021, were considered study populations. Pregnant who was critically ill during study periods and had a history of mental health and hearing impairment problem were excluded.

Sample Size Determinations and Sampling Procedures

We determined the minimum sample size using a single population proportion formula $n = (Z\alpha/2) * P\frac{(1-P)7}{(d)2}$ by assuming a 95% confidence level (Z a/2 = 1.96), the margin of error 5%, and 71.9% prevalence of COVID-19 vaccine acceptance [20]. Therefore, N = $(1.96)^2 \times 0.719 \times (1-0.719)/(0.05)^2$ = 311 and 10 % of addition of non-response rate. Accordingly, one month before the Health management information system (HIMS) report at Pawe woreda, there was a total of 890 pregnant mothers booked ANC in three health centers. Since our final sample size was determined as 342 and was conducted in 3 health centers, proportional sample allocation was used to draw systematically with (k =2.6~3 interval from (Feleg Selam H/C N=127, Addis Zemen H/C N=108, and Mekan Selam H/C N=87) were selected, respectively within study periods.

Outcome Ascertainment Variables

The outcome variable is based on after offering questions "will you accept COVID-19 vaccine at this time" the response of "yes I accept" = 1 or "No don't I accept" = 0. The independent variables included socio-demographic (age sex, resident, marital status, educational, monthly income, Source of information (social Media, TV, Radio), maternal measurement (ANC round, Parity, pregnancy types, comorbidity), etc.

Operationally Definitions

Antenatal care was defined according to WHO antenatal initiation recommendation of 'ANC should be initiated within the first trimester of gestation at least four visits with subsequent contacts taking place at 16, 24, 32, 38, and above weeks of gestational [21]. Vaccine hesitancy: pregnant mothers who were reluctant to accept the COVID-19 vaccine during ANC follow up within available resources [1, 22].

Data Collection Instruments

The data collection instruments were prepared after reviewing relevant articles and the world health

organization COVID-19 vaccine survey tools [1, 4, 6, 22, 23]. The questionnaire was prepared in English and translated to Amharic or local language and its consistency was translated back to the English language professional or expert person.

Study Variables Measurement

Knowledge of the COVID-19 vaccine was computed from summing up all relevant six attitude related 'Agree, "Undecided and disagree" questions, respondents were asked, "Does the newly discovered COVID-19 vaccine is safe"; respondents who respond "yes" will score 1 and "I don't know" 2" and "No" response will earn zero scores. The correct answer for each item was scored "1", and the incorrect answer was scored "0." The same pattern of questioning and scoring was made for the rest of the attitude-related items. Accordingly, respondents who scored greater than or equal to the mean value of the sum of attitude-related questions were thought of as having a positive attitude, and respondents who answered less than the mean value of the sum of knowledge assessment questions were thought as having a negative attitude [1, 4, 6, 22].

Data Collection Procedures and Quality Control

To collect the data, fourteen (7) health extension workers and three BSc Midwives were recruited as data collectors, supervisions, and coordination procedures. The data were collected by face-to-face interview using a structured and pretested questionnaire. The interview was conducted after the client got ANC service; each client was interviewed privately and assured confidentiality of the interview. The data collectors and supervisors were informed to follow the WHO COVID-19 prevention protocols such as using a facemask, maintaining social distance, and sanitizing during data collection times.

Data Processing and Analysis

The data were entered after cleaned and edited into Epi-Data version 3.1 and then exported to STATA/R version 14(SE) for analysis. The questionnaire was cleaned, edited (checking missing value and outliers) accordingly. For all COVID-19Knoeldge and attitude questions, internal consistency was checked using Cronbach alpha (α), and it was a credible range score of ≥0.75 on the scare reference. Bi-variable logistic regression analysis was used to select candidate-transferred for socio-demographic variables with

criteria $P<0.25$. The significant factors were identified based on the 95%confidence interval with it. The adjusted odds ratio of a variable was claimed at a p-value <0.05.

Ethics Approval and Consent to Participate

Ethical clearance was obtained from the institute of ethical review committee from Debre Markos University, College of Health Sciences (Ref. No: DMUHS/984/16/12). A formal letter was submitted to the three-health center for permission to date. The institution of the ethical review committee of Debre Marko's University was also waived consent from pregnant women.

RESULT

Socio-Demographic Characteristic of the Study Participant

Three hundred thirty-six (336) pregnant mothers were included in this study, with an overall response rate of 336/342=98.3%. Six (1.75%) pregnant women refuse to interview. Of those study participants included [ANC=1st:102 (30.36 %), (ANC =2nd: 95(28.79%), (ANC=3rd: 88 (26.19%), 51(15.18%)] were from three health centers. the remaining two pregnant women were refused for interview. The mean age of the study participant was 34.3 years (SD± 9.2). The majority of 150 (44.64 %) of the study participants were Orthodox followers by religion, while the bottom number 28 (8.33%) were catholic believers. Of the total, 194 (57.74%) of the respondent were rural residents, nearly two-fifths 131 (38.99 %) of the pregnant mother had attended preparatory and below education (Table **1**).

Maternal Obstetric Health Care Service Characteristics

In this study, 289(86.01) pregnant mothers were conceived by planned, and 222(66.07 %) were multiparous mothers. Of the pregnant mothers, nearly one-third 102(30.36%) and 95 more than one fourth (28.27%) of the pregnant mothers were booked ANC=1st ANC=2nd during the study periods. More than ten percent 40 (11.90%) of pregnant mothers had medical illnesses. The majority of these are pregnancy-induced hypertension16 (4.8%) and diabetic Mellitus 12(3.57%).

Concerning the source of information about the development of the COVID-19 vaccine, almost two-in-fifth, 133 (39.58%), and nearly one in fifth 58(17.26%)

Table 1:   **Socio-Demographic Characteristics of Pregnant Women who Booked ANC are in Three Health Centers North West Ethiopia (N=336)**

Variables		Frequency	Percent
Age	15-25 years	51	5.18
	26-35 years	107	31.85
	36-50 years	178	52.98
Education	Illiterate	97	28.87
	Completed preparatory	131	38.99
	University and above	108	32.14
Resident	Urban	142	42.26
	Rural	194	57.74
Occupation status	Employed	120	35.71
	Unemployed	216	64.29
Comorbidity/medical illness	Yes	40	1.29
	No	296	88.1
ANC round	ANC=1ST	102	30.36
	ANC =2nd	95	28.79
	ANC =3rd	88	26.19
	ANC =4th	51	15.18
Pregnancy status	Planned	289	86.02
	Unplanned/emergency	47	13.99
TV in the house functionality	Yes	131	38.8
	No	205	61.01
Radio functionality in the house	Yes	80	23.76
	No	256	76.19
Use of social media Face book, what sup, telegram	Yes	159	47.32
	No	177	52.68
Do you hear about COVID-19 infection previously?	Yes	331	98.51
	No	5	1.49

of respondents had heard about the COVID-19 vaccine from their health caregiver and mass media, respectively.

Maternal Source of Information Towards COVID-19 Vaccine

Of the total 336-booked ANC mother, only four (1.19 %) pregnant women did hear about COVID-19 infection. In contrast, more than two of five pregnant women, 145 (45.07%), were social media users. Nearly two-in-five 131 (38.8%9) and more than one in five 80(23.8%) of the pregnant mother had information about COVID-19 infection from TV and Radio, respectively. Indeed, only 5(1.49%) pregnant mothers had no information about COVID-19 infection prevention methods. A total of 266 (79.19%) mothers

are willing to fully positively accept the COVID-19 vaccine, while only 70 (20.1%) responded in the negative response. The overall level of COVID-19 vaccine acceptance was determined as 79.16% (95%CI: 74.46 --83.19) (Table **2**).

Knowledge of Respondents Towards COVID-19 Vaccine

Of the total, 290(86.31%) of the pregnant mother had information for accessibility of COVID-19 vaccines, while 54(16.7%) and 61(18.15%) of the respondent didn't know the effectiveness of prevention of COVID-19 pandemic. Accordingly, 217(64.58%) and 201(59.1%) mothers had good knowledge and attitudes towards COVID-19 vaccinations.

Table 2:   Knowledge Related to Acceptability of COVID-19 Vaccination for Pregnant Mother 2021 (n=336)

S. No	Response	Number	Percent	P< value
1	**Do you have information about the presence of the COVID-19 Vaccine (n=336)**			
	Yes	290	86.31%	P< 0.02
	No	26	7.74 %)	
	I don't	20	5.95%	
2	**Do you have information about the effectiveness of the covid-19 vaccine (n=336)**			
	Yes	221	65.77	P<0.0001
	No	54	16.7	
	I don't know	61	18.15	
3	**Do you know is there any harm in administering an extra dose of the COVID-19 vaccine to a person (n=336)**			
	Yes	247	73.51	P<0.002
	No	53	15.77	
	I don't know	36	10.71	
4	**Does the COVID-19 vaccine increase cause an allergic reaction for pregnancy?**			
	Yes	109	32.44	P< 0.001
	No	206	61.31	
	I don't know	21	6.25	
5	**Does vaccination increase autoimmune disease during pregnancy?**			
	Yes	203	60.42	P<0.03
	No	82	24.40	
	I don't know	51	15.18	
6	**Where do you get information about the COVID-19 vaccine first?**			
	social Media	66	19.64	P< 0.055
	Mass media	43	12.80	
	Health extension worker	120	35.71	
	Family/ relative	38	11.31	
	Church meeting	38	11.31	

Attitude Towards COVID-19 Vaccine Willingness to Accept COVID-19

More than half 173(51.49) pregnant mothers did not hesitate to take vaccines in case of fearfulness of side effects, while only 33(9.8%) didn't decide to take COVID-19 during the interview. Moreover, 233(63.69%) pregnant mother responds that of COVID-19are essential for all pregnant and ready to receive it at least one round. The overall negative intent or attitude to received the COVID-19 vaccine was reported 35.4% (95%CI; 30.46-40.7) (Table **3**).

Acceptability of COVID-19 Vaccine and Ruled Out Implications of the Respondent

More than two-in-five of the study participant (n=141, 41.9%) were SARS-CoV2 antibody (IgG) tested previously, while the overall COVID-19 infection seroprevalence among IgG tested group was found (7, 2.08%). The majority of the participants (n=266/336,

79.7%) were willing to be vaccinated against COVID-19. The most cited reasons for taking the vaccine were to protect my fetus and me from getting COVID-19 infection (n=60/266, 17.6%). Therefore, the overall levels of COVID-19 vaccine acceptability among ANC booked pregnant mothers were found at 79.17 % (95%CI: 74.5 --83.2). In contrast, concerns about safety (n=242, 64.4%) are the most cited reasons for not being willing to accept the COVID-19 vaccine (Table **4**).

Predictors for COVID-19 Vaccine Hesitancy of ANC Booked Mothers

During bi-variable logistic regression from 13 bi-variable regressions, nine variables were candidates for multivariable regression at p<0.25. After controlling, the potential confounding and adjustment, four independent variables found significant predictors for hesitance. Accordingly, the odds of having a poor attitude towards COVID-19 vaccines for acceptance

Table 3:   Response to Attitude-Related Questions of Study Participants and Its Association with Willingness to COVID-19 Acceptance 2021 (n: 336)

S. No	Response	Number	Frequency	P<value
1	**Do you think Side effects will prevent you from taking a vaccine for the prevention of COVID-19?**			
	Yes	173	51.49	P<0.187
	No	130	38.69	
	I didn't decide	33	9.82	
2	**Do you think COVID-19 vaccines are essential for the risk population, especially for pregnant?**			
	Yes	233	63.69	P< = 0.860
	No	75	22.32	
	I don't know	58	17.26	
3	**Do you encourage your family/friends/relatives to receive the COVID-19 vaccine?**			
	Yes	211	62.80	P< 0.61
	No	104	30.95	
	I don't know	21	6.25	
4	**Do you think We can decrease the frequency of COVID-19 without vaccination by preventive measure?**			
	Yes	245	72.92	P<0.002
	No	39	11.61	
	I don't know	52	15.48	
5	**Do you think the vaccine should be given distributed free of charge to Ethiopians?**			
	Yes	234	69.64	P< 0.120
	No	57	16.96	
	I don't know	45	13.39	
6	**Do you think COVID-19 vaccines are safe for all populations?**			
	Yes	137	40.77	P<0.001
	No	162	48.21	
	I Don't know	37	11.01	
7	**Do you think the COVID-19 pandemic can be eradicated without vaccination if everyone implementing preventive measures?**			
	Yes	253	75.30	P< = 0.12
	No	44	13.10	
	I don't know	39	11.61	
*	**CONCERN AND IMPLICATIONS TO CUES TO ACTION OF COVID-19 VACCINE (366)**			
	I will only take the COVID-19 vaccine if I am given adequate information about it.			
I	Strongly agreed	155	46.37	P< 0.055
	Agree	102	30.36	
	Dis agreed	51	28.1	
	Strongly disagreed	28	8.33	
	I will only take the COVID-19 vaccine if the vaccine is taken by many in the populations reassured no side effects for me and fetuses.			
II	Strongly agree	151	44.56	P< 0.001
	agree	110	32.74	
	Disagree	50	14.88	
	Strongly disagree	25	7.44	

Table 4: Acceptability of COVID-19 Vaccine among Pregnant Women who Attend ANC in North West Ethiopia 2021

1	Have you ever SARS-CoV2 antibody (IgG) tested previously?	Frequency	%
	Yes Negative	141	41.96
	Yes Positive	7	2.08
	Not tested	188	55.95
2	Are you willing to get vaccinated with the approved COVDI-19 vaccine?		
	Yes I accepted	266	79.17
	No, I don't want	70	20.83
3	Reason for Accepting of COVID-19 vaccine (N=266)		
I	To protect me and my fetus from getting COVID-19 infection	60	17.86
	To protect my family and baby after birth from getting COVID-19	31	9.23
	I believe in vaccines and immunization has power for protection	26	7.74
	To get rid of the virus and end the pan of transmission	37	11.01
	Health workers' recommendations to vaccination	33	9.82
	It is a social& moral responsibility of all citizens during the fighting of COVID-19	21	6.35
	The vaccines are effective to tackle COVID-19 transmission	24	7.14
	Government enforcement and recommendations of vaccination for all citizen	22	6.55
	I am at higher risk of several comorbidities during pregnancy	12	3.55
II	If I have sick by reemerging from it, I didn't have money for treatment	17	5.06
	I am concerned about the safety of the COVID-19 vaccination pregnancy	16	4.76
	I am concerned about the faulty/fake COVID-19 vaccine	16	4.76
	Religious reasons and might be it Satan/devil sprite	12	3.57
	Fear of bad reaction/side effect after vaccination	9	2.68

had nine (AOR=9.4; 95%CI: 3.7–21.1, P<0.001) times higher than pregnant mothers had the good attitude of COVID-19 vaccine. Income is one of the socio-demographic factors associated with refusal of the COVID-19 vaccine. Monthly income generation for pregnant mothers being ≤118.5 US dollars was six (AOR =6.3; 95%CI: 2.9–12.2, P<0.002) time refused for accepting COVID-19 vaccine compared with monthly income ≥ >=237 $US groups. Mothers who were illiterate and started ANC during the interview were nine (AOR=9.5; 95%CI: 4.6–22.6, P<0.001) times refused to accept the request of COVID-19 vaccine as compared with pregnant mothers with completed university education. In contrast, unplanned pregnancy for mothers who have started ANC during the interview had seven (AOR =7.5; 95%CI: 3.6-11.2, P<0.002) times refused intent to offered COVID-19 vaccine as compared with the counter group. Similarly, ANC booked mothers who initiated ANC follow-up for the first time during the interview were four (AOR =4.2; 95%CI: 2.9–15.1, P<0.001) as a compared mother who fourth-round visited once. Moreover, pregnant mothers who did not have experience of using social media were (AOR= 6.0: 95%CI: 2.5–14.6, P< 0.02*) times higher than the refused offering of COVID-19 vaccine as compared with the counter group (Table **5**).

DISCUSSION

The newly emerged COVID-19 infectious disease hurts pregnant mothers and their unborn fetuses [2, 4, 9]. However, after so many trials of the vaccine, the World Health Organization approved more than four COVID-19 vaccines to date to mitigate the spread and potential threat of this disease [1, 2]. The finding of this study showed that the acceptance of the COVID-19 vaccine among pregnant women was 79.17 %(95%CI:74.5 –83.2).This finding is higher than reported in Southwest Ethiopia 70.9% [4],central Ethiopia 74% [6], Low &Middle Income countries(LMIC) 764% [13], Jordan 37.4% [24] ,Bangladesh 61.16% [25]. Nevertheless, it is lower than reported in china, 91.3% [26], and higher than found in Ghana, 39.3% [27]. It is the sample population difference, and the study setting has shared the difference. Accordingly, the level of good knowledge towards COVID-19 vaccine

Table 5:   Bi-Variable and Multivariable Logistic Regression Covid-19 Vaccine Acceptance and Predictors of Hesitance among Antenatal Care Booked Pregnant in North West Ethiopia 2021

Variables	Categories	Acceptance	Refused	COR	AOR	P<0.05
Age	15-25 years	48	3	1.8(0.67--5.04)	1.5(0.4—5.3)	0.50
	26-35 years	76	31	0.39(0.22--1.16)	0.45(0.2--1.12)	0.08
	36-50 years	142	36	1	1	
Resident	Urban	104	38	1	1	
	Rural	32	162	1.6(0.87--3.14)	1.2(0.9--4.6)	0.053
Educational status	Illiterate	88	9	4.5(3.3--12.8)	9.5(4.6--13.1)	0.001*
	Completed preparatory	88	43	1.7(0.66 --2.06)	0.78(0.5--1.2)	0.61
	University completed	90	18	1	1	
Income	<=118.5 $US	63	3	8.2(2.4---28.7)	6.3(2.9--12.2)	0.02*
	118.6--237 $US	144	44	1.27 (0.70--2.3)	1.5(0.8--3.6)	0.37
	>=237 $US	59	23	1	1	
Pregnancy type	Planned pregnancy	223	66	1	1	
	Unplanned pregnancy	43	4	3.2(1.12—9.18)	7.5(3.6-11.2)	0.001*
ANC round	ANC =1st	96	6	9.5(3.5--25.8)	4.2(1.01-15.1)	0.051
	ANC=2nd	82	13	3.7(1.6-- 8.5)	3.2(0.9--8.4)	0.057
	ANC=3rd	56	32	1.04(0.50 --2.2)	0.9(0.3--2.6)	0.84
	ANC=4th	32	19	1	1	
Medical illness	No	229	67	1	1	
	Yes	37	3	3.6(1.08—12.3)	2.3(0.6--8.72)	0.224
Social media use	yes	106	53	1	1	
	No	17	17	4.7(2.6-- 8.56)	6.(2.5--12.6)	0.02*
Overall knowledge for COVID-19 vaccine	Good	139	46	1		
	Poor	127	24	1.7(1.12--- 3.1)	1.9(0.97--4.5)	0.067
Overall attitude for vaccine of COVID-19	good	143	60	1	1	
	Poor	123	10	5.16(2.5--10.5)	9.4(3.7--21.1)	0.001*

AOR= Adjusted odd ratio, COR= crude odd ratio, and CI= confidence interval.

acceptance is 64.58% (95%CI; 59.3--69.54). This reported is lower than found in central Ethiopia 74.5% [6], but higher than Bangladeshi 62.1% [25]. In fact it also incomparable with study result in France 81.2%, England 83.0%, and Israel 83% [28]. The disparity in the methodology used and research setting, socio-demographic features of participants in the study area, and the availability and accessibility of health service infrastructures may be the possible reason [29, 30]. On the other hand, a report of positive intent or attitude to receive the COVID-19 vaccine was determined as 59.8% (95%CI; 54.5---64.9). This report is similar to as of mid-May 2021, finding in 59%of Australia [28]. Nevertheless, lower than finding as mid-May 2021, 71% in Canada, 74% in Denmark, 63% in Germany, 81% in Italy, 72% in Norway, 70% in Singapore [28,

30]. In the same way, the odd of negative attitude towards COVID-19 vaccines acceptance had (AOR=9.4; 95% CI: 3.7--21.1, P<0.001) times higher than pregnant mother had a good attitude for vaccination of any types of COVID-19 vaccine. Excluding not being eligible yet, the main reason for not negative intent to receive a COVID-19 vaccine across all age groups was 'concerns about side effects, brand vaccine selection, and personal and religious myth [20, 28, 30, 31]. Accordingly, the odds of monthly income generation for pregnant mothers ≤118.5 US dollars were 6.3 (AOR =6.3; 95%CI: 2.9--12.2, P<0.002) time refused for accepting COVID-19 vaccine compared with monthly income ≥ 237 $US groups. This is comparable with reported in Saudi Arabia [20]. Unlike this in research when monthly income level >15,000

SR per month expressed a definite intent to receive the vaccine (51%, 30.36, *df* 9, p<0.001) [20]. It is not surprising that low income generated per month is associated with perceived fear attitude on medical coast for the associated side effect of COVID-19 vaccination. Mothers who were illiterate and started ANC during the interview were (AOR=9.5; 95%CI: 4.6--22.6, P<0.001) times refused to accept the request of the COVID-19 vaccine as compared with completed university education groups. Unlike in this research finding in Ethiopia [4] Indonesia [13], COVID-19 vaccine acceptance willingness is particularly associated with university completed study participants compared to those who had completed primary. At the same time, unplanned pregnancy for mothers who have started ANC during the interview had (AOR =7.5; 95%CI: 3.6-11.2, P<0.002) times refused intent to obtained COVID-19 vaccine as compared with the counter group. Likewise, ANC-initiated mothers for the first time during the interview were AOR =4.2; 95%CI: 2.9--15.1, P<0.001 refused to receive COVID-19 vaccine as the compared mother who is fourth-round visited once. Mothers who were illiterate and started ANC during the interview were (AOR=9.5; 95%CI: 4.6--22.6, P<0.001) times refused to accept the request of the COVID-19 vaccine as compared with completed university education groups. This research finding is in Ethiopia [4], the United Kingdom [32], and Indonesia [13]. Willingness for uptake of COVID-19 vaccine is particularly associated with high levels of education compared with lower educational status individuals. Moreover, pregnant mothers who did not have experience using social media were (AOR= 6.0: 95%CI: 2.5--14.6, P< 0.02) times higher than the refused offering of COVID-19 vaccine compared with the counter group. Perceived uncertainty has been shown to increase belief about Covid-19 vaccines. Yet, public opinion research on the hesitancy of undecided or ambivalent of COVID-19 vaccine acceptance may be more receptive to gaining information and engaging in dialogue with family, friends, and depend on social media. Which briefing the side effect and contraindication of it [33-35].

LIMITATIONS

The limitation of this study was the lack of qualitative data supplementations to explore socio-cultural barriers of pregnant mother's refusal to accept the COVID-19 vaccine. The other limitation of this study was the nature of the study design (cross-sectional) does not show the relationship between cause and effect.

CONCLUSION

The acceptability of the COVID-19 vaccine among pregnant mothers was found at 70.19% in the study area. Maternal monthly income<=118.5 $US, mothers who cannot read and write, unplanned pregnancy, first time of ANC follow up, and not using social media (Facebook, internet, what sup, telegram) were significantly associated with declining for COVID-19 vaccine acceptance. Health care workers should educate pregnant mothers during antenatal care visits to change their negative attitude toward COVID-19 prevention.

AVAILABILITIES OF DATA AND MATERIALS

The data set used for this study is available from the corresponding author upon reasonable request.

ABBREVIATION

ANC	=	antenatal care
COVID-19	=	Corona Virus Infectious Diseases 2019
ACOG	=	American College of Obstetrics and Gynecology
SARS-CoV-2	=	Severe Acute Respiratory Syndrome Coronavirus 2
WHO	=	World Health Organization

CONFLICTS OF INTEREST

The author declared that there is no conflict of interest.

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REFERENCE

[1]   WHO: Vaccine' Hesitancy 'Survey' Questions' 2021; https://www.who Matrix "question & survey tools 2021 Accessed July 10, 2021.

[2]   WHO: Behavioral consideration for acceptance and uptake of covid-19 vaccines who technical advisory group on behavioral insights and sciences for health meeting report. Behavioral insights and sciences for health meeting report accessed May 21, 2021, Available:

https://www.who.int/news/item/21-12-2020-behavioural-considerations-for-acceptance-and-uptake-of-covid-19-vaccin

[3]   WHO'. COVID-19 coronavirus pandemic https://www.worldometers.info/coronavirus

[4]   Mose A, Yeshaneh A. COVID-19 Vaccine Acceptance and Its Associated Factors Among Pregnant Women Attending Antenatal Care Clinic in Southwest Ethiopia: Cross-Sectional Study. International Journal of General Medicine 2021.
https://doi.org/10.2147/IJGM.S314346

[5]   Di Mascio D, Khalil A, Saccone G, Rizzo G, Buca D, Liberati M, *et al*. Outcome of coronavirus spectrum infections (SARS, MERS, COVID-19) during pregnancy: a systematic review and meta-analysis. Am J Obstet Gynecol MFM 2020; 2(2): 100107.
https://doi.org/10.1016/j.ajogmf.2020.100107

[6]   Abebe H, Shitu S, Mose A. Understanding of COVID-19 Vaccine Knowledge, Attitude, Acceptance, and Determinates of COVID-19 Vaccine Acceptance Among Adult Population in Ethiopia. Infection and Drug Resistance 2021.
https://doi.org/10.2147/IDR.S312116

[7]   Alhaff BA, Molham Al, Kreider J, Massou E. Acceptance Towards COVID-19 Vaccination Among the Lebanese Population: A Cross-Sectional Study 2020.
https://doi.org/10.21203/rs.3.rs-301249/v1

[8]   Royal College of Obstetrics and gynecology: Coronavirus (COVID-19) Vaccination in Pregnancy, Version 1.0: Published June 30, 2021, 2021.

[9]   SMFM: Society for Maternal-Fetal Medicine Statement: SARS-CoV-2 Vaccination in Pregnancy 12-1-20. Accessed July 14, 2021.

[10]   Dig F, Murri R, Francesco V, Lorenzo C. Attitudes towards Anti-SARS-CoV2 Vaccination among Healthcare Workers: Results from a National Survey in Italy. Viruses 2021; 13(3).
https://doi.org/10.3390/v13030371

[11]   Ruggiero M, *et al*. Clinical relevance of SARS-CoV-2 infection in late pregnancy. BMC Pregnancy and Childbirth 2021; 21(1).
https://doi.org/10.1186/s12884-021-03985-1

[12]   Shimabukuro TT, *et al*. Preliminary Findings of mRNA Covid-19 Vaccine Safety in Pregnant Persons. N Engl J Med 2021; 384(24): 2273-2282.
https://doi.org/10.1056/NEJMoa2104983

[13]   Eife SAB. Siau MCS, Chen WS, *et al*. Factors Affecting COVID-19 Vaccine Acceptance: An International Survey among Low- and Middle-Income Countries. Vaccine MDRI, 2021. Vaccines 2021; 9: 515.
https://doi.org/10.3390/vaccines9050515

[14]   Aison Jacob, S.S., Alwin Issac, Nadiya Krishnan, Rakesh Vadakkethil Radhakrishnan, and M.D.S.J. Vijay V. R, Azhar SM, Anoop S. Nair, Determinants of Willingness for COVID-19Vaccine: Implications for Enhancing the Proportion of Vaccination Among Indian. cureus Open Access Original 2021.
https://doi.org/10.7759/cureus.15271

[15]   Kebede F, Nemera E, Belete N, Mastewal G, Tadesse T, Bizuneh W. Predictors for a Cure Rate of Severe Acute Malnutrition 6-59 Month Children in Stabilizing Center at Pawe General Hospital, Northwest Ethiopia: Retrospective Cohort Study. International Journal of Child Health and Nutrition 2021; 10: 34-43.
https://doi.org/10.6000/1929-4247.2021.10.01.5

[16]   UNICEF, Situation Analysis of Children and Women: Benishangul-Gumuz Region. Report 2019.

[17]   Fassikaw K, Tshay K, Birhanu K, Belete N, et al.: HIV/AIDS Associated Tuberculosis Occurance on Art Initiated Children In North West Ethiopia 2020. Journal of Pulmonary & Respiratory Medicine, 2021; 11: 6. DOI: 10.4172/2161-105X.11.550.

[18]   Kefyalew A, Dagnachew M, Digsu N, Koye Y, Adama MHG. *et al*. COVID-19 in Ethiopia: a geospatial analysis of vulnerability to infection, case severity, and death. BMJ Open 2021; 11: e044606.
https://doi.org/10.1136/bmjopen-2020-044606

[19]   Tamrat Shaweno IA, Lemlem B, Daniel T, Behailu D, Debebe S. Seroprevalence of SARS-CoV-2 antibody among individuals aged above 15 years and residing in congregate settings in Dire Dawa city administration, Ethiopia. BMC tropical medicine 2021; 2021: 49-55.
https://doi.org/10.1186/s41182-021-00347-7

[20]   Alobaidi S. Predictors of Intent to Receive the COVID-19 Vaccination Among the Population in the Kingdom of Saudi Arabia: A Survey Study. J Multidiscip Healthc 2021; 14: 1119-1128.
https://doi.org/10.2147/JMDH.S306654

[21]   Ali N, *et al*. Antenatal Care Initiation Among Pregnant Women in the United Arab Emirates: The Mutaba'ah Study. Frontiers in Public Health 2020; 8: 211-211.
https://doi.org/10.3389/fpubh.2020.00211

[22]   Diress, Y.B.Y.Y.G.Y.A.B.D.M.G.M.A.S.M. and Y.Y.S.A.F. 3, Willingness of Ethiopian Population to Receive COVID-19 Vaccine. DOVE Journal of Multidisciplinary Healthcare, 2021. Journal of Multidisciplinary Healthcare 2021; 14: 1233-1243.
https://doi.org/10.2147/JMDH.S312637

[23]   WHO, Evaluation of COVID-19 vaccine effectiveness Interim Guidance. Manual, March 17, 2021.

[24]   El-Elimat T, Masul A, Basima A. Almomani Nour A. AlSawalha: Acceptance and attitudes toward COVID-19 vaccines: A cross-sectional study from Jordan. PLOSE, April 23, 2021.
https://doi.org/10.1101/2020.12.22.20248676

[25]   Zaman4, S.M.M.M.I.A.K.A.U.M.M.A., Acceptance of COVID-19 Vaccine and Its Determinants in Bangladesh. Accessed June 23, 2021.

[26]   Wang J, *et al*. Acceptance of COVID-19 Vaccination during the COVID-19 Pandemic in China. Vaccines 2020; 8(3): 482.
https://doi.org/10.3390/vaccines8030482

[27]   Agyekum MW, *et al*. Acceptability of COVID-19 Vaccination among Health Care Workers in Ghana. Advances in Public Health 2021; 2021: 9998176.
https://doi.org/10.1155/2021/9998176

[28]   Innovations, I.I.o.G.H., Global Vaccine Insights_ICL-You Gov-Covid-19-Behaviour-Institute of global health innovation. Iperial college Accessed July 12, 2021, May 2021.

[29]   Harapan H, *et al*. Acceptance of a COVID-19 Vaccine in Southeast Asia: A Cross-Sectional Study in Indonesia. Front Public Health 2020; 8: 381.
https://doi.org/10.3389/fpubh.2020.00381

[30]   Verger P, *et al*. Attitudes of healthcare workers towards COVID-19 vaccination: a survey in France and French-speaking parts of Belgium and Canada, 2020. Euro Surveill, 2021; 26(3).
https://doi.org/10.2807/1560-7917.ES.2021.26.3.2002047

[31]   Biasio LRB, Lorini G, Sergio PC. Assessing COVID-19 vaccine literacy: a preliminary online survey. Accesed 23 June 2021, 2020.
https://doi.org/10.20944/preprints202007.0295.v1

[32]   Robertson E, *et al*. Predictors of COVID-19 vaccine hesitancy in the UK household longitudinal study. Brain Behav Immun 2021; 94: 41-50.
https://doi.org/10.1016/j.bbi.2021.03.008

[33]   Andrew Chadwick JK, Vaccari C, Freeman D, Lambe S, Loe BS, Vanderslott S, *et al*. Online Social Endorsement and Covid-19 Vaccine Hesitancy in the United Kingdom. https://www.worldometers.info/coronavirus/, April-June 2021; 1-17.
https://doi.org/10.1177/20563051211008817

[34]   Benis A, Khodos A, Ran S, Levner E, Ashkenazi S. Social Media Engagement and Influenza Vaccination During the COVID-19 Pandemic: Cross-sectional Survey Study. J Med Internet Res 2021; 23(3): e25977.
https://doi.org/10.2196/25977

[35]   Kerr JR, Freeman ALJ, Marteau TM, van der Linden S. Effect of Information about COVID-19 Vaccine Effectiveness and Side Effects on Behavioural Intentions: Two Online Experiments. MDRI Vaccine Published: April 13, 2021. Vaccines 2021; 9: 379.
https://doi.org/10.3390/vaccines9040379