COVID-19 vaccine acceptance and associated factors among pregnant women attending antenatal care in public health facilities of Addis Ababa, Ethiopia, 2022

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ABSTRACT

Introduction: Coronavirus disease 2019 (COVID-19) is a communicable disease that produces severe morbidity and mortality. Pregnant mothers are at higher risk of this viral infection, with great morbidity and mortality. However, vaccine acceptance among pregnant women were not known in the study area. We assessed COVID-19 vaccine acceptance and associated factors among pregnant women attending antenatal care in public health facilities of Addis Ababa city administrations, Ethiopia, 2022. **Methods:** Institutional-based cross-sectional design was conducted among 348 randomly selected pregnant women attending antenatal care visits in public health facilities of Addis Ababa using an interviewer-administered questionnaire. Multivariable logistic regression analysis was to identify factors associated with vaccine acceptance. Variables with 95% confidence interval that does not include 1 and P-value < 0.05 were identified as statistically significant. **Results:** The prevalence of COVID-19 vaccine acceptance among the participants was 58.0% (95%CI: 52.7-63.3). Vaccine acceptability was significantly associated with those assuming vaccine decreases severe symptoms, (aOR=2.4, 95%CI:1.1- 5.1), assuming vaccine is an effective treatment for active infection (aOR=2.4, 95%CI: 1.14-5.0), being allergic to medication (aOR=0.2, 95%CI:0.13-0.58), young age (aOR=0.1, 95%CI: 0.05-0.2), and perceived effects of the vaccine on the fetus (aOR=0.2, 95%CI:0.05-0.82). **Conclusion:** More than half of the pregnant women in the studied public health facilities would accept to receive the COVID-19 vaccine. The main factors associated with accepting COVID-19 vaccine were assumptions that the vaccine was an effective treatment for active infection or that it decreases symptomatic COVID-19 infection, while being allergic to medication, young age and perceived impacts of the vaccine on the fetus were associated with not accepting the vaccine. Therefore, it is important to raise awareness about the benefits of the vaccine and dismiss the taboos about the vaccine to increase its acceptability.

Introduction

Coronavirus disease 2019 (COVID-19) is a highly communicable respiratory infection caused by the severe acute respiratory syndrome coronavirus 2 and the COVID-19 pandemic has imposed a huge morbidity and mortality burden at the same time severely interrupting society´s health and economic system of the world [1, 2]. Ethiopian Public Health Institution (EPHI) as of March 17, 2022, had a total of 469,329 confirmed cases with over 7488 total deaths [3-5]. Pregnant women may be more prone to severe COVID-19 infection due to decreased immunity and overstress because factors such as chronic stress, obesity, asthma, underlying inflammatory conditions, and socioeconomic factors are also known to increase the risk of viral infection and exacerbate complications during pregnancy [6]. Many respiratory diseases such as SARS, MERS, and influenza have been associated with increasing the rate of intensive care unit (ICU) admission, mechanical ventilation, and death in pregnant women [7].

Literature also indicated that COVID-19 infection during pregnancy will increase the risk of other adverse women´s and neonatal health complications [8]. However, research on COVID-19 in pregnant women is limited [9]. Pregnant women are prone to a higher risk of severe COVID-19-related complications compared with non-pregnant women [8]. In addition to these COVID-19 infections overlap with other influenza and resulting co-morbidity will likely exacerbate diseases and death during pregnancy [10]. Even though the exact number of pregnant women getting COVID-19 infection is unknown, it estimated that millions of pregnant women may have COVID-19 infection, based on the estimated prevalence of 1-10% [11]. In South Africa 53% COVID-positive pregnant women had symptoms, but occurrence of adverse fatal event was low [12].

Pregnant women in Ethiopia had a lower acceptance rate of the COVID-19 vaccine than the general population, which is expected to be 65-78 percent [13]. COVID-19 vaccination before and during pregnancy is safe and effective. The benefits of receiving a COVID-19 vaccine outweigh any known or potential risks of vaccination during pregnancy [14].

In the studies done at Debre Tabor, Debre Markos and central Gondar zone public health facilities vaccine acceptance were 14% ,18% and 62 % respectively [2,15, 16].another study done at country level in Ethiopia vaccine acceptability was 61% [3].

However, in Addis Ababa which is the largest and capital city in Ethiopia no previous studies determine acceptance rate, nor investigate the reasons why pregnant mothers hesitant to use the COVID-19 vaccination.

Methods

Study area and period

The population of women in the reproductive age group in Ethiopia is 24,069,145.932 (23.4%) while in Addis Ababa it is 1,275,380 (34.6%) [17]. Addis Ababa city has a population of 5,228,000 according to 2022 United Nations population projection [18]. Administratively, the city is divided into 10 sub-cities with 116 districts. Addis Ababa city has a total of 101 public health centers. This study was conducted among pregnant women attending ANC at those public health facilities from September - November 2022.

Study design

An institution-based cross-sectional study was conducted to assess COVID-19 vaccine acceptance and associated factors among pregnant women attending antenatal care in public health centers of Addis Ababa city administrations of Ethiopia 2022.

Study population

The study population were pregnant women attending antenatal care in public health centers of Addis Ababa city administrations of Ethiopia 2022. Pregnant women attending antenatal care in public health facilities of Addis Ababa city administrations of Ethiopia who accepted to participate were included in the study. Pregnant women who were seriously ill were excluded from the study.

Sample size determination

The sample size was determined using a single population proportion formula with the following assumptions: vaccine acceptance among pregnant women in southwestern Ethiopia = 71%([13]. 95% confidence interval (level of significance), level of significance (alpha) = 0.05, and margin of error (d) = 5%.

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

By adding a 10% non-response rate, the final sample size was 348.

Sampling technique and sampling procedures

First, all public health facilities of Addis Ababa were identified. Simple random sampling using computer generated lottery method was applied to select nine public health facilities.

Proportional allocation was applied to determine adequate sample from each selected health centers (Figure 1).

Operational Definition

Vaccine acceptance: willingness to take the vaccine without any refuse. *COVID-19 vaccine acceptance*: was measured using self-response (yes and no) questions. Respondents who responded "yes" to each willingness question received a score of 1 (willing to vaccination) and "a score of 0 (refusing to vaccination) was given for "no" responses [13].

Allergic to medication: participants response on whether they experienced allergic reactions after taking any medication (score 1 for yes, and 0 for no).

Being young: yes (1) for age category between 18-24 years as World Health Organization otherwise no (2)

Data collection procedure

Data were collected after getting informed consent from each respondent by using a structured pretested interviewer-administered questionnaire. The questionnaire design was based on previous studies [19-21]. The questionnaire was translated from English into Amharic language and then pretested to check for any meaning variation or ambiguity.

Data quality assurance

Data collection facilitators were trained for two days. Pre-test was conducted in health centers other than those selected for the study. Close supervision was carried out by the principal investigators during data collection procedures. The data were checked for completeness, clarity, consistency and accuracy.

Data analysis

Data were checked, coded and entered into Epi-info version 7.2 and exported to SPSS version 23 for analysis. Descriptive data analysis results were presented in text, tables, chart and figures. Variables included into multivariable logistic regression analysis had a p <0.25 at bivariable analysis. In the adjusted model, factors significantly associated with vaccine acceptability were identified based on aOR with 95% CI that did not include 1 and p-value less than 0.05 and fits Hosmer and Lem show model test.

Ethical consideration

Ethical clearance for this study was given by the ethical review board of Addis Ababa Medical and business College with reference number AAMBC/STU/11.379 and date 15/11/2019. Addis Ababa city Administration provided a letter of support. Informed consent was obtained from each participant that was included in the study. Findings were disseminated to public health facilities and partners in Addis Ababa city.

Results

COVID-19 vaccine acceptance, socio-demographic characteristics and practices Measures (N =348)

There was a total of 348 respondents. Majority 143 (41.1%) were aged 26-35 years old, 97 (27.87%) were aged 15-25 years old, 92 (26.72%) aged 36-45 years old and the rest greater than 45 years above. Most of them 281 (80.7%) were married, 152 (43.7%) had a diploma and above, and 132 (37.9%) were civil servants (Table 1). Vaccine acceptance among pregnant women attending antenatal care was 58% (95%CI:52.7-63.3) i.e. 202/348 (Figure 2).

Among the 202 participants that were willing to accept the vaccine, 82.7% (167/202) believed that COVID-19 vaccination decreases the risk of symptomatic infection compared to 57.5% (84/146) among those not willing to accept the vaccine; and 74.8% (151/202) responded that vaccination decreases the risk of COVID-19 transmission compared to 56.2% (82/146) who were not willing to get vaccinated. Moreover, 65.8% (133/202) of the respondents who were willing to be vaccinated believed/assumed that the vaccine is an effective treatment of the infection compared to 38.4% (56/146) who were not willing to get vaccinated (Table 2).

Fifty-two percent (112/202) of the respondents who would accept the COVID-19 vaccine reported that they usually wear masks.

Factors associated with vaccine acceptance

We run a bivariable binary logistic regression to assess the association between different variables and acceptance of COVID-19 vaccination (Table 2). Variables with p-value less than 0.25 in bivariable binary logistic regression were entered into multivariable logistic regression. Those factors were: being allergic to medication, previous COVID-19 infection; assumptions/beliefs that COVID-19 vaccine decreases risk of transmission, vaccine decreases symptomatic infection, vaccine provides immediate protection after first dose and vaccine is an effective treatment for active COVID-19 infection, being young (18-24 years old), assumption/belief that the vaccine affects fetus, and having a family member who had been hospitalized or died.

The final multivariate logistic regression model showed that vaccine acceptability among pregnant women attending antenatal care was statistically significantly associated with: fear of allergic reactions to the medication (aAOR:0.2, 95% CI:0.13-0.58), assuming/belief that the vaccine decreases severe symptoms (aAOR:2.4, 95% CI:1.1-5.1), and assuming/belief that the vaccine was effective treatment for active infection (aAOR:2.4, 95% CI:1.14-5.0). On the other hand, young women and those who perceived that the vaccine might affect the fetus had statistically significantly reduced odds of accepting COVID-19 vaccination (aAOR:0.1, 95% CI: 0.05-0.2 and aAOR:0.2, 95% CI: 0.05-0.82) respectively (Table 3).

Discussion

This is an institution-based cross-sectional study conducted to assess COVID-19 vaccine acceptability among pregnant women attending ANC services in different public health facilities in Addis Ababa, Ethiopia. In this study Covid-19 vaccine acceptance was 58% (95% CI:52.7%-63.3%). This finding is consistent with the study done at central Gondar zone public hospitals and public health institutions in Ethiopia which reported vaccine acceptance at 62% (95% C.I: 57.6-66.3) and 61% (95% C.I: 56.9-60.1) respectively [2,3]. On the contrary, this vaccine acceptance level is higher than what was reported in the studies done at Debre Tabor and Debre Markos public health facilities where vaccine acceptance was 14% and 18 respectively [22, 23]. This difference may be due to the availability of alternative media sources and greater access to information on COVID-19 vaccination in Addis Ababa city compared to the other study areas. On the other hand, this finding is lower than the 70.7% vaccine acceptance reported in the study done in southwest Ethiopia [13]. The difference may be due to differences in the study times, because the southwest Ethiopia study was done during the peak of COVID-19, when pregnant women were likely to be more worried about catching the disease which possibly increased their willingness to accept the vaccine.

The current finding is also lower than what was reported in other sub-Saharan African countries: Ethiopia (97.9%), Nigeria (86.2%), Uganda (84.5%), Malawi (82.7%) and Burkina Faso (82.5%) [24]. The latter study was a phone survey (phone calling) which is prone to selection and response biases that may have contributed to the high acceptance levels. However, our finding of 58% is consistent with global COVID-19 vaccine acceptance in pregnant women which was 54% (95% CI: 45-62) [18].

The current study identified several factors that were significantly associated with COVID-19 vaccine acceptance. The assumptions that vaccination decreases the risk of symptomatic infection and that the vaccine was an effective treatment for COVID-19 infection were associated with increased likelihood to accept vaccination. While being younger in age assumption that the vaccine affects the fetus and being allergic to medication were negative factors associated with less likelihood to accept vaccination making them potential barriers.

In this study younger pregnant mothers (18-24 years old) were 90% less likely to accept to receive the COVID-19 vaccine. Most young mothers are likely to be primi-para and more sensitive and concerned about their fetus, causing them to over think of the fetal condition if they take the vaccine. Worse still as first time mothers its their first exposure to vaccination during pregnancy. This finding is consistent with studies done at Debre Markos, Debre tabor and southwest Ethiopia [22, 23].

The current finding that assuming vaccine affects fetus was negatively significantly associated with vaccine acceptance, agrees with findings from the Debre tabor public health institutions study [22]. Notably the current study quantified the relationship between assuming vaccine has effect on fetus and vaccine acceptability by odds ratio than only describing the reason for hesitancy as was the case in the Debre tabor study. Also, the Debre tabor study identified being married as a significant factor associated with vaccine acceptance but the current study excluded being married from the regression analysis, because it is already known that most of pregnant attending antenatal care are married no need to do further analysis. This finding is supported by the study done at Debre Markos public health institution [23].

Studies done in China and Ankara [15, 16] also support the finding that assuming that the vaccine can harm the fetus is associated with vaccine acceptability. However, these aforementioned studies identified lower education, gestational complication and higher knowledge on Covid-19 as factors that were significantly associated COVID-19 vaccine acceptance contrary to what we found in the current study.

Compared to studies done at Debre tabor, Debre Markos, southwest Ethiopia and central Gondar zone [2, 22-24], the current study identifies significant associations between the assumptions that vaccination decreases symptomatic infection and COVID-19 vaccine is effective treatment for active COVID-19 infection with vaccine acceptance. This study recognized gaps that are likely to prevent attainment of the WHO COVID-19 immunization target of 70% [25].

Conclusion

In conclusion more than half of the pregnant women expressed willingness to accept the vaccine for COVID-19 in the studied health centers. The main factors associated with COVID-19 vaccination acceptability was being allergic to medication, assuming vaccine was an effective treatment for active infection, assuming vaccine decreases symptomatic COVID-19 infection, perceived effect of the vaccine on the fetus, and age. Health care professionals should routinely educate pregnant women on COVID-19 vaccine role in treatment of COVID-19, adverse events and effects on fetus during their ANC visits. COVID-19 vaccine awareness creation at public meetings, television and radio programs should be prioritized, highlighting the benefits of the vaccine to pregnant women and their babies and dispelling taboos about the vaccine. Awareness creation on vaccination safety and timely management of adverse drug reaction can increase vaccination acceptance in pregnant women. We recommend conducting a study on COVID-19 vaccination safety in pregnant women in Ethiopia to help address the perceived barriers and assist more pregnant women to accept COVID-19 vaccine.

What is known about this topic

- The global COVID-19 vaccine acceptance among pregnant women is 54% (95% CI: 45-62) which is comparable to 58% vaccine acceptance rate we determined on in this study.
- The assumption/perception by pregnant women that COVID-19 vaccine affects the fetus is associated with them not accepting the vaccine.

What this study adds

- Assumptions about COVID-19 vaccine influence vaccine acceptance both positively and negatively among pregnant women. Assumptions that the vaccine was an effective treatment for active infection, and it decreases symptomatic COVID-19 infection were associated with its acceptance while the assumption that the vaccine impacts the fetus discouraged its acceptance. While the latter assumption had been reported by other studies, this study quantified the relationship using odds ratios and showed an 80% likelihood of not accepting the vaccine among mothers who assumed the vaccine impacted the fetus.
- Young mothers (aged 18-24 years) and mothers who were allergic to medication were more likely not to accept the COVID-19 vaccine.

Competing interests

The authors declare no competing interests.

Authors´ contributions

AMM was the principal investigator. ZG and BGY were his academic advisors. All authors played a crucial role in overall activities from title selection to final research activities including manuscript write up activities. All agreed to be accountable in all aspects of the manuscript and consented to its being submitted for publication.

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References

1. Africa Centers for Disease Control. Outbreak Brief 122: Coronavirus Disease 2019 (COVID-19) Pandemic [Internet]. Addis Ababa (Ethiopia): Africa Centers for Disease Control; 2022 May 17 [cited 2024 Jun 6] 8 p. Download AfricaCDC_COVIDBrief_17May22_EN.pdf

2. Taye EB, Taye ZW, Muche HA, Tsega NT, Haile TT, Tiguh AE.COVID-19 vaccine acceptance and associated factors among women attending antenatal and postnatal cares in Central Gondar Zone public hospitals, Northwest Ethiopia . Clin Epidemiol Glob Health [Internet]. 2022 Feb 8 [cited 2024 Jun 6];14:100993. https://doi.org/10.1016/j.cegh.2022.100993 PubMed | Google Scholar

3. Defar A, Molla G, Abdella S, Tessema M, Ahmed M, Tadele A, Getachew F, Hailegiorgis B, Tigabu E, Ababor S, Bizuwork K, Deressa A, Tasaw G, Kebede A, Melese D, Gashu A, Eshetu K, Tayachew A, Wossen M, Hassen A, Habebe S, Assefa Z, Abayneh A, Abate E, Tollera G.Knowledge, practice and associated factors towards the prevention of COVID-19 among high-risk groups: A cross-sectional study in Addis Ababa, Ethiopia . PLoS ONE [Internet]. 2021 Mar 11 [cited 2024 Jun 6];16(3):e0248420. https://doi.org/10.1371/journal.pone.0248420 PubMed | Google Scholar

4. Markos ST. Acceptance of Corona Virus Disease Vaccine and Its Associated Factors among Females Living In Hawassa City, Ethiopia, 2022 [dissertation]. Hawaasa (Ethiopia); Hawaasa University; 2022.

5. Ethiopia Public Health Institute, National Public Health Emergency Operation Center. COVID-19 PANDEMIC PREPAREDNESS AND RESPONSE IN ETHIOPIA WEEKLY BULLETIN Epi-Week- 27 (July 05 - 11, 2021) [Internet]. Adis Ababa (Ethiopia): Ethiopia Public Health Institute; 2021 July 11[cited 2024 Jun 6]. 21 p. Download EPHI_PHEOC_COVID-19_Weekly_Bulletin_63_English_07192021.pdf.

6. Aghaamoo S, Ghods K, Rahmanian M.Pregnant women with COVID-19: the placental involvement and consequences . J Mol Histol [Internet]. 2021 Apr 19[cited 2024 Jun 6];52(3):427-35. https://doi.org/10.1007/s10735-021-09970-4 PubMed | Google Scholar

7. Ames JL, Ferrara A, Avalos LA, Badon SE, Greenberg MB, Hedderson MM, Kuzniewicz MW, Qian Y, Young-Wolff KC, Zerbo O, Zhu Y, Croen LA.COVID-19 prevalence, symptoms, and sociodemographic disparities in infection among insured pregnant women in Northern California . PLoS ONE [Internet]. 2021 Sep 3 [cited 2024 Jun 6];16(9):e0256891. https://doi.org/10.1371/journal.pone.0256891 PubMed | Google Scholar

8. Mirzadeh M, Khedmat L.Pregnant women in the exposure to COVID-19 infection outbreak: the unseen risk factors and preventive healthcare patterns . The Journal of Maternal-Fetal & Neonatal Medicine [Internet]. 2020 Apr 7 [cited 2024 Jun 6];35(7):1377-78. https://doi.org/10.1080/14767058.2020.1749257 Google Scholar

9. Samannodi M.COVID-19 Vaccine Acceptability Among Women Who are Pregnant or Planning for Pregnancy in Saudi Arabia: A Cross-Sectional Study . PPA [Internet]. 2021 Nov 23[cited 2024 Jun 6]; 15:2609-18.https://doi.org/10.2147/ppa.s338932 PubMed | Google Scholar

10. McDonald CR, Weckman AM, Wright JK, Conroy AL, Kain KC. Pregnant Women in Low- and Middle-Income Countries Require a Special Focus During the COVID-19 Pandemic. Front Glob Womens Health [Internet]. 2020 Sep 25 [cited 2024 Jun 6];1:564560. https://doi.org/10.3389/fgwh.2020.564560 PubMed | Google Scholar

11. Wang PH, Lee WL, Yang ST, Tsui KH, Chang CC, Lee FK. The impact of COVID-19 in pregnancy: Part I. Clinical presentations and untoward outcomes of pregnant women with COVID-19. J Chin Med Assoc [Internet]. 2021 Sep [cited 2024 Jun 6];84(9):813-20. https://doi.org/10.1097/jcma.0000000000000595 Google Scholar

12. Basu JK, Chauke L, Magoro T.Maternal mortality from COVID 19 among South African pregnant women . J Matern Fetal Neonatal Med [Internet]. 2021 Mar 22 [cited 2024 Jun 5];35(25):5932-4. https://doi.org/10.1080/14767058.2021.1902501 PubMed | Google Scholar

13. Mose A, Yeshaneh A.COVID-19 Vaccine Acceptance and Its Associated Factors Among Pregnant Women Attending Antenatal Care Clinic in Southwest Ethiopia: Institutional-Based Cross-Sectional Study . IJGM [Internet]. 2021 Jun 8[cited 2024 Jun 5];14:2385-95. https://doi.org/10.2147/ijgm.s314346 PubMed | Google Scholar

14. Leik NKO, Ahmedy F, Guad RM, Baharuddin DMP.Covid-19 vaccine and its consequences in pregnancy: Brief review. Ann Med Surg (Lond) [Internet]. 2021 Nov 23 [cited 2024 Jun 5];72:103103. https://doi.org/10.1016/j.amsu.2021.103103 PubMed | Google Scholar

15. Wu J, Li Q, Silver Tarimo C, Wang M, Gu J, Wei W, Ma M, Zhao L, Mu Z, Miao Y.**COVID-19 Vaccine Hesitancy Among Chinese Population: A Large-Scale National Study**. Front Immunol [Internet]. 2021 Nov 29 [cited 2024 Jun 5];12:781161. **https://doi.org/10.3389/fimmu.2021.781161 PubMed** | **Google Scholar**

16. Goncu Ayhan S, Oluklu D, Atalay A, Menekse Beser D, Tanacan A, Moraloglu Tekin O, Sahin D.**COVID–19 vaccine acceptance in pregnant women** . Int J Gynaecol Obstet [Internet]. 2021 Apr 19 [cited 2024 Jun 5];154(2):291-6. **https://doi.org/10.1002/ijgo.13713 PubMed** | **Google Scholar**

17. Ministry of Health (ET).**Health and Health Related indicators: Responsive Health System in the New Beginnings** [Internet]. Addis Ababa (Ethiopia): Ministry of Health; 2022 Oct[cited 2024 Jun 17]. 51 p. Download pdf to view full document.

18. Sada TS, Tessema TS.**Isolation and characterization of lytic bacteriophages from various sources in Addis Ababa against antimicrobial-resistant diarrheagenic Escherichia coli strains and evaluation of their therapeutic potential** . BMC Infect Dis [Internet]. 2024 Mar 14 [cited 2024 Jun 5];24(1):310. **https://doi.org/10.1186/s12879-024-09152-z PubMed** | **Google Scholar**

19. Alshahrani SM, Alotaibi A, Almajed E, Alotaibi A, Alotaibi K, Albisher S.**Pregnant and Breastfeeding Women's Attitudes and Fears Regarding COVID-19 Vaccination: A Nationwide Cross-Sectional Study in Saudi Arabia** . Int J Womens Health [Internet]. 2022 Nov 25 [cited 2024 Jun 5];14:1629-1639. **https://doi.org/10.2147/IJWH.S387169 PubMed** | **Google Scholar**

20. Halemani K, Dhiraaj S, Latha T, Mishra P, Issac A.**The prevalence of COVID vaccine acceptance among pregnant women: A systematic review and meta-analysis** . Clinical Epidemiology and Global Health [Internet]. 2022 Sep 11 [cited 2024 Jun 5];17:101144. **https://doi.org/10.1016/j.cegh.2022.101144 Google Scholar**

21. Tefera Z, Assefaw M.**A Mixed-Methods Study of COVID-19 Vaccine Acceptance and Its Determinants Among Pregnant Women in Northeast Ethiopia** . Patient Prefer Adherence [Internet]. 2022 Aug 23[cited 2024 Jun 5];16:2287-2299. **https://doi.org/10.2147/ppa.s374217 PubMed** | **Google Scholar**

22. Chekol Abebe E, Ayalew Tiruneh G, Asmare Adela G, Mengie Ayele T, Tilahun Muche Z, Behaile T/Mariam A, Tilahun Mulu A, Abebe Zewde E, Dagnaw Baye N, Asmamaw Dejenie T.**COVID-19 vaccine uptake and associated factors among pregnant women attending antenatal care in Debre Tabor public health institutions: A cross-sectional study** . Front Public Health [Internet]. 2022 Jul 19 [cited 2024 Jun 5];10:919494. **https://doi.org/10.3389/fpubh.2022.919494 PubMed** | **Google Scholar**

23. Aynalem BY, Melesse MF, Zeleke LB.**COVID-19 vaccine acceptability and determinants among pregnant mothers attending antenatal care services at Debre Markos town public health institutions, Debre Markos Northwest Ethiopia: mixed study** . Pan Afr Med J [Internet]. 2022 Apr 12 [cited 2024 Jun 4]: 41:293. **https://doi.org/10.11604/pamj.2022.41.293.32618 PubMed** | **Google Scholar**

24. Kanyanda S, Markhof Y, Wollburg P, Zezza A.**Acceptance of COVID-19 vaccines in sub-Saharan Africa: evidence from six national phone surveys** . BMJ Open [Internet]. 2021 Dec 15 [cited 2024 Jun 4];11(12):e055159. **https://doi.org/10.1136/bmjopen-2021-055159 PubMed** | **Google Scholar**

25. World Health Organization. **Interim recommendations for use of the Pfizer-BioNTech COVID-19 vaccine, BNT162b2, under Emergency Use Listing** [Internet]. Geneva (Switzerland): World Health Organization; 2021 Jan 8 [updated 2022 Aug 18; cited 2024 Jun 4]. 16 p. Download WHO-2019-nCoV-vaccines-SAGE-recommendation-BNT162b2-2022.2-eng.pdf.

Table 1: Socio-demographic characteristics of respondents(N=348)		
		n (%)
Age category (years)	15-25	97 (27.9)
	26-35	143 (41.1)
	36-45	93(26.7)
	45 and above	15 (4.3)
Marital status	Married	281(80.7)
	Single	29(8.3)
	Divorced	8(2.3)
	Widowed	14(4.0)
	Separated	16(4.6)
Education	Can't read and write	27(7.8)
	Can read and write	61(17.5)
	Primary	32(9.2)
	Secondary	76(21.8)
	Diploma and above	152(43.7)
Occupation	Non gov't worker	83(23.9)
	Student	39(11.2)
	Civil servant	132(37.9)
	Housewife	82(23.6)
	Merchant	6(1.7)
	Other	6(1.7)

Table 2: Binary logistic regression analysis of factors associated with Covid-19 vaccine acceptance among pregnant women attending ANC at Addis Ababa public health centers, 2022

Variables		**COVID-19 vaccine acceptance**		cOR (95%CI)	p-value
		Yes (%) n=202	No (%) n=146		
Allergy to medicine	No	151 (74.8)	129 (88.4)	0.4(0.2-0.7)	0.002
	Yes	51 (25.2)	17 (11.6)	1	
Had COVID-19 infection	No	84 (41.6)	21 (14.4)	4.2 (2.5-7.2)	<0.001
	Yes	118 (58.4)	125 (85.6)	1	
Friend or family member who has been hospitalized or died	No	81 (40.1)	41 (28.1)	1.7 (1.1-2.7)	0.020
	Yes	121 (59.9)	105 (71.9)	1	
COVID-19 vaccines decrease the risk of COVID-19 symptomatic infection	No	167 (82.7)	84 (57.5)	1	
	Yes	35 (17.3)	62 (42.5)	3.5 (2.15-5.77)	<0.001
COVID-19 vaccine decreases the risk of transmission of COVID-19	No	51 (25.2)	64 (43.8)	2.3 (1.46-3.65)	<0.001
	Yes	151 (74.8)	82 (56.2)	1	
Do COVID-19 vaccine provide you with immediate protection after the first dose	No	59 (29.2)	82 (52.2)	3.1 (1.99-4.85)	<0.001
	Yes	143 (70.8)	64 (43.8)	1	
COVID-19 vaccine is effective treatment of active COVID-19 infection	No	68 (33.8)	90 (61.6)	1	
	Yes	133 (66.2)	56 (38.4)	3.14 (2.01-4.90)	<0.001
COVID-19 vaccine having side effects	No	31 (15.3)	16 (11.0)	1.47 (0.78-2.86)	0.2379
	Yes	171 (84.7)	130 (89.0)	1	
People who were previously infected with COVID-19 need to be vaccinated	No	44 (21.8)	36 (24.7)	0.83 (0.52-1.41)	0.5293
	Yes	158 (78.2)	110 (75.3)	1	
oppose vaccination concept all together	No	114 (56.4)	57 (39.0)	2.04 (1.32-3.23)	0.0014
	Yes	88 (43.6)	89 (61.0)	1	
Do you think young women need to be Vaccinated for COVID- 19 (18-24 yrs.)	No	30 (14.9)	119 (81.5)	0.04(0.02-0.1)	<0.001
	Yes	172 (85.1)	27 (18.5)	1	
Do you think COVID- 19 vaccine affects your fetus (1).	No	12 (5.9)	111 (76.0)	1	
	Yes	190 (94.1)	35 (24.0)	0.02 (0.01-0.04)	<0.001

Table 3: Factors associated with COVID-19 vaccine acceptance among pregnant women attending ANC at Addis Ababa public health centers,2022(N=348)

Variables		**Vaccine acceptability**		**cOR (95% CI)**	**aOR(95% CI)**
		Accepted	**Not accepted**		
Allergy to medicine	No	151	129	0.4(0.2-0.7)	0.2 (0.1-0.6) *
	Yes	51	17	1	1
Had COVID-19 infection	No	84	21	4.2 (2.5-7.2)	1.7 (0.8-3.6)
	Yes	118	125	1	1
Friend or family member who has been hospitalized or died	No	81	41	1.7 (1.1-2.7)	1.6 (0.8-3.1)
	Yes	121	105	1	1
COVID-19 vaccines decrease the risk of COVID-19 symptom at infection	No	167	84	1	1
	Yes	35	62	3.5 (2.1-5.7)	2.4 (1.1-5.1) *
COVID-19 vaccine decreases the risk of transmission of COVID-19	No	64	51	2.3 (1.5-3.6)	0.784 (0.36-1.7)
	Yes	82	151	1	1
Do the COVID-19 vaccine provide you with immediate protection after the first dose	No	82	59	3.1 (1.9-4.8)	1.6 (0.8-3.2)
	Yes	64	143	1	1
COVID-19 vaccine is an effective treatment of active COVID-19 infection	No	68	90	1	1
	Yes	133	56	3.1 (2.0-4.9)	2.4 (1.1-5) *
Do you think young women need to be vaccinated for COVID- 19 (18-24 yrs.)	No	30	119	0.04(0.02-0.1)	0.1 (0.05-0.2) *
	Yes	172	27	1	1
Do you think COVID- 19 vaccine affects your Fetus	No	12	111	1	1
	Yes	190	35	0.02(0.01-0.04)	0.2 (0.05-0.82)*

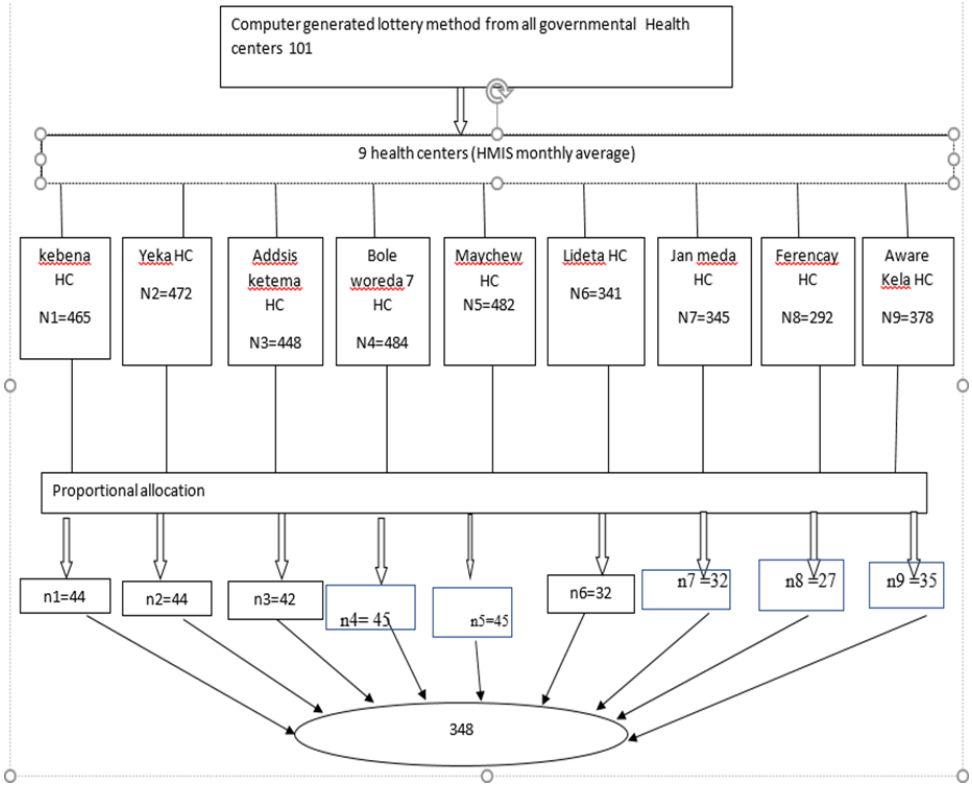

Figure 1: Schematic Presentation of Sampling Procedures

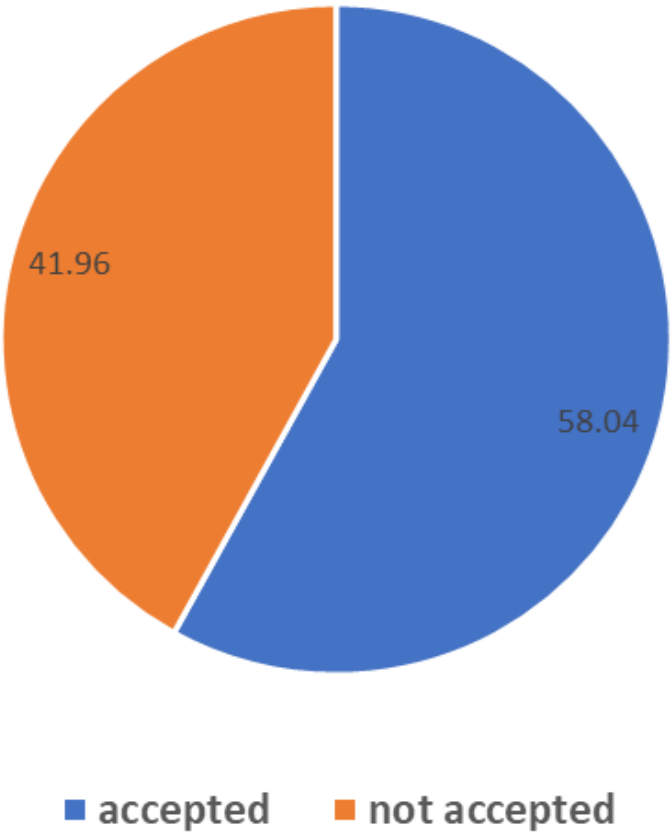

Figure 2: Vaccine acceptance among pregnant women attending ANC Visit, Addis Ababa city public health centers,2022