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ORIGINAL ARTICLE

COVID-19-related attitude and risk perception among pregnant women attending antenatal care, and the associated factors, at public health facilities of East Gojjam Zone, Ethiopia, 2020: a multi-center cross-sectional study

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Abstract

Aim This study aimed to assess COVID-19 (coronavirus disease 2019)-related attitude and risk perception among pregnant women attending antenatal care, and the associated factors, at public health facilities of the East Gojjam Zone, Ethiopia.

Subjects and methods A multi-center cross-sectional study was conducted, from December 1–30, 2020. A total of 847 pregnant women were included in the study using a simple random sampling technique. To collect the data, we used an interviewer-administered questionnaire. Bi-variable and multi-variable logistic regression analyses were used to identify factors associated with pregnancy-related anxiety. A p-value of < 0.05 with a 95% confidence level was used to declare statistical significance.

Results The magnitude of COVID-19-related positive attitude and high-level risk perception among pregnant women was 51.12% and 37.2% respectively. Having adequate knowledge [AOR: 2.09, 95% CI = (1.49–2.95)], ≥ 3 ANC visits [AOR: 1.43, 95% CI = 1.0–1.98], and a low level of risk perception [AOR: 6.27, 95% CI = (4.42–8.89)] were factors associated with a positive attitude of pregnant women with regard to the COVID-19 pandemic. Being urban residents [AOR: 2.24, 95% CI: 1.6–3.10], having wanted pregnancy [AOR: 3.35, 95% CI: 1.18–9.49], having a negative attitude [AOR: 6.21, 95% CI: 4.43–8.70], and a complicated pregnancy [AOR: 1.67, 95% CI: 1.02–-2.75] were factors significantly associated with risk perception of pregnant women with regard to the COVID-19 pandemic.

Conclusions Despite its high fatality, COVID-19 pandemic-related attitude and risk perception among pregnant women were low. As a result, health caregivers and other concerned bodies should consider interventions to improve pregnant women's risk perception and attitude during antenatal care and through various community information platforms.

Keywords Pregnant woman · Attitude · Risk perception · Associated factors · Ethiopia

Introduction

COVID-19 has emerged as a pandemic involving more than 210 countries (Din et al. 2020). The pandemic had devastating social, economic, and health impacts (Aduh et al. 2021). The effects can range from affecting livelihoods, increasing morbidity and mortality, overwhelming health systems, and triggering lasting geopolitical change (UNFPA 2020). During a pandemic, pregnant women and their fetuses are at a higher risk (Dashraath et al. 2020). The COVID-19 pandemic causes psychological distress and views, such as

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that the virus can be passed to a fetus during pregnancy and cause harm to the fetus (Saifi 2020).

The pandemic exposed pregnant women to higher risks of severe disease and poorer neonatal outcomes (Kok 2020), such as fetal distress, premature labor, and vertical transmission (Ashraf et al. 2020). In an Iranian, a congenital case of SARS-CoV-2 infection was reported (Choobdar et al. 2020). A systematic review also reported that vertical transmission of the pandemic occurred (Ashraf et al. 2020). Due to the danger of vertical transmission, pregnant women are one of the most vulnerable populations and must take preventive actions against COVID-19 (Saifi 2020). However, only 64.31 % of pregnant women in China perceived that protecting themselves from COVID-19 during pregnancy is possible (Chen et al. 2020).

A study in Pakistan reported that 67.8%, 83.2%, and 84.6% of women believe COVID-19 can damage their pregnancy, be transmitted to fetuses, and affect children respectively (Hossain et al. 2020). Despite this perception regarding the pandemic, there has been a drop in prenatal care visits and institutional deliveries, making it harder to reduce maternal and newborn morbidity and mortality and improve their health status (Naqvi et al. 2022).

Risk perception is people's subjective judgment about the likelihood of undesirable occurrences such as damage, disease, or death. It is a crucial factor in determining health-related and other activities. The media channels and types and the coverage, the frameworks used to describe risks, the valence and tone of the media coverage, the media sources and their perceived trustworthiness, and the formats have been reported as affecting the community's risk perception (Paek and Hove 2017). Identifying associated factors of risk perception is mandatory for designing appropriate risk communication strategies (Aduh et al. 2021).

The risk perception of pregnant women regarding COVID-19 can predict their protective behaviors against it (Aghababaei et al. 2020). A favorable attitude and a realistically formed risk perception towards the COVID-19 pandemic led to the practice of preventive measures against it (Gummesson and Sällman 2021). A study in Egypt reported that most pregnant women had a high-risk perception level regarding COVID-19 (Elmashad et al. 2021).

Socio-demographic characteristics (He et al. 2021), being nulliparous (Aghababaei et al. 2020), knowledge about COVID-19, and preventive measures against COVID-19 were factors affecting risk perception study participants with regard to COVID-19 (Asefa et al. 2020). Despite the rapid increase in the number of cases of COVID-19 and the high mortality rate, there is a scarcity of local data on pregnant women's risk perception and attitude regarding COVID-19. Therefore, this study aimed to assess COVID-19-related attitude and risk perception among pregnant women attending antenatal care, and the associated factors, at public health facilities of East Gojjam Zone, Ethiopia.

Methods

Study area and period

The study was conducted at public health facilities of the East Gojjam Zone of Amhara Regional State in the period December 1–30, 2020. East Gojjam Zone is a zone in the Amhara Region of Ethiopia, with a capital city of Debre Markos town (located 300 km from Addis Ababa, the capital city of Ethiopia, and 265 km from Bihar Dar, the capital city of Amhara). The East Gojjam Zone has 19 districts and 468 kebeles (the smallest administrative unit of Ethiopia, contained within a woreda). It has ten hospitals, 103 health centers, and 423 health posts. The zone has only one comprehensive specialized hospital (DMCSH).

Study design

A multi-center cross-sectional study was conducted.

Population

The study's source population included all pregnant women at public health facilities in the East Gojjam Zone of the Amhara Region, Ethiopia. All pregnant women attending ANC at selected public health facilities during data collection were the study population. The study excluded pregnant women with communication problems and/or serious illnesses.

Sample size determination

The sample size was determined using single population proportion formula considering the following assumptions: a prevalence of COVID-19-related attitude and risk perception among pregnant women in Ethiopia of 50%, 95% confidence level, 5% margin of error (absolute level of precision). Thus $n = (Z_{a/2})^2 \frac{p\,(1-p)}{d} = 1.96^2*0.5*0.5/\,(0.05)^2 = 384.16 \sim 385$. The final sample size was 847 after considering a 10% non-response rate and design effect two (2).

Sampling procedure and technique

A multistage sampling technique was employed. First, stratification was done based on the level of health facility. Then one-third from each type of health facility was taken using a simple random lottery sampling technique. Then, the sample size was allocated proportionally for each health facility.

Finally, a simple random lottery sampling technique used to select each study participant [Fig. 1].

Study variables

Dependent variable COVID-19-related attitude and risk perception among pregnant women.

Independent variables

Socio-demographic characteristics Age, residence, education level, marital status, occupation, monthly income, and situation of income.

Obstetrical characteristics Gravidity, status of pregnancy, ANC, gestational week of recent pregnancy, parity, complication during pregnancy, number of alive children, and history of abortion.

Individual characteristics Knowledge of the pregnant woman about COVID-19.

Operational definition

Adequate knowledge Pregnant women who scored above or equal to the mean value on knowledge-related questions had adequate knowledge about the COVID-19 pandemic. The knowledge-related questions had 28 items covering issues such as causes, symptoms, mode of transmission, risk perception, and preventive measures against the COVID-19 pandemic.

Positive attitude Pregnant women who scored above or equal to the mean value of ten attitude-related questions had a positive attitude about the COVID-19 pandemic.

Risk perception Pregnant women who scored above or equal to the mean value of fifteen risk perception-related items had a high-risk perception of the COVID-19 pandemic.

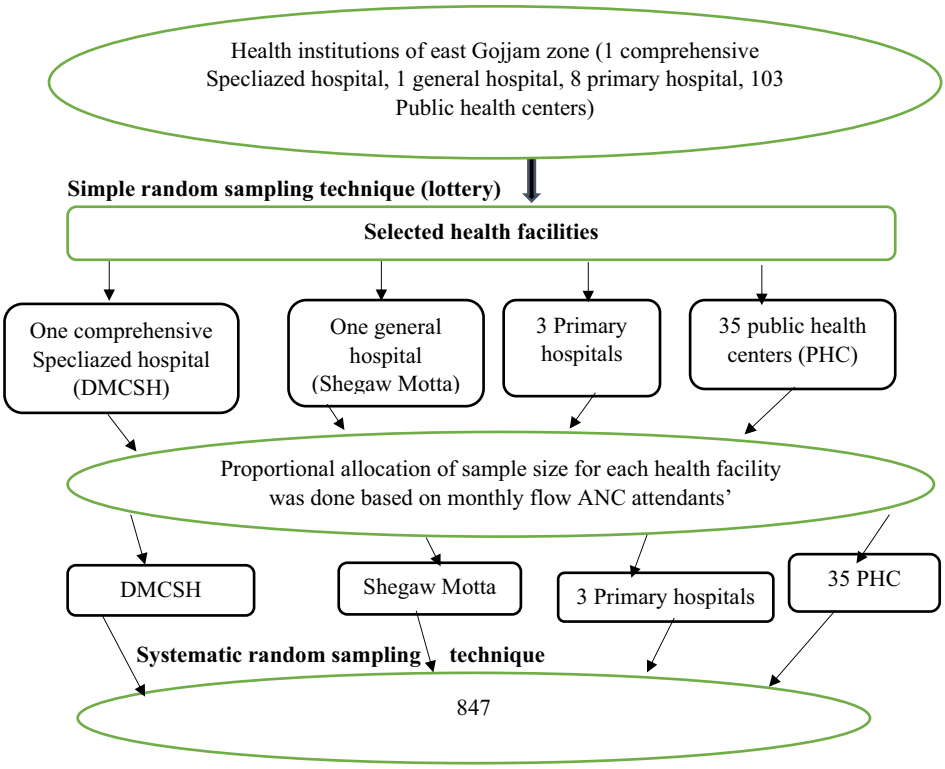

Fig. 1 Diagrammatic presentation of the sampling procedure of COVID-19-related attitude and risk perceptions among pregnant women attending antenatal care and the associated factors at public health facilities of the East Gojjam Zone, Ethiopia

*PHC= Public Health center, DMCSH= Debre Markos Comprehensive specialized hospital

PHC =Amber, Den, Wuseta, Mislewash, Kurar, Jamma, TsidMaryam, Wojel, Yesenbet, Waber, Gozamin, Yetnora ,Weynwuha, Yelamgej, Debrework, Amba Maryam, Jeremis, Kuyy, Yebabat, Amanuel, Dega Segnin,Yekebabat, Debre-Elias, Gofichima, Genet, Kork, Guayi, Debre Markos, Angot, Sedie, Gundewoyn, Gietie Semanni, Girraram, Mergechi Gemborie.

Primary hospitals: Lumame Hospital, Bichena Hospital and Yejubie Primary Hospital

Data collection tool

The data was collected using a pretested interviewer-administered questionnaire. The questionnaire was adapted from reviewed literature (Akalu et al. 2020, Moyer et al. 2020, Anikwe et al. 2020, Honarvar et al. 2020, Elmashad et al. 2021) with modification, and contextualized into the local setting. The questionnaire consisted of socio-demographic variables, obstetric chacterstics, knowledge, attitude, and risk perception of pregnant women towards the COVID-19 pandemic. The questionnaire was drafted in English and translated into Amharic. Twelve BSc midwives collected the data. Six MSc midwives who acted as the study's supervisors. Both pregnant and data collectors wore face masks during the data collection.

Data quality control

Before the data collection, training was given to the data collectors and supervisors. The questionnaire was translated from English to Amharic and back-translated to English to check the consistency. A pre-test was done at Fintoselam hospital on 5% of pregnant women to modify the questionnaire 2 weeks before the actual data collection time. Researchers and supervisors checked the completeness of the collected data during data collection.

Statistical analysis

The consistency and completeness of the questionnaires were first manually checked. Then data were entered into a computer by Epi data 4.2.and exported SPSS 25 for analysis. Summary statistics were computed to describe socio-demographic and other relevant variables. Results of the study were presented using tables. Multivariable logistic regression employed for variables with p-value < 0.25 in bivariate logistic regression to identify factors. A p-value of < 0.05 with a 95% confidence level was used to determine a statistical significance.

Results

Socio demographic characteristics of study participants

Out of the 847 sampled pregnant women, 806 responded to the questionnaires, making a response rate of 95.2%. Among these participants, 285 study participants (35.4%) belonged to the 25–29 years old age group, making this the largest age group. The mean age of the study participant was 27.57 ± 6.080 years. The study participants were predominantly married — 763 (94.6%). More than 50 % (426) of study participants were urban residents. About 42.6% of study participants didn't attend formal education. More than 40% of study participants reported that their monthly income had worsened in the previous 3 months [Table 1].

Obstetrics characteristics of study participants

This study reported that about 501 (62.2%) and 330 (40.9%) of study participants were multigravidas and nulliparous respectively. With regard to the status of abortion, about 70 (8.7%) had a history of abortion. Despite the fact that most of the study participants (774; 96%) had wanted pregnancy, only 306 (38 %) had ≥ 3 ANC visits. One hundred and three (12.8%) of study participants developed obstetrical complications. Of these, 27 (26.2%) and 19 (18.4%) developed hypertension and diabetes respectively [Table 2].

Table 1 Socio-demographic characteristics of pregnant woman attending ANC during COVID–19 pandemic at public health facilities of East Gojjam Zone, Amhara Region, Ethiopia, 2020 ($n = 806$)

Characteristics	Response	Frequency	Percent (%)
Age	15–19	59	7.3
	20–24	199	24.7
	25–29	285	35.4
	30–34	130	16.1
	≥ 35	133	16.5
Marital status	Married	763	94.6
	Divorced	15	1.9
	Single	4	0.5
	Widowed	24	3
Residence	Rural	380	47.1
	Urban	426	52.9
Level of education	No formal education	343	42.6
	Primary	169	21
	Secondary	105	13
	Diploma and above*	189	23.4
Occupation	Housewife	498	61.8
	Civil servant	148	18.4
	Private business	103	12.8
	Others*	57	7
Monthly salary	≤ 1000	126	15.6
	1001–3000	386	47.9
	3001–10000	292	36.2
	> 10000	2	0.2
Situation monthly income in the past 3 months	Worsened	329	40.8
	Improve	98	12.2
	Remain the same	379	47

Diploma and above* = BSc, MSc. Others* = daily laborer, farmer, student, employed in private sector.

Table 2 Obstetrical characteristics of pregnant women attending ANC during COVID-19 pandemic at public health facilities of East Gojjam Zone, Amhara Region, Ethiopia, 2020 ($n = 806$)

Characteristics	Response	Frequency	Percent (%)
Gravidity	Primi	305	37.8
	Multi	501	62.2
Parity	Nulliparous	330	40.9
	Primipara	170	21.1
	Multipara	306	38
History of abortion	Yes	70	8.7
	No	736	91.3
Number of ANC visit	< 3	500	62
	≥ 3	306	38
Status of pregnancy	Wanted	774	96
	Unwanted	32	4
Gestational age	< 37 weeks	739	91.7
	≥ 37 weeks	67	8.3
Number of alive children	< 3 children	734	91.1
	≥ 3 children	72	8.9
Medical health problem	Yes	103	12.8
	No	703	87.2
Types of medical health problem ($n = 103$)	Hypertension	27	26.2
	Diabetes miltus	19	18.4
	Pneumonia	8	7.8
	Asthma	25	24.2
	Cardiac	5	4.9
	Tuberculosis	11	10.7
	HIV/AIDS	8	7.8

COVID-19-related attitude of the study participants

According to this study, more than half of the respondents, 412 (51.12%, 95% CI: 47.67–54.57%), had a positive attitude towards the COVID-19 pandemic, whereas the rest (394; 48.9%) had a negative attitude towards COVID-19.

The study revealed that almost 60 % (483) of study participants agreed that avoiding crowded places prevents the spread of the virus, while 243 (29.8%) disagreed. Four hundred and ninety respondents (60.8%) believed that reporting a suspected case help to control the spread, while 157 (19.5%) did not agree. Nearly 60% of participants (481) agreed that isolating infected people at the selected health facility helped control the spread, while 179 (22.2%) disagreed. Three hundred and eighty-five (47.8%), 403 (50%), and 280 (34.7%) of study participants agreed that closing schools and universities, locking down and restricting travel, and restricting access to religious sites can help to contort the spread of COVID-19, respectively. The rest are reported in the following table [Table 3].

Factors associated with the attitude of pregnant woman to the COVID-19 pandemic

Multivariable logistic regression revealed that frequency of ANC visit, knowledge, and risk perception were significantly associated with the attitude of pregnant women towards COVID-19. The odds of having a positive attitude among participants with adequate knowledge were 2.09 times more likely than their less-informed counterparts (AOR: 2.09, 95% CI = 1.49–2.95).

The odds of having a positive attitude among pregnant with ≥ 3 ANC visits were 1.43 times more likely than those who had < 3 ANC visits (AOR: 1.43, 95% CI = 1.0–1.98). The study also revealed that pregnant women with a low level of risk perception were 6.27 times more likely to develop a positive attitude than those pregnant women with a high-risk perception (AOR:6.27, 95% CI = 4.42–8.89) [Table 4].

Table 3 COVID-19 pandemic-related attitude among pregnant woman attending ANC at public health facilities of East Gojjam Zone, Southwest Ethiopia, 2020 ($n = 806$).

Attitude-related questions	Response [frequency (%)]		
	Agree	Disagree	I don't know
Avoiding crowded places can help reduce the spread of COVID-19.	483 (59.9 %)	243 (29.8%)	80 (10.3%)
Reporting a suspected case can help to control the spread	490 (60.8%)	157(19.5%)	159 (19.7%)
Early detection of COVID-19 can improve outcome of treatment	465 (57.7%)	206 (25.6%)	13.5 (16.7%)
COVID-19 results in death of all infected people	365 (45.3%)	283 (35.1%)	158 (19.6%)
COVID-19 transmitted form animals to humans	329 (40.8%)	283 (35.1%)	129 (24.1%)
Covid-19 infected people should be isolated at selected health facility	481 (59.7%)	179 (22.2%)	146 (18.1%)
School and universities should be closed to control its spread	385 (47.8%)	237 (29.4%)	184 (22.8%)
Lock down and restricting travel can help to control the spread	403 (50%)	216 (26.8%)	187 (23.2%)
Health education plays a vital role to control the spread of COVID-19	643 (79.8%)	83 (10.3%)	80 (9.9%)
Restricting religious site access can help to control the spread	280 (34.7%)	377 (46.8%)	149 (18.5%)

Table 4 Factors associated with COVID-19 pandemic-related attitude among pregnant woman attending ANC at public health facilities of East Gojjam Zone, Southwest Ethiopia, 2020 (n = 806).

Variables	Attitude of pregnant women		COR (95%)	AOR (95%)	P-value
	Unfavorable	Favorable			
Residence					
Rural	200	180	1	1	
Urban	194	232	1.33 (1.01–1.75)	1.34 (0.90–1.98)	0.15
Age of women					
15–19	35	25	0.84 (0.46–1.56)	0.81 (0.40–1.64	0.55
20–24	113	87	0.91 (0.59–1.41)	0.63 (0.3–1.10)	0.08
25–29	118	165	1.65 (1.09–2.50)	1.33 (0.82–2.16)	0.24
30–34	56	74	1.56 (0.96–2.54)	1.31 (0.75–2.30)	0.34
≥ 35	72	61	1	1	
Occupation					
Housewife	263	233	1	1	
Civil servant	52	99	2.15 (1.47–3.14)	1.46 (0.80–2.66)	0.22
Merchant	50	53	1.20 (0.78–1.83)	1.10 (0.67–1.80)	0.72
Others	29	27	1.05 (0.60–1.83)	1.09 (0.58–2.06)	0.79
Educational status					
No formal education	195	148	1	1	
Primary	81	89	1.45 (1.00–2.09)	1.33 (0.85–2.07)	0.14
Secondary	49	56	1.51 (0.97–2.34)	1.20 (0.69–2.09)	0.31
College and above	69	119	2.27 (1.58–3.28)	1.05 (0.57–1.96)	0.58
ANC visit					
< 3	264	236	1	1	
≥ 3	130	176	1.51 (1.14–2.02)	1.43 (1.0–1.98)	0.03*
Over all knowledge					
Adequate	162	254	2.30 (1.74–3.05)	2.09 (1.49–2.95)	0.000*
Inadequate	232	158	1	1	
Risk perception					
High	321	185	1	1	0.000*
Low	73	227	5.40 (3.92–7.43)	6.27 (4.42–8.89)	

COVID-19 pandemic-related risk perception of pregnant woman

More than one-third of study participants (287; 35.6%), agreed they are at a high risk of getting COVID-19 infection compared to people of the same age, and 415 (51.5%) agreed that being infected with COVID-19 is serious. Three hundred and eleven respondents (38.6%) agreed that they could get COVID-19 without contact with infected people. In addition, more than two-thirds of respondents, 325 (40.3%) and 386 (47.9%), agreed that they couldn't perform their day-to-day activities and were at risk of death if they were infected respectively. Finally, less than one-quarter of respondents thought that they had a high risk of the following: being infected during pregnancy, risked transmission to neonate, PPH, cesarean section, a congenital anomaly, being premature, admission to NICU, and/or intrauterine death (9.6%, 17.9%, 15%, 12%, 15.5%14%, 20.8%, and 13.2% respectively) [Table 5]. This study also found that more than one-third of respondent pregnant women (300; 37.2%) had a high level of risk perception towards COVID-19, with 95% CI; 33.86–40.54.

Factors associated with the COVID-19 pandemic related with risk perception of study participants

In multivariable logistic regression, being an urban resident, having wanted pregnancy, having a negative attitude, and having a complicated pregnancy were factors associated with the COVID-19 risk perception of a pregnant woman.

The study revealed that pregnant women who were urban residents were 2.24 times more likely to have high-risk perceptions than rural residents (AOR: 2.24, 95% CI: 1.6-–3.10). The odds of developing high-risk perceptions among pregnant women with wanted pregnancy were 3.35 times more likely than their counterparts (AOR: 3.35, 95% CI: 1.18–9.49). In this study, pregnant women with a negative attitude were 6.21 times more likely to have a high-risk perception than pregnant women with a positive attitude (AOR: 6.21, 95% CI: 4.43–8.70). Finally, the odds of developing high-risk perceptions among pregnant women with a complicated pregnancy were 1.67 times more likely than their counterparts (AOR: 1.67, 95% CI: 1.02–2.75) [Table 6].

Table 5 COVID-19 pandemic related risk perception among pregnant woman attending ANC at public health facilities of East Gojjam Zone, Southwest Ethiopia, 2020 ($n = 806$)

	N	%	*N*	%	*N*	%	*N*	%	*N*	%
Risk perception pregnant about themselves	Strongly disagree		Disagree		Neither agree nor disagree		Agree		Strongly agree	
Is your risk of getting coronavirus is high, compared to most people of your age?	51	6.3	172	21.3	238	29.5	287	35.6	56	7.2
Do you think getting sick with the coronavirus would be serious?	24	3	74	9.2	112	13.9	415	51.5	181	22.5
Do you think that you will contract coronavirus even if you do not have contact with a COVID-19 patient?	60	7.4	188	23.3	126	15.6	311	38.6	121	15
Do you agree people may stigmatize you if get sick due to coronavirus?	48	6	197	24.4	148	18.4	312	38.7	101	12.5
Do you think you cannot manage your daily activities if you are infected?	46	5.7	185	23	153	19	325	40.3	97	12
Endanger life to death	27	3.3	108	13.4	154	19.1	386	47.9	131	16.3
Risk perception about pregnancy	Not at risk at all		Unlikely		Possible		High		Extremely high	
Risk COVID-19 infection during pregnancy?	127	15.8	117	14.5	294	36.5	158	9.6	110	13.6
Risk for transmission to the fetus, if the mother is COVID-19 infected?	135	16.7	142	17.6	294	36.5	144	17.9	91	11.3
Risk of postpartum hemorrhaging due to COVID-19 infection?	150	18.6	168	20.8	262	32.5	121	15	105	13
Risk of cesarean section due to COVID-19 infection?	151	18.7	179	22.2	279	34.6	97	12	100	12.4
Risk of dying of yourself as a result of COVID-19 infection?	140	17.4	160	20.6	292	36.2	115	14.3	93	11.5
Risk of baby being born prematurely due to COVID-19 infection?	151	18.7	151	18.7	280	34.7	125	15.5	99	12.3
Risk of baby having a birth defect due to COVID-19 infection?	146	18.1	210	26.1	252	31.3	113	14	85	10.5
Risk the fetus needing neonatal intensive care due to COVID-19 infection?	119	14.8	154	19.1	255	31.6	168	20.8	110	13.6
Risk of intrauterine death due to COVID-19 infection?	119	14.8	180	22.6	281	34.9	106	13.2	93	11.5

Discussion

The current study aimed to assess the COVID-19 pandemic-related attitude and risk perception among pregnant women attending ANC, and the associated factors, at public health facilities. Determining the level of the risk perception and attitude of pregnant women can predict their preventive practice, and identifying variables is crucial for developing appropriate risk communication methods and measures.

Attitude of pregnant women with regard to COVID-19

Our study findings found that the majority of study participants (343; 42.6%) did not attend formal education. This result is consistent with a study in North West Ethiopia education (Zeleke and Bayeh 2022) and Jimma, South West Ethiopia (Aboma 2021); in which the majority (58.6% and 71.1% respectively) of study participants did not attend formal education. But this result is inconsistent with studies in Lebanon (El Taha et al. 2022), Pakistan (Izhar et al. 2021), India (Rai et al. 2021), Nigeria (West et al. 2021), South Africa (Hoque et al. 2021), and Egypt (Mohamed et al. 2020). This difference might be due to the differences in the study setting and the socio-demographic characteristics of the study participants. According to this study, more than three-quarters of study participants (643; 79.8%) agreed that health education had a vital role in reducing the spread of COVID-19. Evidence from Australia (Gray et al. 2020) and Indonesia (Putri et al. 2021) supports this finding.

The present study found that more than half of pregnant women (51.12%) had a positive attitude regarding the COVID-19 pandemic. The result of the study is lower than studies from India — (98%; Rai et al. 2021), (97.3%; Tomar et al. 2021), and (95%; Kaur et al. 2021) — Iran (90%; Erfani et al. 2020), Turkey (87%; Uzuntarla and Ceyhan 2020), and Bangladesh (62.3%; Ferdous et al. 2020). A possible reason for this difference could be the difference in the educational status of the respondents, although the majority (42.6%) of the study participants in this study had no formal education compared to comparable studies, as most of study participants were highly educated. Well-organized awareness creation programs through social media platforms and sufficient human resources result in extensive public health information dissemination regarding COVID-19 that contribute to a more positive attitude in developed countries than in developing countries like Ethiopia.

However, this finding is higher than from studies in Pakistan (38.1%; Izhar et al. 2021), South Africa (25%; Hoque et al. 2021), and Nigeria (20.2%; West et al. 2021). The probable reason for the discrepancy might be the difference in sociodemographic characteristics and study setting. In addition, the time difference between studies may be the source of the discrepancy. This finding is also consistent with a study in Ethiopia (52.6%; Degu et al. 2021). But this result is higher than a study conducted in Debark Town, Northwest Ethiopia, in which the magnitude of positive attitude among pregnant women was 43% (Zeleke and Bayeh 2022). This discrepancy may be due to time differences and changing levels of awareness of study participants through time

Table 6 Factors associated with COVID-19 pandemic-related risk perception among pregnant woman attending ANC at public health facilities of East Gojjam Zone, Southwest Ethiopia, 2020 ($n = 806$)

Variables	Risk perception of pregnant women		COR (95%)	AOR (95%)	*P*-value
	Low	High			
Residence					
Rural	211	169	1.80 (1.35–2.41)	2.24 (1.6–3.10)	0.001*
Urban	295	131	1	1	
GA in weeks					
< 37 weeks	454	285	1.98 (1.07–3.69)	1.93 (0.98–3.86)	0.06
≥ 37 weeks	44	14	1	1	
Status of pregnancy					
Wanted	479	295	3.33 (1.27–8.73)	3.35 (1.18–9.49)	0.02*
Unwanted	27	5	1	1	
Attitude					
Positive	321	73	1	1	
Negative	185	227	5.40 (3.92–7.43)	6.21 (4.43–8.70)	0.001*
Complicated pregnancy					
Yes	74	29	1.60 (1.02–2.52)	1.67 (1.02–2.75)	0.04*
No	432	271	1	1	

*Statistically significant at a p value < 0.05

due to frequent communication and messaging on Covid-19 because of continuous awareness creation programs and exposure to information through various social media.

The current study found that pregnant women who had adequate knowledge regarding the COVID-19 pandemic were 6.27 times more likely to have a positive attitude than their counterparts who did not. Studies in South Korea (Lee et al. 2021a) and Nepal (Devkota et al. 2021) also reflected this finding. This is also consistent with a study in Nigeria, as good knowledge about COVID-19 was associated with a high-level positive attitude (Allagoa et al. 2020). In this study, pregnant women with ≥3 ANC visits were 1.43 times more likely than those with < 3 ANC visits. This is because more frequent ANC visits will create more opportunities to apply health educational guidelines to disseminate correct information regarding COVID-19 that improves the attitude of pregnant women. This may also be due to the importance of ANC in strengthening health education efforts to dispel misinformation and myths among pregnant women about the pandemic.

The study also revealed that pregnant women with a low level of risk perception were 6.27 times more likely to develop a positive attitude than those pregnant women with a high-risk perception. This could be due to ongoing counseling sessions during ANC and other information campaigns to reduce COVID-19-related misunderstandings by health caregivers and other concerned bodies, resulting in acceptable risk perception. Appropriate risk communication can help pregnant women to acquire a positive attitude toward COVID-19.

Risk perception of pregnant women with regard to COVID-19

Concerning the COVID-19-related risk perception of pregnant women, most study participants agreed regarding the risk of infection and death if they become infected. This result is comparable to studies in Pakistan (Din et al. 2020) and Egypt (Elmashad et al. 2021). Studies from Sweden (Gummesson and Sällman 2021) and China (Lee et al. 2021b) also supported this finding, where many study participants perceived their high-risk perception of contracting and dying from COVID-19 infection. The majority of study participants agreed that vertical transmission and unfavorable pregnancy outcomes such as preterm, IUFD (intra uterine fetal death), and admission to the neonatal intensive care unit (NICU) could occur due to COVID-19 infection. This finding is consistent with a study in Lahore, Pakistan (Saifi 2020) that pregnant women believed that COVID-19 infection was transmitted to the fetus and may result in adverse pregnancy outcomes.

The current study revealed that only 37.2% of pregnant women had a high-risk perception of COVID-19. This result is lower than previous studies in Nigeria (66.8%; Envuladu et al. 2021), Ghana (68.3%; Serwaa et al. 2020), and Egypt (78.5%; Elmashad et al. 2021). The possible explanation for this might be due to differences in sociodemographic characteristics of study participants and study setting. It might be also due to the difference in the quality of ANC services between nations, in which ANC may act as a source of information regarding COVID-19 for pregnant women. A study conducted in Ethiopia among waiters reported a higher magnitude (53.4%) of high-risk perception than this study. This is because waiters are more vulnerable due to contact with almost all individuals, especially foreigners who enter hotels and restaurants (Asefa et al. 2020). This result is also lower than from another local study (Eyeberu et al. 2021). The difference in the study setting and data collection questionnaire accounted for this discrepancy.

According to this study, urban residents' pregnant women were 2.24 times more likely than pregnant women in rural residents to have a high-risk perception. Studies in the United States (Chauhan et al. 2021) and Nigeria (Akwaowo et al. 2021) supported this evidence. High levels of information and risk cognition regarding COVID-19 among urban residents (Ripon et al. 2021, Rahman et al. 2021) lead to a high level of risk perception; hence, those more knowledgeable about the outbreak are more concerned about being infected during the pandemic (Vartti et al. 2009). Participants who lived in rural areas were generally less concerned about the COVID-19 pandemic than urban residents (Chauhan et al. 2021).

The study also revealed that pregnant women with a negative attitude were 6.21 times more likely to develop a high-risk perception than pregnant women with a positive attitude. Potentially ambiguous and harmful information that can be disseminated through various media outlets may lead to a high level of risk perception among study participants who had a negative attitude compared to a positive attitude. The stress and negative effect of the COVID-19 pandemic on the study participant's daily activities may contribute to a higher level risk perception. Lastly, exaggerating false beliefs about COVID-19 risk and its impact on pregnancy outcomes may lead to a higher risk perception among pregnant women with a negative attitude.

Finally, the study found out the odds of developing high-risk perception among pregnant women with a complicated pregnancy were 1.67 times more likely compared to others. A study in Canada supported this finding, in which pregnant women with medical risk had a high level of risk perception (Bayrampour et al. 2013).

Limitations

This study attempted to ensure the representativeness of the findings by including all health facility types of the zone. The cross-sectional nature of the study is considered a limitation of the study. The study was also prone to interviewer bias.

Conclusion

COVID-19 pandemic-related attitude and risk perception among pregnant women was low. Pregnant women's knowledge, ANC, and risk perception were variables significantly associated with attitude regarding the COVID-19 pandemic. COVID-19 pandemic-related risk perception of a pregnant woman was affected by residence, status pregnancy, complicated pregnancy, and a negative attitude. Therefore, more attention should be given towards improving COVID-19-related attitudes, knowledge, and risk perception among pregnant women during ANC. In addition, interventions to avoid complicated pregnancy should be considered.

List of abbreviations *ANC*: Antenatal Care; *AOR*: Adjusted Odd Ratio; *COVID-19*: Coronavirus Disease of 2019; *CI*: Confidence Interval; *COR*: Crude Odd Ratio; *SPSS*: Statistical Package for Social Sciences

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Authors' contributions Addisu Andalem and Keralem Anteneh Bishaw conceptualized the proposal, searched the literature, trained data collectors, and wrote the Results and Discussion sections. Addisu Andalem and Keralem Anteneh Bishaw together with Yibelu Bazezew Bitewa, Mamaru Getie Fetene, Zemenay Tiruneh, Endihnew Beka, Bewket Yeserah Aynalem, Biachew Asmare, Yidersal Hune, Dehnnet Abebe, Alehegn Aderaw, Temesgen Ayenew, Melaku Desta, and Samuel Debas Bayable contributed to the design of the study, data analysis, and interpretation. Keralem Anteneh Bishaw also prepared the first draft of the manuscript, critically reviewing and editing the manuscript. All authors read and approved the final version of the manuscript.

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Data availability All data included in the manuscript can be accessed from the corresponding authors through the following email address: keralemante2010@gmail.com.

Declarations

Ethical approval This study was performed in line with the principles of the Declaration of Helsinki. The study was approved by Debre Markos University, College of Health Science (Ref. No.: HSC/R/C/Ser/Co/214/11/13/).

Informed consent Informed consent was obtained from all study participants included in the study.

Consent for publication Not applicable

Competing interests All authors declare that they have no conflicts of interest.

References

Aboma D, Gurmu S (2021) Level of knowledge and preventive practices against Covid-19 pandemic infection among pregnant women visiting Serbo Health Center, Jimma Town, South West Ethiopia. Women's Health Med 10(1): 9–13. https://doi.org/10.35248/2167-0420.21.10.510

Aduh U, Folayan M, Afe A, Onyeaghala A, Ajayi I, Coker M, Tebeje Y (2021) Risk perception, public health interventions, and Covid-19 pandemic control in sub-Saharan Africa. J Public Health Africa. https://doi.org/10.4081/jphia.2021.1622

Aghababaei S, Bashirian S, Soltanian A, Refaei M, Omidi T, Ghelichkhani S, Soltani F (2020) Perceived risk and protective behaviors regarding COVID-19 among Iranian pregnant women. Middle East Fertility Soc J 25:1–9. https://doi.org/10.1186/s43043-020-00038-z

Akalu Y, Ayelign B, Molla MD (2020) Knowledge, attitude and practice towards COVID-19 among chronic disease patients at Addis Zemen Hospital, Northwest Ethiopia. Infection Drug Resistance 13:1949

Akwaowo CD, Eyo CS, Umoh IO, Ekpin VI, Esubok NU (2021) Perception and practices towards Covid-19 amongst residents in Southern Nigeria. Nigerian Postgraduate Med J 28:149. https://doi.org/10.4103/npmj.npmj_554_21

Allagoa DO, Oriji PC, Obagah L, Tekenah ES, Dambo N, Atemie G (2020) Knowledge, attitudes and practices towards Covid-19 among pregnant women in a tertiary hospital in South-South, Nigeria. Int J Res Rep Gynaecol 3:35–41

Anikwe CC, Ogah OO, Anikwe IH, Okorochukwu BC, Ikeoha CC (2020) Coronavirus disease 2019: knowledge, attitude, and practice of pregnant women in a tertiary hospital in Abakaliki, southeast Nigeria. Int J Gynecol Obstet 151(2):197–202. https://doi.org/10.1002/ijgo.13293

Asefa A, Qanche Q, Hailemariam S, Dhuguma T, Nigussie T (2020) Risk perception towards COVID-19 and its associated factors among waiters in selected towns of Southwest Ethiopia. Risk Manag Healthc Policy13:2601–2610. https://doi.org/10.2147/RMHP.S276257

Ashraf MA, Keshavarz P, Hosseinpour P, Erfani A, Roshanshad A, Pourdast A, Sohrabi PN, Chaichian S, Poordast T (2020) Coronavirus disease 2019 (COVID–19): a systematic review of pregnancy and the possibility of vertical transmission. J Reproduct Infertil 21:157

Bayrampour H, Heaman M, Duncan KA, Tough S (2013) Predictors of perception of pregnancy risk among nulliparous women. J Obstet Gynecol Neonatal Nurs 42:416–427. https://doi.org/10.1111/1552-6909.12215

Chauhan RS, da Silva DC, Salon A, Shamshiripour E, Rahimi U, Sutradhar S, Khoeini A, Mohammadian K, Derrible S, Pendyala R (2021) COVID-19 related attitudes and risk perceptions across urban, rural, and suburban areas in the United States. Findings June:23714. https://doi.org/10.32866/001c.23714

Chen S, Zhuang J, Chen Q, Tan X (2020) Psychological investigation on pregnant women during the outbreak of COVID-19. https://doi.org/10.21203/rs.3.rs-34763/v2

Choobdar FA, Ghassemzadeh M, Attarian M, Abbariki E, Nateghian A, Ghanbari B, Hamzehi SS, Hashemi MR, Azarbin Z (2020) Transplacental transmission of SARS-CoV-2 infection: a case report from Iran. Arch Pediatr Infect Dis.9(2):e108582

Dashraath P, Jeslyn WJL, Karen LMX, Min LL, Sarah L, Biswas A, Choolani MA, Mattar C, Lin SL (2020) Coronavirus disease 2019 (COVID-19) pandemic and pregnancy. Am J Obstet Gyneco 222(6): P521–P531. https://doi.org/10.1016/j.ajog.2020.03.021

Degu A, Nibret G, Gebrehana H, Getie A, Getnet B (2021) Knowledge and attitude towards the current pandemic Corona Virus disease

and associated factors among pregnant women attending antenatal care in Debre Tabor General Hospital Northwest Ethiopia: an institutional-based cross-sectional study. Int J Women's Health 13:61–71

Devkota HR, Sijali TR, Bogati R, Clarke A, Adhikary P, Karkee R (2021) How does public knowledge, attitudes, and behaviors correlate in relation to COVID-19? A community-based cross-sectional study in Nepal. Front Public Health 8:589372. https://doi.org/10.3389/fpubh.2020.5893

Din YM, Munir SI, Razzaq SA, Ahsan A, Maqbool S, Ahmad O (2020) Risk perception of COVID-19 among pregnant females. Annals King Edward Med Univ 26:176–180

El Taha L, Beyrouthy C, Tamim H, Ghazeeri G (2022) Knowledge and attitudes among Lebanese pregnant women and women seeking fertility treatment during the COVID-19 outbreak: a cross-sectional survey. BMJ Open 12:e057873. https://doi.org/10.1136/bmjopen-2021-057873

Elmashad AM, El-Maksoud MMA, Abd-Ella NY (2021) COVID-19 risk perception of pregnant women and its relationship with their protective behaviors. Egyptian J Health Care 12:421–437

Envuladu EA, Okoh EO, Gwomson D, Shindang MI, Maigamo NY, Osagie IA, Zoakah AI (2021) COVID 19 related social stigma among women of reproductive age in Jos, Plateau State, Nigeria. J Internal Med Primary Health Care 5:011. https://doi.org/10.24966/VRV-0193/100016

Erfani A, Shahriarirad R, Ranjbar K, Mirahmadizadeh A, Moghadami M (2020) Knowledge, attitude and practice toward the novel coronavirus (COVID-19) outbreak: a population-based survey in Iran. Bull World Health Organ 30(10):2471. https://doi.org/10.2471/blt.20.256651

Eyeberu A, Mengistu DA, Negash B, Alemu A, Abate D, Raru TB, Wayessa AD, Debela A, Bahiru N, Heluf H (2021) Community risk perception and health-seeking behavior in the era of COVID-19 among adult residents of Harari regional state, eastern Ethiopia. SAGE Open Med 9:20503121211036132. https://doi.org/10.1177/20503121211036

Ferdous MZ, Islam MS, Sikder MT, Mosaddek ASM, Zegarra-Valdivia J, Gozal D (2020) Knowledge, attitude, and practice regarding COVID-19 outbreak in Bangladesh: an online-based cross-sectional study. PLoS One 15:e0239254. https://doi.org/10.1371/journal.pone.0239254

Gray DJ, Kurscheid J, Mationg ML, Williams GM, Gordon C, Kelly M, Wangdi K, McManus DP (2020) Health-education to prevent COVID-19 in schoolchildren: a call to action. Infectious Dis Poverty 9:1–3. https://doi.org/10.1186/s40249-020-00695-2

Gummesson E, Sällman E (2021) Risk perception and protective behaviours regarding COVID-19 among pregnant people in Sweden. Lund University, Lund, Sweden.

He S, Chen S, Kong S, Liu W (2021) Analysis of risk perceptions and related factors concerning COVID-19 epidemic in Chongqing, China. J Community Health 46:278–285. https://doi.org/10.1007/s10900-020-00870-4

Honarvar B, Lankarani LB, Kharmandar A, Shaygani F, Zahedroozgar M, Haghighi MRR, Ghahramani S, Honarvar H, Daryabadi MM, Salavati Z (2020) Knowledge, attitudes, risk perceptions, and practices of adults toward COVID-19: a population and field-based study from Iran. Int J Public Health 65:731–739. https://doi.org/10.1007/s00038-020-01406-2

Hoque AM, Alam AM, Hoque M, Hoque ME, Van Hal G (2021) Knowledge, attitudes, and practices towards COVID-19 of pregnant women at a primary health care facility in South Africa. Eur J Med Health Sci 3:50–55. https://doi.org/10.24018/ejmed.2021.3.1.654

Hossain N, Samuel M, Sandeep R, Imtiaz S, Zaheer S (2020) Perceptions, generalized anxiety and fears of pregnant women about Corona Virus infection in the heart of pandemic. (preprint). https://doi.org/10.21203/rs.3.rs-32235/v1

Izhar R, Husain S, Tahir MA, Husain S, Hussain S (2021) Pregnant during the COVID-19 pandemic: knowledge, concerns, attitudes and practices of Pakistani women. Eur J Midwifery 5:54. https://doi.org/10.18332/ejm/142818

Kaur TP, Rana A, Perumal V, Sharma A, Dadhwal V, Kulshrestha V, Singhal S, Meena J, Kumar S, Bhatla N (2021) A cross-sectional analysis to evaluate knowledge, attitude and practices among pregnant women during COVID-19 pandemic. J Obstet Gynecol India 71:18–27. https://doi.org/10.1007/s13224-021-01558-y

Kok TL (2020) Attitude and perceptions towards COVID-19 among pregnant women in Singapore: a cross-sectional survey. (Preprint). https://doi.org/10.21203/rs.3.rs-67288/v1

Lee M, Kang BA, You M (2021a) Knowledge, attitudes, and practices (KAP) toward COVID-19: a cross-sectional study in South Korea. BMC Public Health 21:1–10. https://doi.org/10.1186/s12889-021-10285-y

Lee T-Y, Zhong Y, Zhou Y, He X, Kong R, Ji J (2021b) The outbreak of coronavirus disease in China: risk perceptions, knowledge, and information sources among prenatal and postnatal women. Women Birth 34:212–218. https://doi.org/10.1016/j.wombi.2020.05.010

Mohamed AI, Elsayed DMS, Abosree TH, Eltohamy NHE (2020) Pregnant women's knowledge, attitude and self-protective measures practice regarding Corona virus prevention: health educational intervention. Egyptian J Health Care 11:260–278

Moyer CA, Compton SD, Kaselitz E, Muzik M (2020) Pregnancy-related anxiety during COVID-19: a nationwide survey of 2,740 pregnant women. (Preprint). https://doi.org/10.21203/rs.3.rs-37887/v1

Naqvi F, Naqvi S, Billah SM, Saleem S, Fogleman E, Peres-da-Silva N, Figueroa L, Mazariegos M, Garces AL, Patel A (2022) Knowledge, attitude and practices of pregnant women related to COVID-19 infection: across-sectional survey in seven countries from the Global Network for Women's and Children's Health. BJOG 129(8):1289–1297. https://doi.org/10.1111/1471-0528.17122

Paek H-J, Hove T (2017) Risk perceptions and risk characteristics. Oxford Res Encyclopedia Commun. https://doi.org/10.1093/acrefore/9780190228613.013.283

Putri SI, Widiyanto A, Fajriah AS, Atmojo JT, Akbar PS, Qomariah NL (2021) Health education for the prevention of Covid-19 transmission with the 3M movement in Ngaglik District, Batu City, East Java. Jurnal Empathy Pengabdian Kepada Masyarakat 2021:57–62. https://doi.org/10.37341/jurnalempathy.v0i0.32

Rahman FN, Bhuiyan MAA, Hossen K, Khan HT, Rahman A, Dalal K (2021) Challenges in preventive practices and risk communication towards COVID-19: a cross-sectional study in Bangladesh. Int J Environ Res Public Health 18:9259. https://doi.org/10.3390/ijerph18179259

Rai S, Poonja N, Nandhan N, Chauhan N, Alevoor S (2021) Knowledge, attitude and practice towards the Corona Virus [COVID-19] pandemic among the pregnant women. J Evol Med Dent Sci 10:1191–1196. https://doi.org/10.14260/jemds/2021/255

Ripon MKH, Khan NM, Khan AA, Ahmed R, Afrin S, Sayed MA, Moghal MMR (2021) A comparative study on the knowledge and attitude of COVID-19 among urban and rural populations of Bangladesh. Turkish J Public Health 20(1):104–116. https://doi.org/10.20518/tjph.860245

Saifi HZ (2020) Impact of COVID-19 on mental health of pregnant women attending tertiary care hospital

Serwaa D, Lamptey E, Appiah AB, Senkyire EK, Ameyaw JK (2020) Knowledge, risk perception and preparedness towards coronavirus disease-2019 (COVID-19) outbreak among Ghanaians: a quick online cross-sectional survey. Pan African Med J 35(Suppl 2):44. https://doi.org/10.11604/pamj.supp.2020.35.2.22630

Tomar BS, Singh P, Nathiya D, Suman S, Raj P, Tripathi S, Chauhan DS (2021) Indian community's knowledge, attitude, and practice toward COVID-19. Indian J Social Psychiat 37:48. https://doi.org/10.1101/2020.05.05.20092122

UNFPA (2020) The impact of Covid-19 on maternal health and family planning in Viet Nam. Estimates and modelling scenarios. https://vietnam.unfpa.org/en/publications/impact-covid19-maternal-health-and-family-planning-viet-nam. Accessed 31 Oct 2022

Uzuntarla Y, Ceyhan S (2020) Knowledge, attitude and behavior towards COVID-19 among the Turkish healthcare workers. J Clin Med Kazakhstan 6:93–98. https://doi.org/10.23950/jcmk/9271

Vartti A-M, Oenema A, Schreck M, Uutela A, de Zwart O, Brug J, Aro AR (2009) SARS knowledge, perceptions, and behaviors: a comparison between Finns and the Dutch during the SARS outbreak in 2003. Int J Behavioral Med 16:41–48. https://doi.org/10.1007/s12529-008-9004-6

West B, Aitafo J, Genesis D, Kalio B (2021) Knowledge, attitudes and practices of pregnant women attending the antenatal clinic of Rivers State University Teaching Hospital, Nigeria towards the Coronavirus (COVID-19) pandemic. Int J Health Sci Res 11:21–33. https://doi.org/10.52403/ijhsr.20210403

Zeleke AM, Bayeh GM (2022) Knowledge, attitude and practice towards COVID-19 and associated factors among pregnant women at Debark Town Northwest Ethiopia: An institutional-based cross-sectional study. https://doi.org/10.53346/wjast.2022.1.1.0031