

Declaration

I, hereby declare that the thesis entitled “**Antenatal care service utilization among women of recent delivery under COVID environment: Analysis of the determinants of access and quality of services in selected health facilities in Burayu town, Oromia, Ethiopia**” is my original work and has not been submitted earlier for the award of any academic degree or diploma. I also declare that no chapter of this thesis in the whole or part incorporated in this thesis from any earlier work done by others or me. The participant’s rights to anonymity, withdrawal from the study without prejudice.

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Approval Sheet

This is to certify that the thesis prepared by **Mr. Lemma Terfassa Deressa** entitled “**Antenatal Care Service Utilization among Women of Recent Delivery under COVID Environment: Analysis of the determinants of access and quality in selected Health Facilities in Burayu Town, Oromia, Ethiopia**”, and submitted in partial fulfilments of the requirements for the degree of masters of science in population studies (Reproductive Health) complies with the regulations of the university and meets the accepted standards with respect to the originality and quality.

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Dedication

To love of my life, Dinkinesh Amente

And

Ko'isan and Milto, the greatest blessing I have received from God.

“Education breeds confidence, Confidence breeds hope, Hope breeds peace.”

Confucius

Acknowledgment

Above all, I praise and glorify the Almighty God for all His blessings and guidance in my life and for giving me patience and strength throughout this study. I would like to express my heartfelt thanks to Professor Nigatu Regassa. I am privileged to have Professor Nigatu as my advisor. Throughout this study, he gave me his excellent and constructive comments and diligent efforts in providing professional guidance and he supported me at any time.

Next, I would like to express my deepest gratitude to Prof. Gobena Ameni and Dr. Balako Gumi from Addis Ababa University for their unforgettable financial support not only for conducting this study but also to attend my MSc program. They are PI and coordinator respectively of the research project entitled “**ABtbCD**” funded by the Bill and Melinda Gates Foundation (BMGF) and the Department for International Development of the United Kingdom (DFID), which funded me for my MSc programme and this study.

I also wish to extend my thanks to the Burayu health bureau. Burayu health care center workers who co-operated in the study and all the study participants for their participation.

Acronyms/Abbreviations

ABtbCD	Accelerating Bovine Tuberculosis Control in Developing Countries
AIDS	Acquired Immunodeficiency Syndrome
ANC	Antenatal Care
ANOVA	Analysis of Variance
AOR	Adjusted Odds Ratio
CI	Confidence Interval
COVID-19	Novel Coronavirus
CSA	Central Statistical Agency
DHS	Demographic and Health Survey
EDHS	Ethiopian Demographic and Health Survey
FANC	Focused Antenatal Care
FMOH	Federal Ministry of Health
HIV	Human Immunodeficiency Virus
HSTP	Health Sector Transformation Plan
ICFI	Inner City Fund International
LMICs	Lower and Middle-Income Countries
NGOs	Non-Governmental Organizations
NRR	Non-response Rate
SNNPR	Southern Nation, Nationalities, and Peoples Region
SPSS	Statistical Package for Social Sciences
SS	Sample Size
SSA	Sub-Saharan Africa
STDs	Sexually Transmitted Diseases
UNFPA	United Nations Fund for Population Activities
WHO	World Health Organization
UNICEF	United Nations Children's Fund

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Abstract

In Ethiopia, although the use of maternal health services, including antenatal care has improved, most of the mothers do not attend and use a minimum number of four visits and the six-core set of items of ANC services recommended by the World Health Organization (WHO). Therefore, the objective of the study was to investigate determinants and quality of ANC in the Burayu Healthcare center, Ethiopia. A cross-sectional study was conducted on 420 mothers who gave birth within the past six months as of March to June 2021 at Burayu Healthcare center, Ethiopia. Data were entered into Epi data version 3.1 and exported to STATA version 14 software. Multivariable logistic and Negative Binomial regression models were used to determine the determinants of the two outcome variables. Among the 420 mothers included in this study, the majority of the mothers (68.6%) attended 4⁺ ANC visits and a very small proportion (1.9%) of mothers received all the six selected elements of ANC services. In multivariable logistic regression analysis of the determinants of frequency of ANC visits, women who were from urban, early starters of ANC visit, those with inter-pregnancy of less than or equal to 24 months and who had pregnancy-related acute illness had higher odds of receiving at least 4⁺ visits compared to their respective reference categories. Similarly in multivariate negative binomial regression analysis, married mothers, mothers with morbidity history, pregnancy-related acute illness, and who spent less than 30 minutes to reach health facilities were more likely to receive the WHO recommended items/contents of ANC services than their counter parts. Their respective odds ratios were marital statuses ($AOR = 1.05$; $95\%CI: 1.01-1.09$), mothers with no morbidity history ($AOR = 1.03$, $95\% CI: 1.02-1.06$), and the mothers who lives at a distant greater than one hour from health facilities ($AOR = 1.88$; $95\% CI: 1.85-1.91$). Moderate and extremely low levels of compliance with the WHO minimum recommended ANC visit (4⁺ visit) and core contents or items of the ANC respectively have been observed in Burayu town. Health promotion programs targeting mothers are vital to increase their awareness about the importance of antenatal services and to improve the coverage and contents of ANC services in Burayu.

Keywords: Antenatal Care Utilization, Recently delivered mothers, Burayu, Ethiopia

I. INTRODUCTION

1.1. Background of the study

Coronavirus is a disease caused by a virus known as COVID-19, and was first discovered on December 19 in Wuhan, China, and has since then spread to countries in the world (Rasmussen et al., 2020). Some studies indicated that the ongoing COVID-19 pandemic has affected the pregnant mother's ANC visits in more than half of the participants. For instance, a study done in Naples reported the psychological impact of COVID-19 as severe, and a similar number of pregnant women reported worrying about the vertical transmission of the infection (Saccone et al., 2020), which affects the likelihood of ANC visits.

Antenatal care is the care pregnant women receive from health professionals during pregnancy at regular intervals to monitor maternal well-being, fetal well-being, and progress of fetal growth. Antenatal Care/ANC (i.e., "care before birth") was introduced in high-income countries in the early 1900s, aiming to help women remain healthy; find and correct adverse conditions, when present; and promote the health of the unborn baby. According to WHO definition, it is the "services or cares a pregnant mother receives before birth. (Akowuah et al., 2018). The health care services utilization given from the Health care center is a very important proximate determinant of maternal and infant outcomes (Reynolds et al., 2006). It is possible to prevent the cause of maternal and antenatal deaths related to obstetric complications and can improve certain outcomes of pregnancy complications by well-timed ANC utilization (Reynolds et al., 2006). However, it is not easy to create and maintain effective maternity services for women in developing countries (Fekede and G/Mariam, 2007; Tunçalp et al., 2017b).

Even though the use of maternal health services had improved in Ethiopia, most of the mothers do not attend the minimum number of four ANC visits recommended by WHO (Abosse et al., 2010; CSA, 2016; Mulat et al., 2015). EDHS indicated that a trend analysis of the ANC from 2000 to 2016 showed that there was a significant increase in the proportion of mothers who had at least one ANC visit. Accordingly, the increment indicated from 27.2% in 2000 to 28.3% in 2005, 42.5% in 2011, and 62% in 2016 (CSA, 2016). In 2016, thirty-two percent of women had at least four ANC visits during their last pregnancy. The increase was significant during the period 2005 to 2011(CSA, 2016)

Studies in different countries show that the age of the mother, the number of children, education level, place of residence, occupation, religion, socioeconomic level, and obstetric medical history are factors that are significantly related to the use of antenatal care (Ali et al., 2018; Ayalew and Nigatu, 2018; Birmeta et al., 2013; Tadesse et al, 2020). Most previous studies in Ethiopia have reflected the low use of prenatal care in cities and towns (Bayou et al., 2016; Fekede and G/Mariam, 2007). In addition, understand the recommended number of antenatal checkups, attitudes to prenatal care, education level, and decision-making, respondents' income and well-being are still barriers to receiving obstetric care services (Bayou et al., 2016; Tsega and Beyene, 2015).

A cross-sectional study conducted in Tigray, Ethiopia, showed that the use of antenatal care services was closely related to the marital status, education level, closeness to the clinic, and occupation (Tsegay et al., 2013). Another study from the Hadiya zone in Ethiopia also found that the mother's age, husband's attitude, family size, maternal height, education level, and estimated morbidity were significantly related to antenatal use (Abosse et al., 2010). According to studies conducted in Boricho District, educational status of the respondents, occupation of

their partners, Number of pregnancies, number of live birth, birthplace, and midwife's occupation are also closely related to the use of antenatal care (Dulla et al., 2017). According to a retrospective study in Womberma Woreda in northwestern Ethiopia, planned pregnancy, and autonomous mothers of health care decision-making were highly related to the use of ANC services (Mulat et al., 2015).

According to CSA and ICF reports, among mothers who received ANC, about (75%) mothers had their blood pressure measured, 73% had a blood sample taken, and 66% had a urine sample taken as a part of an ANC visit. Accordingly, (66%) of mothers received nutritional counseling during their ANC visits (CSA, 2016). The increment of visitors to ANC had been made by three components from 2000 and 2016. The prevalence of pregnant women who had a urine sample collected increased from 21% in 2000 to 66% in 2016 and blood samples from 25% in 2000 to 73% in 2016. The prevalence of women who had their blood pressure measured increased from 69% to 75 between 2000 and 2016 (CSA, 2016). The OVID19 pandemic poses a major challenge for countries to maintain basic, high-quality medical care for mothers and newborns (UNICEF, 2020).

Therefore, this study aimed to assess the use of pregnancy care services in recent delivery during COVID-19 pandemic; the analysis of the determinants and quality services conducted in selected health facilities in Burayu town, Oromia.

1.2. Statement of the Problem

Worldwide, 303,000 mothers die each year from complications of pregnancy and childbirth, 99% of which occur in sub-Saharan Africa and Southern Asia (Ayalew and Nigatu, 2018; Tadesse, 2020). Maternal mortality during pregnancy or within 42 days of termination of

pregnancy remains high in sub-Saharan Africa, including Ethiopia (Ayalew and Nigatu, 2018; Robertson et al., 2020). Globally, 85% of pregnant women have received at least one antenatal care provided by trained medical professionals, only 49% of people have had at least four antenatal visits in sub-Saharan Africa (UNICEF, 2017). More than 70% of women in the world have received at least one prenatal check-up during pregnancy, but there are large differences between countries. Coverage is extremely high in high-income countries (98%) compared to in low and middle-income countries (68%) (Tunçalp et al., 2017b).

The majority (62%) of pregnant mothers in Ethiopia have received antenatal care at least once, while only 26% of pregnant women have been admitted to medical institutions (Mehretie et al., 2018). Another study indicated that in Ethiopia, only 40% of mothers aged 15-49 received ANC1 (at least one visit) from qualified health providers, like the doctor, nurse, or midwifery (CSA, 2016). On the other hand, during the entire treatment period, only 32% of mothers with live births received ANC4 (at least four visits) during their pregnancy, which is below the average rates for least developed countries and Sub-Saharan Africa which is 44% and 47% respectively (UNICEF, 2015).

There is a big gap between the mini-DHS value of maternal health in 2019 and the five-year target planned in HSTP, i.e. ANC at least four visit coverage is planned to be 95% at the end of 2020 (FMOH, 2015). Whereas the coverage was 32% in 2014 (CSA, 2016). According to the 2016 EDHS, the maternal mortality rate in Ethiopia is estimated at 412 deaths per 100,000 live births. Most of these deaths occur unpredictably during childbirth, and immediately after delivery (CSA, 2016). According to Tegegne, the proportion of women who had at least four ANC visits during their last pregnancy was 36.78% (66.93% urban, 28.41% rural) (Tegegne et al., 2019). The use of ANC service varies by region, zones, and city administration.

Accordingly, the highest number of four or more antenatal care visits was reported in Addis Ababa (89.33%), followed by Dire Dawa (65.15%) and the Tigray Region (55.83%) (Tegegne et al., 2019).

Therefore, this study has aimed to assess the determinants of frequency and items/ qualities of ANC utilization among recently delivered mothers who attended public facilities in Burayu town under the COVID-19 pandemic era. The findings of this study may close the information gap and limited evidence indicated in different scientific literature. In addition, the result of this study might be used to design strategies for prioritizing maternal healthcare, even within the COVID-19 pandemic period.

1.3. Objectives of the study

The major objective of this study was to examine the determinants and quality of ANC service among recent delivery women in selected health facilities in Burayu town during the COVID-19 pandemic era, Ethiopia, 2021.

The specific objectives were included to

- a) Estimate the prevalence of antenatal care utilization and its associated predictors in the study area.
- b) Examine the key predictors of the quality of ANC service in Burayu town
- c) Assess the service providers' related challenges affecting women's utilization of antenatal care service in the study area
- d) Assess the quality of service provided in health facilities in Burayu town during attending antenatal care services (based on WHO criteria) in the study area.

1.4. Research questions

- a) What is the magnitude of antenatal care utilization among pregnant women in selected facilities of Burayu town during the COVID-era
- b) What are the service providers related challenges in ANC service utilization?
- c) What is the quality of service provided in health facilities in Burayu town during attending antenatal care services based on six recommended components or items of ANC services?

1.5. Significance of the study

Every pregnant woman is at risk for pregnancy-related complications. To minimize this risk, pregnant women should start ANC visits early in the first trimester so that they will have enough time for essential diagnosis and treatment of the cases. Nevertheless, there is a gap in the timing of the first ANC visit in our country. Therefore, the results of the study will enable pregnant mothers to be the beneficiaries of this study. Moreover, also it would be use as an input for planning and implementation of quality antenatal care service in Burayu town. The study will also be used as the baseline information to conduct more detailed analysis on the subject to understand the dynamics of institutional delivery and health outcomes. The finding of the study will give information to the concerned bodies in setting policies, strategies, and further investigation for ANC utilization.

1.6. Scope and Limitation of the study

There are three health care centers in Burayu town, but the scope of this study will be limited to one health facility and its women clients or pregnant women who visited the health care for

their ANC service. In addition, it is a facility-based study and covers only the most recent pregnancies.

Both advantages and limitations are found in this study. The strength part of this study is well educated and trained interviewers in face-to-face communication collected the data. Especially, the data collectors were of the same sex and almost similar age as the participants, to improve the accuracy of the responses in interviews. As this is a cross-sectional study, it cannot be ruled out that it is limited to causal conclusions.

1.7. Organization of the study

The thesis is categorized into six chapters. The first chapter presented the introduction part (i.e. background of the study, statement of the problem, research questions, objectives, the significance, scope, limitation, and the organization of the study). In the second chapter, related pieces of literatures were reviewed (i.e. conceptual, analytical frameworks, and definitions of key terms). The methodology and result of the interpretation of the study were provided under the third and fourth chapters, respectively. The fifth chapter provided the discussions, conclusions, and recommendations of the study.

1.8. Operational and Contextual definitions of the terms

For understanding, some of the words and phrases that need clarification and operational definitions are defined as follows.

Antenatal care is the care that provided for mothers during pregnancy that helps to ensure healthy outcomes for women and newborns (WHO, 2016). In this study, antenatal care was

referred to the number of visits made by pregnant mothers to the ANC before delivery and the content of ANC received.

Utilization: is the frequency of visits to the antenatal care clinic made by pregnant mothers from the first visit until the delivery. For this study, pregnant mothers who made less than four visits were defined as inadequately utilized ANC, whereas those with four or more visits were categorized as adequately utilized ANC service.

Stillbirth: The delivery of a dead baby after the 24th week of pregnancy

Miscarriage: The loss of the fetus before the 24th week.

Third trimester: Pregnancy from week 29-40 weeks (7, 8, and 9 months)

Kebele: is the smallest (lowest) administration unit in Ethiopia.

II. LITERATURE REVIEW

This review chapter includes the conceptualization of antenatal care, health promotion and disease prevention, detection and treatment of existing diseases and conditions, birth preparedness and complication readiness, coverage of antenatal care, the trend in antenatal care service use, determinants of ANC Service Use: (1–3 Visits), and determinants of ANC service use. The conceptual framework was introduced at the end of the chapter.

2.1. Conceptualization of antenatal care

Antenatal care is a general term used to describe medical procedures and care during pregnancy. Ethiopia has accepted and adopted Antenatal Care (ANC) as part of monitoring women's health and offering preventive services (Ekabua et al., 2011).

2.2. Health promotion and disease prevention during pregnancy

An interaction between a provider and a pregnant woman provides a platform to discuss important issues affecting the woman's health, her pregnancy, and her plans for childbirth. According to Ebunoluwa Oshinyemi, these issues include:

1. recognition of danger signs
2. good nutrition and its importance to the health of the mother and baby
3. good hygiene and infection prevention practices
4. risks of using tobacco, alcohol, medications, local drugs, and traditional remedies
5. rest and avoidance of heavy physical work

6. benefits of child spacing to mother and child, including options for family planning services after the baby's birth
7. benefits of breastfeeding, the importance of early and exclusive breastfeeding
8. protection against HIV and other STDs through individualized risk reduction, availability and benefits of HIV testing, and specific issues related to mother to child transmission and living with AIDS (after positive test results)
9. it also advocates the following preventive interventions for all pregnant women: immunization against tetanus, reduction of iron deficiency anemia, presumptive treatment for hookworm, prevention of mother-to-child transmission of HIV, protection against malaria, protection against vitamin A and/or iodine deficiency (Oshinyemi et al., 2018).

2.3. Detection and treatment of existing diseases and conditions

Antenatal care involves the detection and treatment of diseases and conditions including conditions that can severely affect mothers and babies if they are left untreated like HIV, malaria, syphilis, and other sexually transmitted diseases, anemia, heart disease, diabetes, malnutrition, and tuberculosis (Gloyd et al., 2001). The early detection and management of complications include conditions such as severe anemia, infection, vaginal bleeding, preeclampsia/eclampsia, abnormal fetal growth, and abnormal fetal position after 36weeks (Oshinyemi et al., 2018).

2.4. Birth preparedness and complication readiness

According to Darmstadt, appropriate ANC visits were used not only improves maternal and newborn health but also to increase maternal and newborn survival (Darmstadt et al., 2005).

Therefore, World Health Organization recommended that women who did not have any previous medical conditions should attend at least four physical examinations (Hill et al., 2007). The main aim of ANC utilization was to prevent, detect, relieve, and manage dangerous signs of pregnancy complications and health-related problems during pregnancy that may affect the mother and baby and to prepare mothers for birth (Tunçalp et al., 2017b).

The mother should fully prepare for the birth of the baby and the complications that may accompany the birth of the baby, which is important for the health of the mother and the baby. This includes preparing for the arrival of health professionals during childbirth, place of birth and travel, emergency transportation if necessary, items such as sterile gloves and childbirth cotton, and childbirth money.

2.5. Trends and levels of antenatal care service use

The global data indicated that around 86% of pregnant mothers access ANC at least once while (62%) have at least four ANC contacts (UNICEF, 2020). According to a study conducted in five countries from 2011 to 2017 (Guatemala, India [2 sites], Kenya, Pakistan, and Zambia), a high proportion of women received at least one ANC visit across this period and indicated that there was a variation of utilization across all sites (Tikmani et al., 2019).

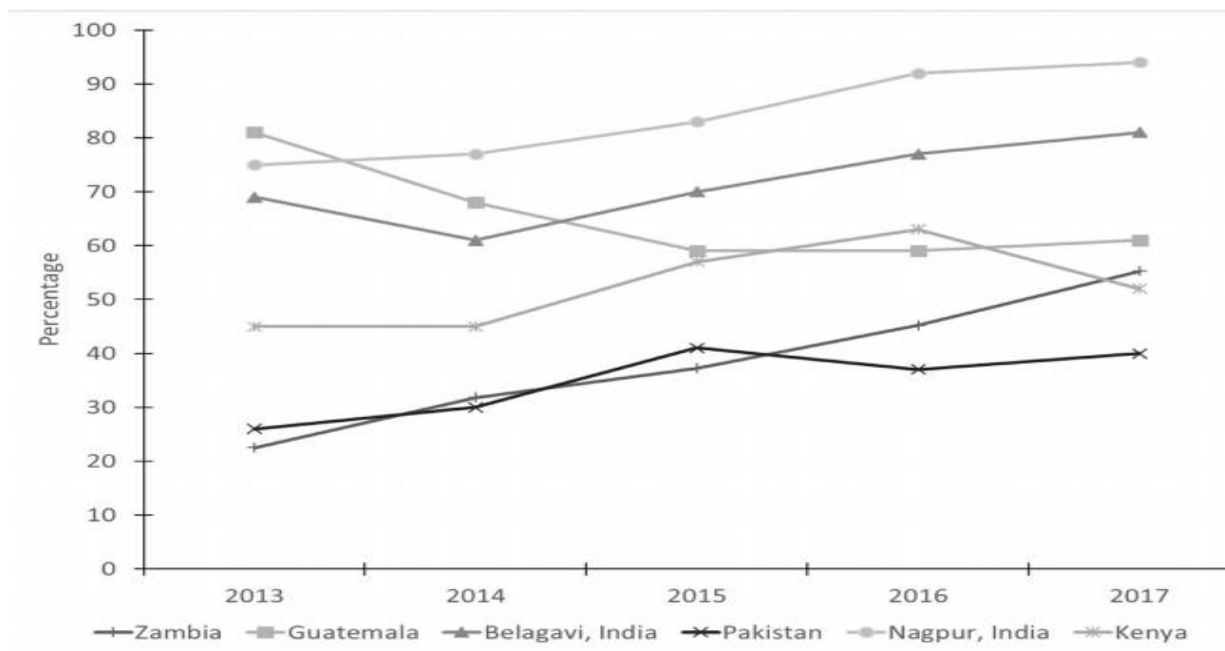


Figure 1: Percentage of women with at least four Antenatal care visits in five countries by year and site.

In Ethiopia, the proportion of women of childbearing age who received four or more recommended examinations increased from 10.0% (95% CI) in 2000 (8.74-12.5%) to 32.0% in 2016 (95% CI from 29.4 to 34.3%).). While the number of women receiving DR increased from 27% in 2000 (95% CI: 23.6-30.7%) to 62.0% in 2016 (95% CI: 60.4-67.3%).(See figure 2) (Mekonnen et al., 2019).

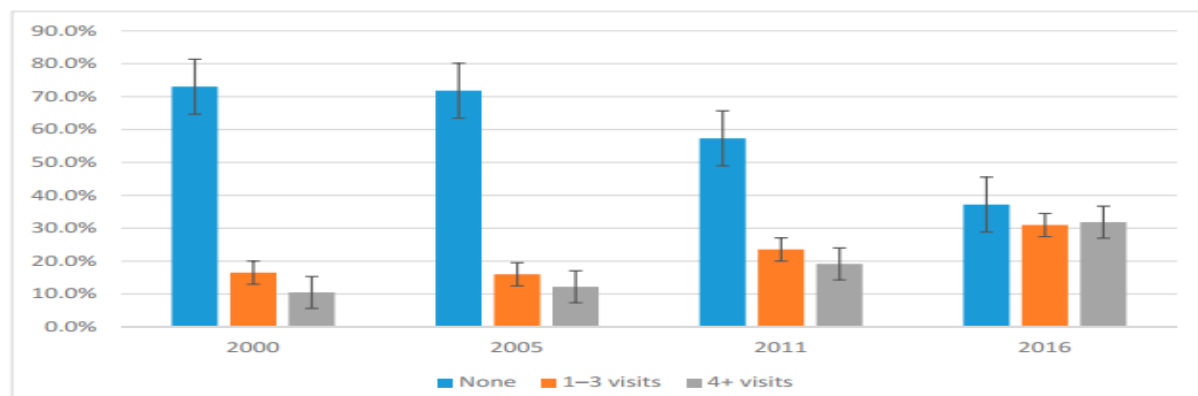


Figure 2: Trend in Antenatal care service use in Ethiopia 2000-2016 (CSA, 2017)

2.6. Determinants of ANC Service Use

Some of the previous studies conducted in different countries on factors influencing the use of maternal healthcare services have shown that factors like maternal age, number of living children, education, place of residence, occupation, religion, and ethnicity are significantly associated with the use of ANC (Ali et al., 2018).

According to Terefe, in developing countries, financial constraints, poor road network, lack of transport facilities, shortage of midwives, public health nurses, doctors, and obstetricians, leading to long queues and several hours stay at the facility are the factors that affect the accessibility of obstetric facilities (Terefe, 2019). The use of pregnancy health services in developing countries depends on the availability, accessibility, and quality of health services (including antenatal care), and the socio-economic status of women, children, and adolescents. Magadi's study identified Demographic factors, education, knowledge of the importance of antenatal care, cultural background, and obstetric medical history as the factors of ANC visits (Magadi et al., 2000).

The study conducted in South Sudan indicated that the reasons for very low attendance of ANC among pregnant mothers were long distance to health facilities, lack of transport means, flooding and poor roads, demand for payment at health facilities, the heavy burden of domestic work among women and the negative influence of husbands (Wilunda et al., 2017).

According to the EDHS report from 2000 to 2016, mothers who have not received a formal education, whose partners have not received a formal education, and whose husbands are not working use contraceptives, while expressing the possibility of rural women who are far from the facilities where they participate in using contraceptives (see Table 1). In addition, women

from the wealthiest quintile of households are three times more likely to use prenatal care than women with prenatal care, which is the lowest among the four surveys (Mekonnen et al., 2019).

Table 1: EDHS report 2000–2016 on the association between Antenatal care utilization and predictors.

Characteristics		2000 EDHS		2005 EDHS		2011 EDHS		2016 EDHS	
		* AOR (95%CI)	p-Value	AOR (95% CI)	p-Value	AOR (95% CI)	p-Value	AOR (95% CI)	p-Value
Sociodemographic level factors									
Mother's education	Secondary	1.00		1.00		1.00		1.00	
	Primary	0.73 (0.40–1.33)	$p = 0.300$	0.31 (0.17–0.54)	$p < 0.001$	0.23 (0.12–0.45)	$p < 0.001$	0.33 (0.17–0.62)	$p < 0.001$
	No education	0.34 (0.18–0.64)	$p < 0.001$	0.21 (0.12–0.38)	$p < 0.001$	0.13 (0.06–0.26)	$p < 0.001$	0.17 (0.09–0.34)	$p < 0.001$
House hold wealth status	Poor	1.00		1.00		1.00		1.00	
	Medium	1.38 (1.02–1.89)	$p = 0.040$	1.41 (1.0–1.94)	$p = 0.030$	2.01 (1.51–2.69)	$p < 0.001$	1.38 (1.07–1.77)	$p = 0.010$
	Rich	6.12 (3.80–9.85)	$p < 0.001$	5.54 (3.75–8.20)	$p < 0.001$	6.04 (4.02–9.08)	$p < 0.001$	2.30 (1.54–3.42)	$p < 0.001$
Mother's employment	Not working	1.00		1.00		1.00		1.00	
	Working	0.90 (0.66–1.22)	$p = 0.500$	1.54 (1.14–2.09)	$p = 0.010$	1.45 (1.16–1.80)	$p < 0.001$	1.30 (1.01–1.68)	$p = 0.040$
Partner occupation	Non-agricultural	1.00		1.00		1.00		1.00	
	Agricultural	0.32 (0.21–0.47)	$p < 0.001$	0.32 (0.23–0.44)	$p < 0.001$	0.40 (0.30–0.52)	$p < 0.001$	0.71 (0.51–0.98)	$p = 0.040$
	Not working	0.73 (0.23–2.30)	$p = 0.590$	1.52 (0.56–4.11)	$p = 0.410$	0.92 (0.27–3.12)	$p = 0.890$	0.48 (0.32–0.71)	$p < 0.001$
Partner education	Secondary	1.00		1.00		1.00		1.00	
	Primary	0.29(0.21–0.41)	$p < 0.001$	0.29(0.21–0.41)	$p < 0.001$	0.38(0.26–0.56)	$p < 0.001$	0.45(0.32–0.65)	$p < 0.001$
	No education	0.18(0.12–0.27)	$p < 0.001$	0.18 (0.12–0.27)	$p < 0.001$	0.19(0.13–0.28)	$p < 0.001$	0.26(0.18–0.36)	$p < 0.001$
Marital status	Currently married	1.00		1.00		1.00		1.00	
	Formerly married	1.21(0.80–1.83)	$p = 0.35$	1.33(0.91–1.93)	$p = 0.14$	0.79(0.54–1.15)	$p = 0.22$	0.11(0.05–0.19)	$p < 0.001$
Need factors									
Contraceptive use	Yes	1.00		1.00		1.00		1.00	
	No	0.15 (0.11–0.21)	$p < 0.001$	0.41 (0.30–0.56)	$p < 0.001$	0.35 (0.28–0.43)	$p < 0.001$	0.55 (0.42–0.70)	$p < 0.001$
Wanted pregnancy at the time	Wanted then	1.00		1.00		1.00		1.00	
	Wanted later	0.91 (0.68–1.21)	$p = 0.520$	1.14 (0.84–1.54)	$p = 0.400$	0.91 (0.69–1.19)	$p = 0.490$	0.77 (0.59–1.02)	$p = 0.070$
	Unwanted	1.12 (0.82–1.54)	$p = 0.470$	1.04 (0.76–1.43)	$p = 0.810$	1.07 (0.76–1.50)	$p = 0.710$	0.60 (0.42–0.86)	$p = 0.010$
Enabling factors									
** Seek permission to visit health services	Not a big problem			1.00		1.00		1.00	
	A big problem			0.62 (0.48–0.80)	$p < 0.001$	0.62 (0.46–0.84)	$p = 0.002$	0.72 (0.53–0.97)	$p = 0.031$
** Getting money to pay health services	Not a big problem			1.00		1.00		1.00	
	A big problem			0.58 (0.44–0.76)	$p < 0.001$	0.73 (0.58–0.93)	$p = 0.010$	0.65 (0.52–0.83)	$p = 0.010$
** Distance to health facility	Not a big problem			1.00		1.00		1.00	
	A big problem			0.45 (0.35–0.59)	$p < 0.001$	0.49 (0.38–0.62)	$p < 0.001$	0.57 (0.43–0.75)	$p < 0.001$
** Accompany to health facility	Not a big problem			1.00		1.00		1.00	
	A big problem			0.60 (0.47–0.77)	$p < 0.001$	0.87 (0.69–1.10)	$p = 0.272$	0.62 (0.47–0.81)	$p = 0.001$
Community level factors									
Residence type	Urban	1.00		1.00		1.00		1.00	
	Rural	0.18 (0.09–0.33)	$p < 0.001$	0.19 (0.12–0.30)	$p < 0.001$	0.30 (0.20–0.45)	$p < 0.001$	0.29 (0.15–0.55)	$p < 0.001$

Source: EDHS, 2016

According to a study taken place in Kaffa, Sheka, and Bench Maji Zones of SNNPR, Ethiopia Socio-demographic (including age at first pregnancy) and environmental characteristics were

considered as the most important determinants of the number of ANC visit utilization (Terefe, 2019).

2.7. Contents or items of Antenatal care utilization

According to the recommendations of the World Health Organization, at least four ANC visits to improve the health of mothers and newborns, so ANC visits should be an effective preventive measure, and the content and quality of ANC should also be monitored (Tunçalp et al., 2017a). The standard quality of ANC is comprised of three components: (i) assessment (history taking, physical examination, and laboratory tests), (ii) health promotion (advice on nutrition, planning the birth, information regarding pregnancy, subsequent contraception, and breastfeeding), and (iii) care provision (tetanus toxoid immunization, psychosocial support, and recordkeeping) (WHO, 2009). According to Haile et al., in their latest study in 2020 on the determinants of the frequency and content of antenatal care for Arba Minch Zuriya postpartum mothers in Ethiopia's SNNPR, only 17.1% of mothers received all eight selected prenatal care programs. Among the ANC elements, 78.5% of mothers used blood pressure measurement most often, followed by 78% of mothers for hazard and nutrition education, and 77.8% of mothers measured blood pressure and weight. It is said that more than two-thirds (67.4%) of mothers have undergone blood tests. According to reports, more than half (56.3%) of mothers had an HIV test, 53.2% of mothers received tetanus vaccine, 54.4% of mothers had a urinalysis, and 50% of mothers stated that they were receiving treatment (over 90 years of age) (Haile et al., 2020).

2.8. Challenge of ANC and stress of COVID-19

To meet the needs of pregnant women, antenatal care must address many situations directly or indirectly related to pregnancy, including malaria, malnutrition, sexually transmitted infections, HIV, and tuberculosis. Antenatal care should also provide necessary information and advice about pregnancy, childbirth, and including newborn care. During the COVID pandemic, pregnant women and mothers with newborn babies might be barred from visiting medical centers due to inconvenience and fear of infection, and financial desperation due to unemployment, limited care, and inconvenience may make it difficult to obtain obstetric care services. Congestion in the health system, reduced travel, and changing priorities at the primary health care level are some of the challenges women face during a pandemic. So some studies reported that COVID-19 harmed maternal care especially ANC utilization (Akseer et al., 2020; Cantelmo et al; 2020; CSA, 2016).

Ethiopian midwives are fighting COVID19 while ensuring safe delivery. The midwife said that Ethiopian travel restrictions related to COVID19 forced pregnant women to give birth at home (Tadesse et al., 2020). Due to the COVID19 pandemic, pregnant women face more obstacles in accessing maternal health services, including restrictions, traffic problems, anxiety, and fear of possible contracting coronavirus.

2.9. Conceptual framework

Ronald M. Andersen first developed Andersen's health care behavior model in the 1960s. The model is applied to predict or explain the determinants of health care services. There are three components of the model (i.e., predisposing factors, need factors, and enabling factors). They are used to guide in the accessing of risk factors associated with different health outcomes

(Hirshfield et al., 2018). The current study addressed the gaps in the literature regarding the determinants and quality of ANC among mothers of recent delivery by using Andersen's conceptual framework. This conceptual framework was explained by the three components (Figure 3).

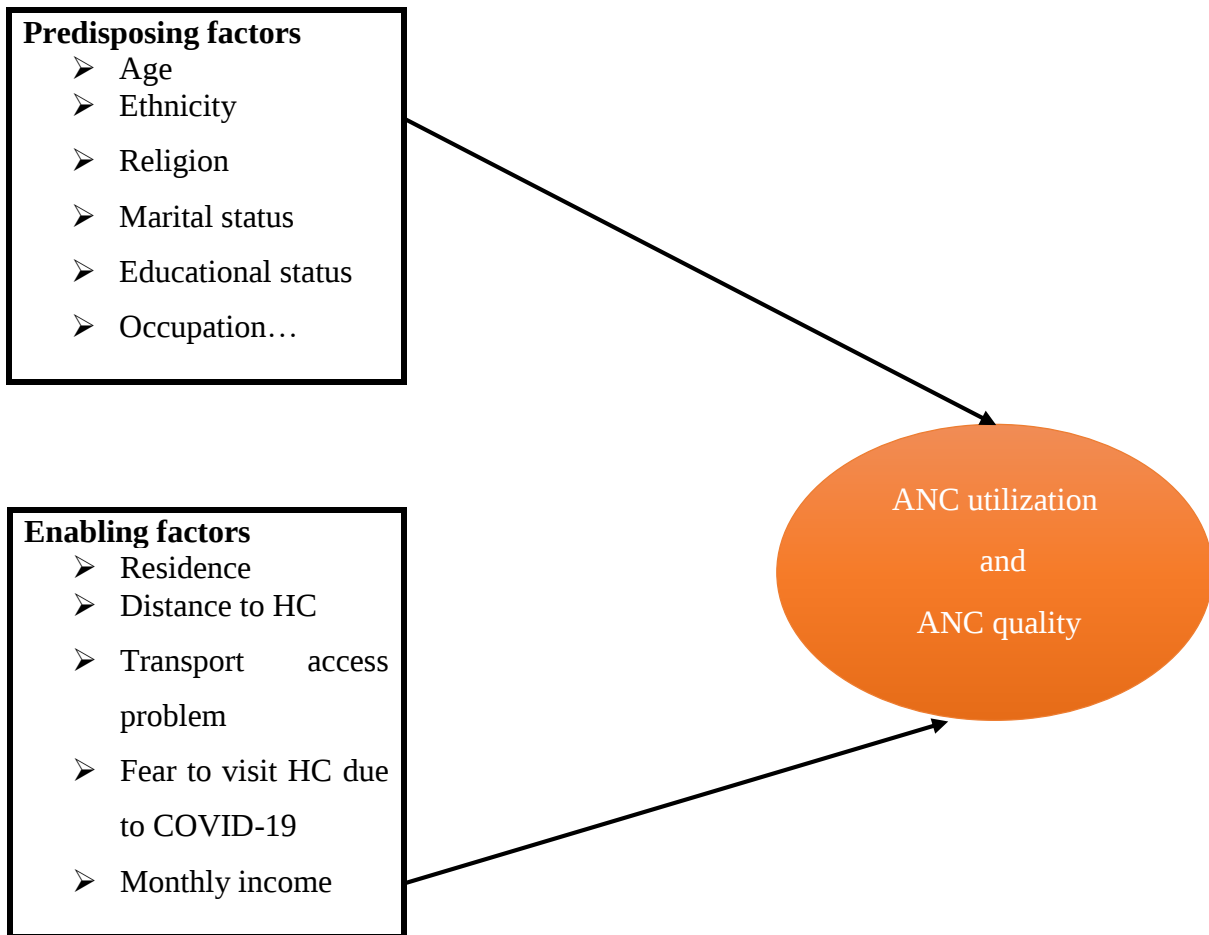


Figure 3: Conceptual framework of Antenatal care, developed based on Anderson's health care seeking model.

Source: Hirshfield et al 2018, Adapting Andersen's Behavioral Model of Health Service Use to Examine Risk Factors for Hypertension among U.S. MSM.

III. METHODOLOGY

3.1. Study area description and period

It is a cross-sectional study conducted at a health facility in Burayu City. Burayu town is located in the central part of Oromia National regional state, which is located 12 km west of Addis Ababa (Bekele et al., 2014). The town has six kebele (the smallest administrative unit in Ethiopia) and three health care centers namely Guje, Anne Dima, and Burayu, and the estimated size of population 250,700, out of this male account 49% and female 51%. The area is geographically situated at 9°3'N and 38°30'E, at an altitude of 2400 meters above sea level. (*Burayu town profile, 2019*). This study period is from March to June 2021 among participants selected from the Burayu health care center.

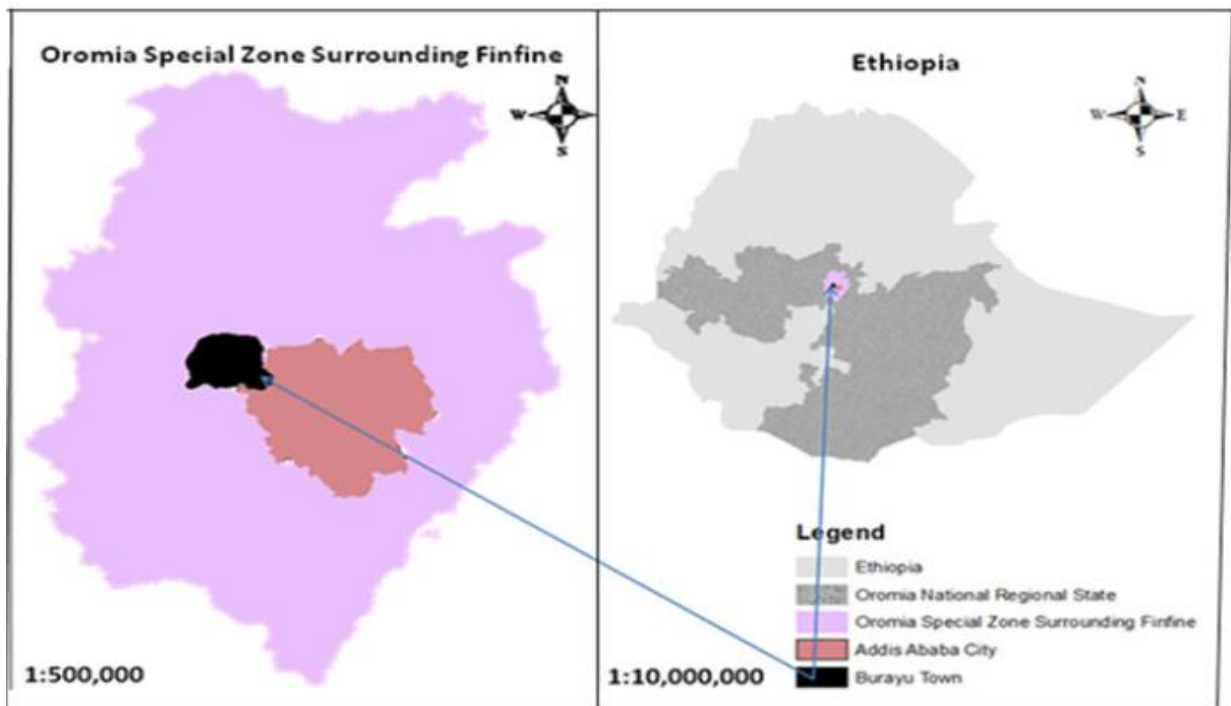


Figure 4: Geographic Location of Burayu Town in Ethiopia, 2021.

Source; *Causes and Remedy of Squatting in Burayu Town, Ethiopia*.

3.2. Population

3.2.1. Source population

The source population was all women of the reproductive age group (15 to 49 years old) who visited ANC service in all Burayu's health facilities.

3.2.2. Target population

The target population of the study was all Reproductive age group women (15-49) with the most recent delivery who visited the facilities during six months period before the survey date.

3.3. Inclusion and exclusion criteria

3.3.1. Inclusion criteria

All pregnant women who had given live birth during the six months before the survey date, voluntary to participate, able to respond and present at the time of interview were included.

3.3.2. Exclusion criteria

All mothers who did not have the interest to participate in the study were excluded.

3.4. Study design and approach

Institution-based cross-sectional study was conducted at a specific health center in Burayu City to examine the determinants of the frequency and quality of ANC among mothers who gave birth during the COVID-19 pandemic era for three months. A quantitative approach employed to achieve the objectives and address the research questions.

3.5. Sample size determination and sampling procedure

The researcher used the single population proportion formula to calculate the required sample size by considering a 95% confidence interval, 5% level of significance, and the prevalence (P) taken from the six different reports. Different studies reported that households' monthly income, Parity, abortion history, accessibility to ANC services, interruption due to COVID-19, and planned pregnancies are the most determinants of ANC utilization. The variables with a larger sample size (Monthly income that is 420 including 10% non-response rate) would be selected for this study. The sample size is calculated by considering the margin of error ($m=0.05$) and $Z_{\alpha/2}=1.96$ which is by the default 95% CI.

Table 2: Prevalence of different studies to calculate Sample size, 2021.

Factors	ANC 4 ⁺	ANC 4 ⁻	AOR	SS	NRR	Final SS
HHs monthly income (≥ 1000 Birr) [(Yarinbab, 2018)]	53.80	18.59	1.45	382	10%	420
Planned Pregnancy (Berhe et al., 2014)	81.20	3.60	3.922	235	10%	258
No Abortion history (Woyessa & Ahmed, 2019)	94.40	85.50	0.753	81	10%	89
Distance to health facility (minutes) [(Yarinbab, 2018)]	68.10	26.99	3.26	334	10%	367
Accessibility to ANC services (Woyessa & Ahmed, 2019)	89.20	10.8	.474	148	10%	163
Interruption due to COVID-19 (Tadesse et al, 2020)	75.39	24.61	0.675	285	10%	314

From the three health centers of Burayu town, one health Center would select to be included in the study by simple random sample method. The sampling method of the research enquired careful sampling procedures so that generalizations were extended to other individuals, groups, times, or settings. Firstly, among three health care centers, one health care center was randomly selected. Finally, study respondents who satisfy the inclusion criteria were recruited in the study

using a random sampling technique. For pretest purposes, 5% of the total sample size (i.e. 21 households) was used before the survey.

3.6. Data gathering Tools and Procedures

3.6.1. Measures of outcomes and exposure variables

Dependent variables

Two baseline outcome variables were used in this study. These are the determinants of access of antenatal care (ANC) visits and the quality of care received during ANC visits. The WHO recommends a minimum of four visits of ANC to improve maternal and newborn health(Tunçalp, Pena-Rosas, et al., 2017). Accordingly, those whose visited their ANC for more than four times were considered as they utilized their ANC services.

The second target variable was related to the core components of antenatal care that remain recommended when visiting caregivers. There are six essential recommended components or items of ANC services. This includes measurement of weight and blood pressure, testing of urine and blood samples, having an ultrasound, and counseling about a dangerous sign of pregnancy complications. Information on these six items of ANC content was derived from the response of the question “As part of your antenatal care during this pregnancy, were any of the following done at least once? Was your weight measured? Was your blood pressure measured?”. The answers were recorded as Yes or No. However, as mothers were asked to report experiences of any of these items at least once, binary values were framed for each of the six responses. By linearly combining (adding) the six values, it was possible to create a composite index of ANC quality as the secondary outcome variable. Thus, the outcome variable took the form of count with a minimum value of one indicating that the women did receive one ANC

services and a maximum value of six indicating that the women received services for all the six elements. A similar type of content index was used by other recent studies (Barber et al., 2007; Islam and Masud, 2018; S and H, 2016).

Explanatory variable

The study considers the mother's socioeconomic and demographic characteristics as predictor variables. These include socio-demographic condition (Age, ethnicity, religion, marital status, residence, educational status, occupation, monthly income, educational status of the husband, occupation of the husband & principal household income generator), morbidity history and challenges during COVID-19, and History of current pregnancy and experience of ANC.

3.6.2. Data gathering Tools and data quality management

A structured questionnaires was used to gather the data to access the frequency and quality of ANC. To ensure the validity of the instrument, the researcher adopted some of the questions from DHS and other internationally used tools. The questionnaires were first prepared in English and the translated into local working language Afan Oromo. Three Health Extension workers and one supervisor with a qualification in midwifery would collect data. The training was provided to data collectors and supervisors for two days. Data were collected after the purpose of the study briefed about the study participants and obtaining written informed consent. After each day of data collection, data were checked for completeness and consistency by meeting with the data collectors and supervisors. The quality of data assured by proper designing and a pretested interview administered structured questionnaire.

3.7. Data processing and analysis

The collected data entered into Epi-data v-3.1 and exported to STATA v-14 for analysis. Univariate (Frequency, mean) was used to summarize and describe the characteristics of the respondents. Bivariate logistic regression and Poisson regression analyses were used to examine associations between the outcome variables and the independent variables. In both dependent variables, variable selection for the multivariable analysis was made based on P-value in bivariate regression (i.e., significant variables were further treated in multivariate analysis) (Sperandei, 2014). Multivariate logistic regression analysis was used to determine the association of each independent variable with ANC service utilization during the most recent delivery. Negative Binomial regression analysis was used to examine the effects of explanatory variables on the quality of care (i.e.; count outcome variable). A multi-collinearity check was done to remove variables having a strong relationship using a cut-off value of 0.5 (Vatcheva et al., 2016). Odds ratio with its 95% CI, P-value of <0.05 in the multivariable logistic and Negative Binomial regression analysis was used to identify variables significantly associated with the outcome variables.

3.8. Ethical Approval

Ethical clearance or approval was obtained from Addis Ababa University, College of Developmental Studies, center for population studies Ethics Review Board before commencing data collection. During the data collection process, the data collectors informed each study participant about the objective and anticipated benefits of the research project, all women clients willing to participate in the study were included except those who did not fulfill the inclusion

criteria. Confidentiality of the information was maintained and study participants were told that they could withdraw from the data collection at any time.

IV. RESULT AND DISCUSSION

4.1. Results

4.1.1. Characteristics of study participants

Four hundred and twenty (420) women were included in the study with a 100% response rate. Table 3 shows the socio-demographic characteristics of the respondents. It indicated that the majority of mothers fall in the age group of 25-34 (54.05%), married (91.4%), Christians (81.7%), urban residence (87.4%), secondary grade educated (51.2%), and 91.4% of the mother had parity of 2-3. Regarding the accessibility of health services, most of the mothers walked less than 30 minutes to health facilities (67.6%) and about 91.9% of the mother had gravidity of 2-3. Only 14.5% of study participants had a morbidity history.

Table 3: Socio-demographic characteristics of the respondents, Oromia, Burayu town health centers, 2021, (n=420).

Background variables	No.	Percentage
Age of the respondents		
15-24	46	10.95
25-34	227	54.05
35-49	147	35.00
Marital status		
Married	384	91.4
Others	36	8.6
Residence		
Urban	367	87.4
Rural	53	12.6
Religion		
Christian	343	81.7
Muslim	58	13.8
Others	19	4.5
Ethnicity		
Oromo	208	49.5
Amhara	98	23.3

Gurage	78	18.6
Others	36	8.6
Parity		
1	5	1.2
2-3	384	91.4
≥4	31	7.4
Mother's educational status		
No formal education	5	1.2
Primary education	137	32.6
Secondary education	215	51.2
Diploma and higher	63	15
Household Income		
Very low	22	5.2
Low	206	49.0
Moderate	149	35.5
High	43	10.2
Work status respondents		
Not working	328	78.1
Working	92	21.9
Husband's educational status		
No formal education	77	18.3
Primary education	125	29.8
Secondary education	108	25.7
Diploma and higher	74	17.6
Distance from Health facilities		
≤ 30 minutes	284	67.6
31-60 minutes	116	27.6
≥ 61 minutes	20	4.8
Gravidity		
1	2	0.5
2-3	386	91.9
≥4	32	7.6
Morbidity history		
Yes	61	14.5
No	359	85.5
Inter pregnancy interval		
≤24 months	319	76.0
>24 months	101	24.0

4.1.2. Description Frequency and contents of Antenatal care visits

Table 4: Percentage distribution of frequency and contents of Antenatal care visits, 2021, (n=420).

Background variables	No.	%
ANC visits		
<4	132	31.4
≥4	288	68.6
Blood measured		
Yes	330	78.6
No	90	21.4
Weight measured		
Yes	347	82.6
No	73	17.4
Blood test		
Yes	223	53.1
No	197	46.9
Urine test		
Yes	265	63.1
No	155	36.9
Ultrasound		
Yes	150	35.7
No	270	64.3
Counseling		
Yes	89	21.2
No	331	78.8

Table 4 shows the description frequency and contents of ANC visits reported by the study participants. The majority of the mothers (68.6%) reported having at least four ANC visits during their most recent birth as recommended by WHO. In the present study, only 1.9% of mothers received all the six selected elements of ANC services and the major of the mother (36.0%) received three of the six service types. About 78.6% of mothers received blood measurements, 82.6% received weight measurements, 53.1% received blood tests, 63.1% received urine tests and only 35.7% received ultrasound.

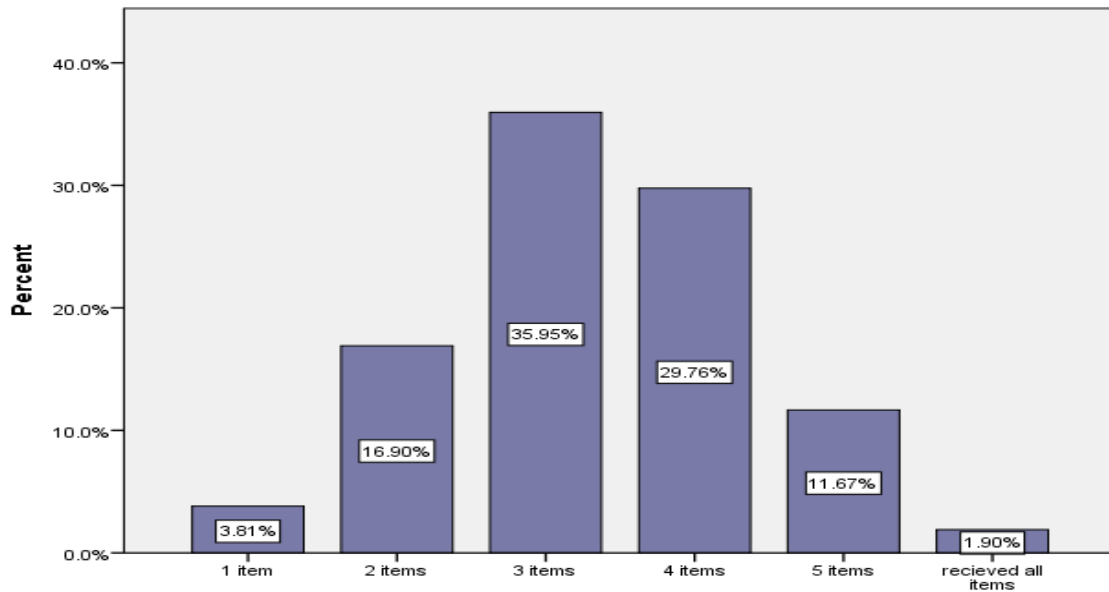


Figure 6: Contents of antenatal care received during antenatal visits Burayu town, Oromia, Ethiopia, 2021

4.1.3. Bivariate analysis

Table five presents a summary result of the bivariate logistic regression (unadjusted) for the association between each potential predictor and the frequency of ANC visits (proportion of at least four ANC visits as recommended by WHO). The analysis indicates that place of residence, education of mothers, religion, mothers work status, starting time of ANC visits in months, pregnancy-related acute illness, and inter-pregnancy interval have a significant association with the frequency of ANC visits at 95% CI.

Regarding the starting time of the first visits of ANC in months, mothers who start their first ANC visits in the second trimester were more likely to have at least four or more ANC visits. Furthermore, mothers who travel a distance of fewer than thirty minutes to reach health facilities were more likely to have or to attend four or more ANC visits than mothers who travel greater

than thirty minutes to reach the health facilities. Mothers with no pregnancy-related acute illness were more likely to make four or more ANC visits compared to mothers with pregnancy-related acute illness. Women of the inter-pregnancy interval of fewer than two years were more likely to have at least four or more ANC visits than mothers whose inter-pregnancy greater than two years.

Table 5: Results of Bivariate logistic regression analysis (unadjusted) for antenatal care visits (<4 vs. +4 visits), Oromia, Burayu town Health centers, 2021, (n=420).

Variables	ANC visit		P-Value	OR	95% CI	
	4 ⁺ visit n (%)	4 ⁺ visit n (%)			Lower	Upper
Age of the respondents						
15-24	15 (11.4)	31 (10.8)	0.99	1.00	0.49	2.03
25-34	69 (52.3)	158 (54.9)	0.65	1.11	0.71	1.73
35+	48 (36.3)	99 (34.3)	-	1	-	-
Residence of the participants						
Urban	98 (74.2)	269 (93.4)	<0.001	4.91	2.68	9.01
Rural	34 (25.8)	19 (6.6)	-	1	-	-
Marital status of the mother						
Married	121 (91.7)	263 (91.3)	0.91	0.96	0.46	2.01
Others	11 (8.3)	25 (8.7)	-	1	-	-
Religion						
Christian	110 (83.3)	233 (80.9)	0.15	0.4	0.11	1.39
Muslim	19 (14.4)	39 (13.5)	0.17	0.38	0.10	1.48
Others	3 (2.3)	16 (5.6)	-	1	-	-
Educational Status						
No formal education	3 (2.3)	2 (0.7)	0.02	0.09	0.01	0.67
Primary education	45 (34.1)	92 (31.9)	0.004	0.30	0.13	0.68
Secondary education	76 (57.6)	139 (48.3)	0.001	0.27	0.12	0.59
Diploma and above	8 (6.0)	55 (19.1)	-	1	-	-
Work status of the mother						
Not working	08 (81.8)	220 (76.4)	0.20	0.72	0.43	1.21
Working	24 (18.2)	68 (23.6)	-	1	-	-
Parity						
1	0	5 (1.7)	0.99	102029	0	-
2-3	120 (90.9)	264 (91.7)	0.39	1.39	0.65	2.95
≥ 4	12 (9.1)	19 (6.6)	-	1	-	-
Planned pregnancy						
Yes	121 (91.7)	268 (93.1)	0.61	1.22	0.57	2.62
No	11 (8.3)	20 (6.9)	-	-	-	-

ANC interruption due to COVID-19						
Yes	22 (16.7)	54 (18.8)	0.61	1.15	0.67	1.99
No	110 (83.3)	234 (81.2)	-	1	-	-
Starting months of first ANC visit						
First trimester	20 (15.2)	124 (43.1)	<0.001	13.05	6.34	26.87
Second trimester	72 (54.5)	145 (50.3)	<0.001	4.24	2.29	7.84
Third trimester	40 (30.3)	19 (6.6)	-	1	-	-
Household Income						
Very low	4 (3.0)	18 (6.2)	0.64	1.36	0.37	4.97
Low	69 (52.3)	137 (47.6)	0.19	0.60	0.28	1.29
Moderate	49 (37.1)	100 (34.7)	.231	0.62	0.28	1.36
High	10 (7.6)	33 (11.5)	-	1	-	-
Distance from Health facilities						
≤ 30 minutes	95 (72.0)	189 (65.6)	0.44	0.66	0.23	1.88
31-60 minutes	32 (24.2)	84 (29.2)	0.81	0.88	0.29	2.61
≥ 61 minutes	5 (3.8)	15 (5.2)	-	1	-	-
Pregnancy-related acute illness						
Yes	16 (12.1)	19 (6.6)	0.06	1.95	0.97-	3.93
No	116(87.9)	269 (93.4)	-	1	-	-
Inter pregnancy interval						
< 24 months	95 (72.0)	224 (77.8)	0.19	1.36	0.85	2.18
≥ 24 months	37 (28.0)	64 (22.2)	-	1	-	-

Table 6 shows the results from the negative binomial logistic regression model to assess the association between selected predictors and contents of ANC services. It indicated that residence of respondents, marital status, work status, household size, husband's education, morbidity history, inter-pregnancy interval, stillbirth, planned pregnancy, pregnancy-related acute illness, the start time of ANC visits, and distance to health facilities were statistically significant predictors to the mean number of ANC services.

The expected mean score of ANC service type decreases by 2% for women residing in urban areas compared to those living in rural areas (OR 0.98; 95% CI: 0.96–1.01). The expected mean number of ANC services is 1.12 times higher for women with formal education compared to those with no education. (OR 1.12; 95% CI: 1.02.1.21).Furthermore, the expected mean number

of ANC services is 1.02 times higher for women with morbidity compared to those with no morbidity history(OR 1.02; 95% CI: 0.99, 1.04).

The expected mean scores of ANC services for mother who had started their ANC visits early (first trimester) would be decreased by 2% and those started first ANC in the second trimester was 1.02 times higher compared to mother who started first ANC visit in the third trimester. Similarly, the mean scores of ANC services for interrupted due to COVID-19 stress were decreased by 0.1 compared to the mothers whose ANC visits did not interrupt due to COVID-19 (OR 0.99; 95% CI: 0.97–1.02).

Table 6: Results of bivariate Negative Binomial regression (unadjusted) for contents/ quality of antenatal care service, Burayu town Health centers, 2021, (n=420).

Variables	p-values	IRR	95% CI	
			Lower	Upper
Age of the respondents				
15-24	0.32	1.01	0.98	1.04
25-34	.635	1.01	0.98	1.04
35+	-	1.00	-	-
Residence of the participants				
Urban	0.14	0.98	0.96	1.01
Rural	-	1.00	-	-
Marital status of the respondent				
Married	<0.001	1.08	1.04	1.11
Others	-	1.00	-	-
Religion				
Christian	0.89	0.99	0.96	1.03
Muslim	0.10	0.96	0.93	1.01
Others	-	1.00	-	-
Educational Status				
No formal education	0.08	1.12	1.02	1.21
Primary education	0.22	0.99	0.96	1.01
Secondary education	0.01	0.97	0.95	0.99
Diploma and above	-	1.00	-	-

Monthly income				
Very low	0.03	1.05	1.01	1.09
Low	0.21	0.98	0.95	1.01
Moderate	<0.001	0.91	0.88	0.94
High	-	1.00	-	-
Work status of the mother				
Not working	<0.001	0.95	0.93	0.97
Working	-	1.00	-	-
Household size				
1-3	<0.001	0.91	0.91	0.98
4-5	0.01	1.03	1.01	1.05
≥6	-	1.00	-	-
Husband education status				
No formal education	0.79	0.98	0.91	1.08
Primary education	<0.4	0.93	0.89	0.95
Secondary education	<0.001	0.94	0.91	0.96
Diploma and above	-	1.00	-	-
Morbidity history				
Yes	0.11	1.02	0.99	1.04
No	-	1.00	-	-
Inter pregnancy interval				
≤2 years	0.11	0.98	0.96	1.01
> 2 years	-	1.00	-	-
Stillbirth				
Yes	0.16	1.03	0.98	1.08
No	-	1.00	-	-
Planned pregnancy				
Yes	<0.001	0.94	0.91	0.97
No	-	1.00	-	-
Parity				
1	0.07	1.08	0.99	1.19
2-3	0.98	1.01	0.97	1.03
≥ 4	-	1.00	-	-
Pregnancy-related acute illness				
Yes	<0.001	1.06	1.03	1.09
No	-	1.00	-	-
Starting timing of first ANC visit				
First trimester	0.09	0.98	0.95	1.01
Second trimester	0.02	1.03	1.00	1.05
Third trimester	-	1.00	-	-
Distance from Health facilities				
≤ 30 minutes	<0.001	0.88	0.85	0.92
31-60 minutes	<0.001	0.89	0.86	0.93
≥ 61 minutes	-	1.00	-	-

**ANC interruption due to
COVID-19**

Yes	0.83	0.99	0.97	1.02
No	-	1.00	-	-

4.1.4. Determinants of frequency and quality of ANC services: Multivariate analysis

The binary logistic regression was conducted and those variables with p-values less than 0.2 were included in multiple logistic regression. The bivariate analysis outputs present unadjusted effects of the explanatory variables on the frequency of ANC visits. To identify the significant adjusted or net effect of an explanatory variable on the frequency of ANC visits, we employed a multivariate regression model. After adjusting the effects of all other explanatory variables, the odds ratio was used to measure the net effect of one explanatory variable.

Accordingly, in multivariable logistic regression analysis starting time of first antenatal visit, educational statuses of the mother, working status of mothers, and pregnancy-related acute illness were identified as significant predictors of frequency of the ANC (Table 7).

The odds of receiving adequate ANC (four or more) among mothers who started their first ANC visit early (before three months) were 15.34 times higher compared to those of their counterparts (AOR: 15.34, 95%CI: 4.92– 47.77). This may be due to early visitors having more time to attend. Employed mothers had 0.59 times lower odds of receiving four or more ANC visits than unemployed (AOR: 0.59, 95%CI: 0.32– 1.06). Mothers with no formal education were 0.07 times less likely to have at least four ANC visits than the women who have an education level of diploma and above (OR = 0.07, 95% CI: 0.01–0.67). Mothers who had a pregnancy-related acute illness were 2.48 times more likely to attend ANC visits ≥ 4 compared to mothers who had no pregnancy-related acute illness (AOR: 2.48, 95%CI: 1.14– 5.44) (Table 7).

Table 7: Results of Multivariable logistic regression analysis (adjusted) for antenatal care visits (<4 vs. +4 visits), Oromia, Burayu town Health centers, 2021, (n=420).

Variables	p-values	AOR	95% CI	
			Lower	Upper
Intercept	0.48	1.97	0.76	2.24
Residence				
Urban	0.96	1.03	0.35	3.03
Rural	-	1.00	-	-
Religion				
Christian	0.14	0.36	0.09	1.39
Muslim	0.14	0.33	0.08	1.45
Other	-	1.00	-	-
Mothers educational status				
No formal education	0.02	0.07	0.01	0.67
Primary education	0.03	0.37	0.15	0.89
Secondary education	0.001	0.25	0.11	0.57
Diploma or Higher	-	1	-	-
Work status of participants				
Working	0.03	0.59	0.32	1.06
Not working	-	1.00	-	-
Starting time of first visit				
First trimester	<.001	15.34	4.92	47.77
Second trimester	0.01	4.42	1.53	12.75
Third trimester	-	1.00	-	-
Inter pregnancy interval				
≤24 months	0.34	1.30	0.76	2.24
> 24 months	-	1.00	-	-
Acute illness				
Yes	0.02	2.48	1.14	5.44
No	-	1.00	-	-

The binary negative binomial regression was employed and those variables with *p*-values less than 0.2 were included in multivariable Negative Binomial regression analysis. Table 8 presents the results of Multivariate Negative Binomial regression analysis predicting the utilization of the items or content of ANC visits by a mother during her pregnancy. The results indicated morbidity history of mothers, distance to health facilities, working status of mothers, and

planned pregnancy as significant predictors of receiving the contents or quality of ANC services. The expected mean number of ANC service components received were 1.03 times higher for mothers with morbidity history than no morbidity history (IRR = 1.03, 95% CI: 1.02–1.06). The mean number of ANC item received by mothers were 1.05 times higher for mothers who had a pregnancy-related acute illness compared to those who had no pregnancy-related acute illness counterparts (IRR = 1.05; 95% CI: 1.03– 1.07). Similarly, the expected mean scores of ANC services items received for mothers who had distance to health care center less than 30 minutes were 1.88 times higher (IRR = 1.88; 95% CI: 1.85–1.91) and ANC services item decreased by 13% for mother who distant 30-60 minutes than mothers who distant greater than 61 minutes (IRR = 0.87; 95% CI: 0.84–0.90). The expected mean scores of ANC service was decreased by 3% for mothers who had work compared to those who had no work (IRR = 0.97; 95% CI: 0.95–0.98). Accordingly, the expected mean scores of ANC services for mother who had started their ANC visits early (first trimester) was 1.01 times higher and those start their ANC visits in the second trimester was 1.06times higher when compared to mother who started first ANC visit in the third trimester (IRR = 1.01; 95% CI: 0.96–1.05 and IRR = 1.06; 95% CI: 1.02–1.11). Similarly, the expected mean score for mothers with planned pregnancy was 1.95 times higher when compared to those of with no planned pregnancy (IRR = 1.95; 95% CI: 1.93–1.98).

Table 8: Results of Multivariable Negative Binomial regression analysis (adjusted) for quality of antenatal care service Oromia, Burayu town health centers, 2021 (n=420).

Variables	p-values	IRR	95% CI	
			Lower	Upper
Intercept	0.001	3.69	3.47	3.93
Residence of study participant				
Urban	0.32	0.98	0.94	1.02
Rural	-	1.00	-	-
Marital status				
Married	0.15	1.05	1.01	1.09
Others ^{RC}	-	1.00	-	-
Household size				
1-3	0.75	1.01	0.95	1.07
4-6	0.04	1.02	1.00	1.04
>6	-	1.00	-	-
Morbidity history				
Yes	0.02	1.03	1.02	1.05
No	-	1.00	-	-
Pregnancy-related acute illness				
Yes	0.053	1.05	1.03	1.07
No	-	1.00	-	-
Inter pregnancy interval				
≤2 years	0.06	1.05	1.03	1.07
>2 years	-	1.00	-	-
Stillbirth				
Yes	0.47	1.02	0.97	1.07
No	-	1.00	-	-
Distance to health facilities				
≤ 30minutes	<0.001	1.88	1.85	1.91
30-60minutes	<0.001	0.87	0.84	0.90
≥61minutes	-	1.00	-	-
Work status of participants				
Yes	0.002	0.97	0.95	0.98
No	-	1.00	-	-
Starting time of first ANC visit				
First trimester	0.03	1.01	0.96	1.05
Second trimester	0.001	1.06	1.02	1.11
Third trimester	-	1.00	-	-
Planned pregnancy				
Yes	0.003	1.95	1.93	1.98
No	-	1.00	-	-

4.1.5. COVID-19 related challenges on service utilization and provision

The study revealed that out of 420 respondents, 76(18.1%) of mothers reported that their ANC visits were interrupted due to the COVID-19 outbreak. These 76 study participants asked a follow-up question on the type of COVID-19 challenges during ANC service utilization.

Accordingly, only 26(6.2%) were reported that their ANC service was interrupted due to COVID-19 stress. Similarly, other participants responded that the main components of COVID-19 challenges that led to ANC interruption were a shortage of health workers (7.1%), poor access to medication (1.9%) fear of COVID-19 transmission (6.4%), transport access problem (6.9%) and ignorance of health workers (10.7%).

Table 9: Distribution of respondents by challenges of COVID-19 during antenatal care service, Burayu town, Oromia, Ethiopia, 2021, (n=420).

Reported challenges	No.	%
ANC interrupted due to COVID-19		
Yes	76	18.1
No	344	81.9
Mobility restriction		
Yes	50	11.9
No	26	6.2
Shortage of workers		
Yes	30	7.1
No	46	11.0
Poor access to medication		
Yes	8	1.9
No	68	16.2
Fear of COVID 19		
Yes	27	6.4
No	49	11.7
Transport access		
Yes	29	6.9
No	47	11.2
Ignorance of health?		
Yes	45	10.7
No	31	7.4

V. DISCUSSION AND CONCLUSION

5.1. Discussion

This institution-based cross-sectional study attempts to assess the frequency and quality of antenatal care for recently delivered mothers in Burayu, Addis Ababa. According to the recommendations of the World Health Organization, a normal pregnant woman should undergo four inspections during pregnancy (Villar et al., 2001). The findings showed that the overall level of antenatal care utilization was 68.6 % and while 35.6% did not receive the minimum required four ANC visits as recommended (Fig. 1). As the study was taken place during the COVID-19 outbreak, 76(18.1%) of mothers reported that their ANC visits were interrupted due to the COVID-19 outbreak.

The major reason for the difference in the findings across these studies could be due to the difference in the socio-demographic and socio-economic characteristics of the respondents, sample size considered, the difference in the time of the study and cultural and awareness differences.

One of the aims of this study was to identify the determinants that have important influences on the utilization of antenatal care services. The determinants of ANC utilization identified in this study include mothers' educational status, working status of mothers, starting time of first ANC visits and pregnancy-related acute illness were found significantly associated with utilization of ANC services utilization in Burayu town. The results indicated that the educational status of mothers had a significant positive association with the frequency of ANC visits. The result of this study showed that mothers who have no formal education, primary education, and

secondary education were less likely to utilize ANC services compared to mothers who had a diploma and above.

This study also revealed that the timing of the first ANC visit or first booking was identified as a risk factor or determinant of the frequency of the ANC. Mothers who started ANC visits before three months or early visitors were more likely to attend a minimum of four ANC visits than late visitors were. The reason is that early visitors were having more time to attend. This is in line with a study elsewhere like Arba Minch (2019) (Haile et al., 2020).

Mothers who had a pregnancy-related history of illness during pregnancy significantly attended antenatal care than mothers who had no history of illness. This is in line with a study conducted in the South Wollo zone and Oromia special zone (Tadesse, 2020). This study could also indicate that women who had a job were less likely to attend four or more ANC visits than women who did not have a job. This in line with the study conducted in Womberma (2015) (Mulat et al., 2015). Similarly, mothers who had pregnancy related acute illness were more likely to attend their 4+ ANC visits than who had no pregnancy related acute illness.

In the current study, only 1.9 % of mothers received all the six selected elements of ANC services (Figure 6). Among the elements of ANC, the findings of the study revealed that the commonest component of ANC offered in town are the measurement of blood pressure reported by 82.6% of mothers, the bodyweight reported by 78.6% of mothers, Urine test was reported by 63.1% and Blood test was the least received item (53.1%). These indicate that, lack of education and COVID-19 was the major thing that affects the ANC receiving the status of the mother.

The current study identified that husband education, mother's morbidity history, distance from health facilities, starting time of first ANC visits, working status of mothers, and planned pregnancy found to be significant predictors of the receipt of items of ANC services.

These findings are inconsistent with findings from Bangladesh (2018) and in Ethiopia (EDHS 2016). Mothers who had morbidity history were more likely to receive the contents or quality of ANC than mothers who had no morbidity history.

Mothers spending less than 30 min to reach health facilities more likely to attend adequate ANC content compared to their counterparts. These findings were confirmed by the previous study conducted in Nepal, which reported that urban women are more likely to receive quality antenatal care than rural women (Joshi et al., 2014). This is also supported by the study conducted in India (Yeoh et al., 2016) and Hosanna SNNPR (Berehe and Modibia, 2020).

In this study, regarding the time of starting the first ANC visit those mothers who started ANC before 3 months or early beginners were more likely in receiving ANC items than their counterparts. This is inconsistent with a study elsewhere (Haile et al., 2020).

The probability of receiving a higher number of ANC contents or quality was higher for mothers who had a planned pregnancy compared to an unplanned pregnancy. The finding indicates that mothers are usually less careful about receiving ANC services in the case of an unwanted pregnancy. Additionally, this might be due to women who had an unplanned pregnancy did not want to attend ANC care early, and to receive full items/qualities of ANC. This finding is the same as the studies in Kenya, South Africa, and Ethiopia (EDHS) (Adeniyi et al., 2018; Afulani et al., 2019; Basha, et al., 2019). Therefore, the policymakers and concern bodies should make awareness and strengthen the implementation of strategies that decrease unplanned pregnancies.

5.2. CONCLUSION AND RECOMMENDATIONS

5.2.1 CONCLUSION

The findings of this facility-based cross-sectional study indicated a moderate and extremely low level of compliance with the WHO minimum recommended ANC and core contents of the ANC respectively during pregnancy in Burayu town. This finding implies that the health service providers should focus not only on the frequency of ANC visits but also on the quality/ contents of ANC that should be received. The study indicated that both mothers' working status and start time of first ANC booking identified as significant determinants for both frequencies of the ANC and the contents of ANC care services. Mothers' educational status, mothers pregnancy acute illness were also the most determinants of frequency of receiving 4+ ANC visits and morbidity history, distance to health care center and planned pregnancy were the most determinants of receiving the ANC item recommended by WHO. This implies concerned policymakers, government and non-governmental bodies should give attention to strengthening all mothers should start ANC visits early during their pregnancy because having an adequate level of ANC visits and ANC content may contribute to early detection and timely management of risk for adverse pregnancy outcome. The study findings highlight that Burayu is still very far from achieving universal coverage of recommended contents/quality of ANC service.

5.2.2. Recommendation

Given the significant proportion of women are receiving low-quality ANC services due to a range of factors, priority should be given to women and their partners of low educational status, women who have their own job, and mothers who distant from health facilities to get appropriate

antenatal care and its items/contents service promotions. Rising from the findings of the study, the level of ANC quality/ receiving the ANC contents in the study area was extremely low. Promoting women's education will be very effective in improving women's health behavior. Future research can also try to reach women who do not use prenatal care at all and start post-natal care. (i.e., in the second or third trimester). Therefore, policymakers and stakeholders appreciate health workers working in the area to help women maintain adequate ANC quality to reduce the risk of complications during pregnancy.

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VII. APPENDICES

Appendix I: Manuscript Submitted to BMC Women's Health

‘Antenatal Care Service Utilization among Women of Recent Delivery: Analysis of the determinants of quality of care in selected health facilities in Burayu Town, Oromia, Ethiopia. 2021’

Corresponding Author: Lemma Terfassa Deressa

BMC Women's Health

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Appendix II: Information sheet

Name of Student undertaking Study: Lemma Terfassa Deressa

Name of the Advisor): Prof. Nigatu Regassa

Name of the University: Addis Ababa University, College of Development Studies, Center for Population Studies.

Title: Antenatal care service utilization among recent delivery women under COVID environment: Analysis of the determinants and quality in selected health facilities in Burayu town, Oromia, Ethiopia.

Purpose

The purpose of this research is to examine the determinants and challenges of ANC utilization during the post COVID environment among mothers with the most recent delivery in selected health facilities in Burayu, Oromia, Ethiopia.

Procedure

To access antenatal care service utilization among recent delivery women under COVID environment: the analysis of the determinants and quality of ANC utilization in selected health facilities in Burayu town we invite you to take part in our research. If you are willing to participate in this research, you need to understand and sign the agreement form.

Then, you will be given a questionnaire to be fill or the data collector will interview you. The aim is to access the utilization and associated factors among pregnant women in town. However, if you are unable to participate in the study by the recommendation of the researcher or based on your interest, it does not affect anyway in obtaining the regular institutional services delivered at the health care you are following.

Risk and Discomfort

By participating in this research, you may feel that it has some discomfort but this will not be too much as you are thinking it is and there is no risk.

Benefits

If you participate in this research, you may not get the direct benefit but there may be an indirect benefit in that there will be awareness of the health care toward utilization of antenatal care. In addition, your participation is highly appreciated as it will also likely help in studies to improve Antenatal care utilization among pregnant women in the Burayu Health care service.

Confidentiality

The information that we collect from this research will be kept confidential. Information about you that will be collected for this study will be stored in a file, which will not have your name on it, but a code number assigned to it. This data will not be revealed to anyone or used for any purpose except for the study.

Right to refuse or withdraw

You have full right not participating in this research if you do not wish to participate, and this will not affect the services you are getting in the health care institution in any way. You have also the full right to withdraw from this research at any time you wish to, without losing any of your rights as a client of the institution.

Whom to Contact

This research will be reviewed and approved by Addis Ababa University, College of Development Studies, and the Center for Population Studies ethical clearance Committee. The main task of the ethical committee of the University is to make sure that research participants are protected from harm. If you have any questions contact any of the following individuals and you may ask at any time you want.

1. Prof. Nigatu Regasa, AAU, Email: negyon@yahoo.com
2. Mr. Lemma Terfassa, AAU, Email: lematd63@gmail.com

Appendix III: Inclusion and Exclusion Criteria

In general, pregnant women will be considered eligible for participation if they have been visiting at least one or even more than four according to WHO clinical guidelines and consented to participate in the study. On the other hand, women, those on clients who had never followed the focused ANC was excluded or those who are not interested to participate will be excluded from the study.

Appendix IV: Consent form

Subject Name ----- Age----- Sex----- Code----- Site /health care -----

I have been informed about a study that plans to assess Antenatal care service utilization among recent delivery women under COVID environment: Analysis of the determinants and quality of ANC utilization in selected health facilities in Burayu town, Oromia, Ethiopia. For this study, I have been requested to give information required through interviews. The researcher has briefed me that there are no major risks associated with the data collected. I have been informed that there is no direct benefit provided to me. The investigator also informed me that all the data collected will be kept confidential. Moreover, I have also been well informed of my right to withdraw from participating in this research and that my actions will have no impact on the overall management of my conditions. I have been given enough time to think over before I signed this informed consent. It is, therefore, with the full understanding of the situation that I gave my informed consent and cooperates with trust in the course of the conduct of the study.

Signature of the participant: _____

Date: _____

Witness

I have witnessed the participant has understood the purpose of the study and had time to ask questions. I confirm that the individual has given consent freely.

Signature of witness: _____

Date: _____

I confirm that I have explained the nature and purpose of the study and the risks that are involved throughout the procedure. I have also answered all questions to the best of my knowledge that the individual has given consent freely.

Name of researcher _____

Signature of researcher _____

Date _____

This interview schedule is prepared to gather information on “Antenatal care service utilization among women of recent delivery under COVID environment. Your participation in this study is very important. The data will be used for research purposes only. All your answers will be kept confidential and will not be passed to a third party without your knowledge and consent.

May I continue the interview?

Part I. Socio-demographic questions			
No.	Questions	Response	Remark
101	Age?	_____	
102	Residence?	Urban Semi-urban B) Rural	
103	Marital status	Single Married C) Divorced D) Widowed	
104	Religion	Orthodox Muslim C) Protestant D) Other -----	
105	Ethnicity	Oromo Amhara C) Gurage D) Other-----	
106	Educational status	Illiterate Primary (1-8) C) Secondary and above	
107	Your monthly income	_____ Ethio. birr	
108	Household size	_____	
109	Your occupation status	Gov't employed Private Merchant D) Daily laborer E) Housewife F) Other -----	
110	Occupational status of your husband	Gov't employed Private Merchant D) Daily laborer E) Farmer F) Other	

111	Educational status of your husband	Illiterate Primary (1-8)	C) Secondary and above	
Part II. Morbidity history and challenges during COVID-19				
201	Do you have any history of morbidity/ illness?	Anemia Hipertensión Chronic kidney disease Diabetes HIV Thyroid disorder	1. Yes, 2. No 1. Yes 2. No 1. Yes, 2. No 1. Yes, 2. No 1. Yes, 2. No 1. Yes, 2. No	
202	Have you ever had experiences of stillbirth/ abortion complications?	Yes No		
203	Have you ever had any experience with pregnancy-related acute illnesses such as respiratory infections? urinary tract infections, Malaria	Never Yes		
204	Has your ANC visit interrupted or affected due to COVID-19?	Yes No		
205	If your answer for Q302 is yes, what were the reasons	A. Mobility restrictions B. Shortage of health workers C. Poor access to medication D. Fear of contracting COVID-19 E. Transport access problem F. Unwillingness/ ignoring of health workers to provide adequate services due to fear of COVID 19	1. Yes 2. No 1. Yes 2. No 1. Yes 2. No 1. Yes .No 1. Yes 2. No 1. Yes 2. No	
206	Have you tested positive for COVID-19 anytime during your pregnancy?	Yes No		
207	Distance to health facility (min)	-----		
Part- III History of current pregnancy and experience of ANC				
301.	At what month you start first ANC for current pregnancy?	_____ months		
302.	Is pregnancy planned?	A) Yes B) No		
303.	Is pregnancy wanted?	A) Yes B) No		
404	Gravidity (Number of previous pregnancies)			
405	Parity (Number of previous live births)			
406	Inter pregnancy interval in months			
407	When did you start your ANC visit?	1 st trimester 2 nd trimester	3. 3 rd trimester	
408	Total number of ANC visits			
409	Which components of ANC did you receive during the LAST visit?	Weight measurement Blood pressure measure Urine test Blood test	1. Yes, 2. No 1. Yes, 2. No 1. Yes, 2. No 1. Yes, 2. No	

		Ultrasound Counselling	1. Yes, 2. No 1. Yes, 2. No	
410	Have you ever received any of the following services during ANY of the ANC visits you had?	A. Weight measurement B. Blood pressure measure C. Urine test D. Blood test E. Ultrasound F. Counselling	1. Yes, 2. No 1. Yes, 2. No 1. Yes, 2. No 1. Yes, 2. No 1. Yes, 2. No 1. Yes, 2. No	

This is all that I want to ask you. Thank you for spending the time and valuable information you gave me. Do you have any questions that I can address for you?

Date of interview-----

Study participant's name -----, signature-----

Name of data collector-----, signature-----

Name of supervisor-----, signature-----

Appendix V: Questionnaire (Afan Oromo Version)

Heloo, akkam jirta? Maqaan koo_____jedhama. Amma Qu'annoo University Finfinneetti, qorannoomata duree 'Itti fayyadaminsa yaalaa fayyaa yeroo ulfaa kan dhiyeenya da'an irratti''adeemsifamuf fedhii kee yoo ta'e gaaffiifi deebii goona.

Hirmaannaan keetillee as keessatti bu'aa guddaa akka ta'u ni abdanna. Hirmaannaa keetiin walqabatee ammo sodaan wayituu akka sitti hin uumaamne ni beeksisna. Maaliif yoo jette gaaffilee irratti maqaan kee hin barreefamu waan ta'eef, kanaafuu icciitiin sirriitti eegama. Akkasumas immoo fedhii kee malee hirmaachuuf dirqama hin qabdu.

Kutaa 1 ^{ffaa} : Gaaffii waa'ee odeeffannoo waliigala			
S.no	Gaaffii	Deebii	yaada
101	Umuriin kee meeqa?	_____	
102	Bakki jireenya keeessa?	A) Magaala B) Badiyyaa C) Gam-lachuu	

103	Haala gaa'ela kee	A) Hin heerumne C) Narraadu'e	B) Walhiikne D) Heerumeera	
104	Amantaan kee maalii?	A) Ortodooksii B) Muslim	C) Proteestantii D) Kan biro ibsi	
105	Sabummaakee	A) Oromoo B) Amaara	C) Guraagee D) Kan biro(ibsi)-	
106	Sadarkaa barumsa kee	A) Barreessuu fi dubbisu hin danda'u B) Sad.1ffaa (1-8) C) Sad. 2ffaa fi isaaol		
107	Galii ji'aa tilmaamaan	_____birrii Itiyoopiyatin		
108	Baayyina maatii	_____		
109	Haala hojii kee	A) Hojjetaa motummaa B) Hojii dhuunfaa C) Daldalaa D) Hojii humnaa E) Haadha manaa F) Kan biro (ibsi)		
110	Haala hojii abbaa manaa kee	A) Hojjetaa motummaa B) Hojii dhuunfaa C) Daldalaa D) Hojii humnaa E) Haadha manaa F) Kan biro (ibsi)		
111	Haala barumsa abbaa manaakee	A) Barreessuu fi dubbisu hin danda'u B) Sad.1ffaa (1-8) C) Sad. 2ffaa fi isaa ol		
Kutaa 2^{ffaa} : Gaaffiiwaa'eerakkoofayyaa fi dhiibbaa COVID-19n walqabate				Yaadaa
201	Rakkoon fayyaa armaan gadii si mudatee beekaa?	Hir'ina dhiigaa 1. Eyyee 2. Lakki Dhiibbaa dhiigaa 1. Eyyee 2. Lakki Dhukkuba kale 1. Eyyee 2. Lakki Dhukkuba sukkaaraa 1. Eyyee 2. Lakki Dhukkuba HIV 1. Eyyee 2. Lakki Quufa mormaa 1.Eyyee 2. Lakki		
202	Ulfiisirraaba'eebeekaa?	A) Eyyee B) Lakki		
203	Rakkoon argansuu, tuubboo fincaanii fi dhukkuba busaa si mudatee beekaa?	A) Eyyee B) Lakki		
204	Sababa COVID-19tiin hordoffiin ulfaa kee addaan citeeraa?	A) Eyyee B) Lakki		

205	Yoo deebiin 204 Eyyee ta'e, Sababiin isaa maalii?	Sababii xiqqachuu geejibaa 1. Eyyee 2. Lakki Hanqina hojjettoota fayyaa 1. Eyyee 2. Lakki Hirina qulqulina egumsa fayyaa 1. Eyyee 2. Lakki Sodaa COVID-19 qabamuu 1. Eyyee 2. Lakki Rakkoo tajaajila geejibaa 1. Eyyee 2. Lakki Sababa COVID-19 ogeessi fayyaa fedhii yaaluu dhabuu 1. Eyyee 2. Lakki	
206	Yeroo ulfaa kanatti COVID-19 qabamteettaa?	A) Eyyee B) Lakki	
207	Fageenyi mana jireenyaa kee fi egumsa fayyaa (daqiiqaadhaan)	_____	
Kutaa 3^{ffaa}: Gaaffii waa'ee ulfa ammaa fi itti fayyadamina tajaajila yaalaa			
301	Ulfa kanaaf hordoffii baatii meeqatti eegalte?	baatii_____	
302	Ulfa kana karoorsiteetii?	A) Eyyee B) Lakki	
303	Ulfi kun ni barbaadamaa?	A) Eyyee B) Lakki	