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Assessment of Antenatal Care Utilization and Associated Factors Among Pregnant Women in Akaki Kality Sub City, Addis Ababa, Ethiopia 2025.

Nahom Gebrgziabher Mihretu, (GMPH), Libsework Nigussie Adane, (GMPH), Engidayehu Girma Tessema, MD, Teshom, Ayalew Feleke, (GMPH), Leyu Tamerat Estefanos, MD, Dagmawi Awoke Mulu, MD, Abduletif Umer Ali, MD

Department of Medicine, Arsi University College of Medicine and Health Sciences, Ethiopia.

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Corresponding author:

Nahom Gebrgziabher Mihretu

Department of Medicine, Arsi University College of Medicine and Health Sciences, Ethiopia

nahommhiret@mail.com

ABSTRACT

Antenatal care utilization is defined as the receipt of care by pregnant women from skilled health care provider initiated within 12 weeks of gestation and frequent visits (at least eight ANC visits) for care related to pregnancy. To assessment of antenatal care utilization and associated factors among pregnant women in Akaki kality sub city, Addis Ababa, Ethiopia 2025. The community based cross sectional study was conduct from November 2024 to July 2025 on the assessment of antenatal care utilization and associated factors among pregnant women in Akaki kality sub city, Addis Ababa, Ethiopia 2025. Single population proportion formula will be used to determine the sample size. A multistage sampling technique were employee to select the study subjects. The town has 12 woreda and of these, four woreda will be selected through simple random sampling technique. After obtaining the total number of households from selected woreda, participants will be selected through systematic random sampling technique based on population proportion to size method. Before data collection, pre- test will be undertaken on 10% of the total sample size i.e. 43 mothers on non-selected woreda in Akaki kality sub city to control the quality of data and the restructuring of questionnaire. Then, a face to face interview will be carried based on the structured questionnaire. The collected data will be analyzed by using Software Statistical Package for Social Sciences (SPSS) and possible association will made by using Chi-square and P-value. The findings will be statistically interpreted and comparison will made with other findings. This study showed that 47% of pregnant women started their first ANC visit late. The age of 30 years and above being married, unplanned pregnancy, having a wrong perception about the timing of the ANC visit, and not having ANC for previous pregnancy was significantly associated with late ANC initiation. Nearly half of the women initiated their first ANC visit late, needs awareness.

INTRODUCTION

Background

Antenatal care utilization is defined as the receipt of care by pregnant women from skilled health care provider initiated within 12 weeks of gestation and frequent visits (at least eight ANC visits) for care related to pregnancy (1).

ANC is one of the best opportunities for pregnant mothers to prevent maternal and child mortality and morbidity by increasing women's access to basic obstetric care (2,3).

The World Health Organization (WHO) recommends at least eight antenatal care (ANC) contacts with skilled health care providers, focusing on health promotion, disease prevention, and early detection management of complications (1,4).

Globally approximately 287,000 women died during and following pregnancy and child birth in 2020, with 95% of these available maternal deaths occurring in low-resource setting (5).

According the World Health Organization (WHO) revised its ANC guideline in 2016, recommending a minimum of eight contacts during pregnancy, emphasizing quality and timelines of care. However, adherence to this guideline remains uneven, particularly in low-and middle- income countries (LMICs) where structural and socioeconomic barriers persist (6).

Currently globally, 90% of pregnant women attend ANC at least once, but only 60% complete the minimum 4 visits, with disparities concentrated in low-income regions (7).

In Sub-Saharan Africa, the coverage rate for the recommended antenatal care is only 58% (8).

In Ethiopia a study in Arba Minch town, southern Ethiopia in 2023, assessed the level of optimal antenatal care utilization and its associated factors among pregnant women using the new WHO- recommended ANC 8+ model (1).

A systematic review and meta-analysis of studies in Ethiopia revealed that the overall pooled estimate of adequate ANC service utilization after the onset of the Covide-19 pandemic was 46.28%. This study included 11 eligible articles (9).

Early antenatal care visits are strongly associated with adequate antenatal care service utilization women who are attend ANC early are 10.9 times more likely to have adequate antenatal care utilization (10).

Addis Ababa the capital city of Ethiopia, faces a complex challenge in ensuring optimal maternal health care for its residents. Significant gaps remain, even in urban centers like Addis Ababa although a study showed that 76.8% of pregnant mothers who attended ANC visits had four or more visits (11).

On the other hand there is not enough studies currently antenatal care (ANC) utilization service on the privet health centers in Addis Ababa, but based on the trends available data percentage of women using ANC 80-90% (urban coverage), percentage using privet centers 30-40% of (urban women), average number of ANC visits 3-4, timing of first ANC visit 60% in first trimester (12).

Statement of the Problem

Despite a 38% decrease in the maternal mortality rate between 2000 and 2007, maternal mortality is still a major public health concern worldwide. In order to lower maternal and newborn mortality, access to high-quality antenatal care (ANC) is essential. However, only 52% of women in sub-Saharan Africa receive four or more prenatal care visits, indicating a global deficiency in adequate ANC utilization (3).

Quality antenatal care (ANC) is one of the strategies to improve the health of the mother and her unborn child and it provides an opportunity to identify complications early, offers timely management, and helps to build rapport with the mother about her health and the well-being of her unborn baby (13).

A previous study has reported that quality antenatal care increased the likelihood of using skilled birth attendance and post-natal care (14). Studies have indicated that different factors are associated with ANC service utilization among Internally Displaced women. Socio demographic (including couple educational status, maternal age, husband educational status, household monthly income, lack of knowledge, health system related factors (including distance to health facility) and political factors such as conflict and war affect ANC service uptake (15).

Missing ANC visits had adverse maternal and birth outcome; a study done in Tigray revealed that a women who had less than four ANC visits had 4.34 times more risk of experiencing adverse birth outcome; this study was supported by another study done in Nigeria which showed that attending fewer than 4 ANC visits increase the odds of maternal death by 1.75 among pregnant mothers (15).

Current situation according to the 2019 Ethiopian Demographic and Health Survey (EDHS), only 43% of pregnant women in Ethiopia completed the recommended eight or more ANC visits, with significant region disparities. For instance, Addis Ababa reported the highest ANC utilization rate (82.7%), while the Somali Region had the lowest (11.3%) (16, 17).

In the privet level using percentage 30-40% ANC utilization coverage due to key factors influencing utilization income, education, proximity, and quality of care (12).

This indicates that a larger population of women, especially in rural and underserved areas, is not receiving adequate ANC services. Even when women attend ANC visits, the quality of care provided is often suboptimal. A study assessing ANC quality in Ethiopia found that the mean ANC quality score was 11 out of 24, with key components such as breast examination for cancer screening being neglected. This highlights gaps in in the delivery of essential ANC interventions, such as iron-folate supplementation and tetanus vaccination which are crucial for maternal and neonatal health (3.3%) (18, 19).

Many women in Ethiopia initiate antenatal care visits late, with only 28% starting in the first trimester as recommended by the World Health Organization (WHO). Delayed initiation limits the effectiveness of ANC in early detection and management of pregnancy related complications, contributing to poor maternal and neonatal outcomes In Ethiopia, and specifically in Addis Ababa, the utilization of antenatal care services is also suboptimal. Studies indicate that a significant number of pregnant women delay their first ANC visit beyond the recommended time, with factors such as age, marital status, and educational level influencing this delay and additional factors such as lack of confidentiality, long waiting times, and dissatisfaction with services, despite some awareness of ANC benefits, many women still lack comprehensive knowledge, which affects their utilization of these service (20, 17).

Activities that cause maternal mortality in developing countries are identified as inadequate prenatal/postnatal/delivery care units, limited access to care, and gaps in the quality of care offered. These studies further showed that if facilities providing maternal health services had improved access to prenatal care, safe delivery, and postnatal care, the majority of maternal deaths could have been averted (21).

Ethiopia is suggested to have one of the highest maternal mortality ratio (MMR) rates globally, at a staggering 673 MMR per 100,000 live births. There is no breakdown by region. The estimate is also 77 infant deaths per 1,000 live births (22, 39).

According to reports from the Ethiopia Ministry of Health (MOH), nationally, the coverage of prenatal care decreased from 60.4% in 2005–06 to 60.4% in this report (39).

Even though a substantial number of women knew of the advantages of antenatal care (ANC) and even engaged with the service, this study identifies a disconnect in understanding awareness as well as use. The result of disconnect implies there is a knowledge-action gap, or putting another way, is that providing information is insufficient to guarantee service uptake. By comparison, usage of ANC is oftentimes very situational to sociodemographic factors. However,

understanding the exact barriers social groups face is less understood; thus, more comprehensive consideration of the nuances in such differences is warranted. This study is warranted in framing interventions for maternal health to pivot towards interventions that are inclusive of community, specificity, and mobilization - as well as inclusion of a health worker. The study emphasizes research inquiry in devising approaches that also integrate local community deliberation to motivate ANC service utilization.

The contribution of this study is for policy development, educational program, enhance access to care by the study's insight in to barriers to ANC utilization can guide health systems in improving access to care, ensuring that women more receive the necessary support during pregnancy and help concerned governmental bodies and non-Governmental organizations (NGOs) for improving ANC coverage that can in turn reduces Maternal mortality rate & infant mortality rate.

Significance of the Study

The study on antenatal care (ANC) utilization among women in Akaky/Kality sub-city was significant because there had been limited research on ANC use in the area. This research addressed that gap by examining the proportion of women who accessed ANC services and assessing the quality of care they received. The findings provided valuable insights for policymakers and health program planners, supporting efforts to align private-sector maternal health services with national strategies.

Furthermore, the study helped fill critical data gaps on ANC service utilization in the study area. The results assisted the Ethiopian government in developing strategies to promote early ANC initiation nationwide. Specifically, the evidence generated was useful for the Ministry of Health and the Addis Ababa Health Bureau in designing targeted educational interventions to improve ANC awareness and service uptake among pregnant women.

The study is useful to other relevant stakeholders at different hierarchies ranging from hospital to federal level and other organizations working in the promotion of maternal health to implement programs aimed at improving ANC follow up among pregnant women to improve maternal and neonatal health status in the study area. Especially in privet health institutions, the findings of this study intended to improve the interventions of health care workers in maternal and neonatal health care of during pregnancy, and the study is also used for researchers and planners for the secondary source of data for the future (13).

Here are the important elements that highlight significance, awareness for health professionals which are the findings of this study will be useful to increase awareness for health professionals on the factors that contribute to non- attendance to antenatal care services. Knowing factors which lead to non-attendance to antenatal care services may assist with designing valid interventions which can help to improve improvements to service providing and to encourage more women to seek care during is pregnancy. On the other hand planning and evaluation of services, the result can provide useful knowledge regarding planning and evaluation of maternal and child health service in the study area. By identifying barriers to antenatal care use, health planners can develop strategies to improve access, availability and service quality. Ultimately improve maternal and child health. This study the need for educational campaigns to inform about the importance of antenatal care.

Magnitude of Antenatal Care Utilization

Women are the backbone a society and vanguard of the family welfare. However, because of their compromised and marginalized status, women receive the least benefits from societal and family resources. Especially women in developing countries suffer a lot from unfavorable conditions due to under development, traditional and cultural sanctions and poverty among other things. As a result many health indicators such as maternal mortality rate are unacceptably high (14).

Studies indicated that ANC service utilization had great impact in curving maternal and child mortality and morbidity. Globally the post MDGs era reveals that overall prevalence of ANC service use was 78.3%. In SSA countries, it was 58.5% and higher in southern (78.9) and lower (53.39) % in Eastern Africa. In Ethiopia 74% of women received ANC from skilled provider and the 2019 mini DHS revealed that ANC utilization in Amhara region was 82.6%. Too many knowledge there is no evidence which shows global prevalence of ANC service utilization among IDPs including in Tigray region (15).

In Ethiopia, the utilization of optimal antenatal care was determined to be at 41% (4).

Sub-Saharan Africa (SSA) with two-thirds of the global maternal deaths has only indicated that approximately 52% of women completed > 4 ANC visits, which is well below global targets (EDHS; 2019; Gurara et al; 2023) (6).

In Ethiopia, maternal mortality is still high at 401 deaths per 100,000 live births, regardless of national efforts to address aligned with sustainable development goal (SDG) 3.1 and reduce maternal mortality to < 70 per 100,000 by 2023. According to the 2019 Ethiopian Demographic and Health Survey (EDHS), only 43% of pregnant women completed > 4 ANC visits, which still failed to meet the government aim of 95% (22).

Previous studies in Ethiopia, have identified significant determinants of antenatal care (ANC) utilization during pregnancy including: maternal education, household's wealth, urban-rural differences and geographical accessibility. In particular, educated women are more likely to seek ANC, as a result of improved health literacy and independence (6).

On the other hand studies shows that currently approximately 75.8% pregnant women in Ethiopia do not attend adequate ANC visits, defined as starting after the first trimester and having fewer than four visits (16). Only 55.41% of women who attended at least one ANC visit received adequate component of care (17).

ANC utilization coverage as at least eight visits but doesn't provide current statistics. Disparities in ANC coverage in four

African countries (Nigeria, Chad, Liberia, Sierra Leone), noting varying level of inequality. For example, Serra Leone has higher coverage among the poorest quintile score was 11 out of 24, but this is more about service quality than the number of visits. However, it does state the Ethiopia has high maternal mortality (412 per100, 000) and that only 43% had four or more visits according to the 2019 EMDHS (18, 19).

On the other hand studies indicates that Global trends in ANC utilization current coverage the pooled prevalence of optimal Antenatal care utilization (> 4 visits) in 27 high maternal mortality countries (primary low- and middle- income) was 55.66% (95% Cl:47.48-63.85) (20).

Countries like Ghana (86.05%) and Liberia (85.07%) reported high coverage, while Afghanistan had the lowest coverage (16.19%) (20). Globally, disparities persist weather; educated and urban women are more likely to meet ANC recommendations (21, 20).

Factors Associated with Antenatal Care Service Utilization in Privet Health Facilities

Research on ANC utilization in public and private health facilities highlights a key difference which is public health facilities are cheaper, although the often confront issues as overcrowding, wait times and scarce resources, which all can deter a woman from using ANC. Patients at privet health facilities receive better quality of care, although low-income women will not have access to these care packages. Currently, women are receiving a dual healthcare system where wealthy women experience better access to quality health preventative services. Despite the advantages, privet health care facilities have several challenges for limiting ANC Utilization based on cost (the cost of ANC services in private facility are often considered out of reach of low-income women; which lead in equality in their access, lack regulation (in some cases privet facilities may not have some regulation leading quality of care to differ, limited coverage private health facilities tend to favor urban centers (28, 29).

Socioeconomic Inequality

Antenatal care services ,utilization in Ethiopia: A decomposition,analysis using Ethiopian nationwide,Demographic Health Surveys 2011–2019 indicated that wealthier, educated, and urban women are more likely to meet ANC recommendations (> 4 visits) compared to poorer, less educated, and rural women. The pooled prevalence of optimal ANC utilization in 27 high maternal mortality countries is 55.66% Disparities are driven by income, education, and healthcare access. For example, in Afghanistan, antenatal coverage is as low as 16.19, while Ghana and Liberia exceed 85% (19).

Education and Media Exposure

Maternal education and partner education have positive associations with antenatal care attendance. Women with a secondary education are 2-4 times more likely to complete ANC visits. Media exposure (radio, TV,) increases awareness and health seeking behavior (21, 30).

Health System Related and Other Factors

Distance to the facility, lack of infrastructure, and cost are some of the most notable factors affecting service utilization in low-income countries. Women in rural areas face 42% lower odds of adequate antenatal visits than urban women (25; 30) A study done in Ethiopia suggests that women living within one hour of a health facility were more likely to use ANC services than counterparts living far away. And also study done in Nigeria found that those residing from 1 to 5 kilometers (1KM and 5 KM) from the health facility increases the proportion of women not using ANC for a proportion of 39.1% and 63.5% respectively (15).

Several studies have noted that facilities that are under staffed and poorly equipped negatively affect antenatal service provision and utilization (19, 25).

Obstetric Related Factors

Among obstetric factors that associate with ANC service utilization is parity; women who had no previous parity are more likely to initiate ANC service than women who had more parity; but a study done in Ethiopia revealed that women having increased number of children had a 7% lower level of utilization of ANC service compared with their counterparts (15).

According to WHO studies Multiparous women often underutilize ANC due to over confidence from previous uneventful pregnancies, while primiparous women are more likely to seek ANC early(WHO,2021). Pregnancy intention which is planed pregnancy are associated with higher antenatal care utilization, while unplanned pregnancy lead to. Despite higher utilization, poor service quality, such as long waiting times and lack of privacy, remains a barrier (22, 19).

The primary barriers to antenatal care utilization among women aged 15 to 49 years in Akaky/kality sub-city are multifaceted, encompassing socioeconomic, cultural, and systemic factors. This barrier significant hinders access to essential maternal health service, contributing to disparities in care utilization (23).

Studies indicated in Uganda on 2022 Lack of male partner support and decision-making power often hinders antenatal care utilization (24).

In fragile and conflict- affecting setting (FCAS) women faces additional barriers such as insecurity and disrupted health care system characterized by violence, instability, and weak governance, which disproportionately affect women's access to maternal health services. Globally 930 million people live in FCAS, where women face significant barriers to accessing antenatal care due to insecurity, disrupted healthcare systems, and socioeconomic challenges (25).

ASS has the highest maternal mortality rates globally, with conflict affected regions experiencing the most sever

disparities. In SSA, only 49% of women utilize skilled ANC services at least four times during pregnancy, far below the WHO recommendation. Conflict – affected areas, such as those in the Democratic Republic of Congo and South Sudan, report even lower utilization rates. Women in these regions often rely on traditional birth attendants or forego ANC altogether, increasing the risk of maternal and neonatal mortality (25, 26).

Recently, the study indicates that the ongoing hostility that has expanded in northern Ethiopia has resulted in a severe disruption of healthcare service leading to decreased ANC utilization. It has been reported that ANC utilization in Tigray has dropped tremendously; many women are unable to access even basic maternal health service. According to a report, only 51% of internally displaced women in Amhara region received at least one ANC visit in 2023, and only 5.2% of them have received four or more visits (15).

Single (unmarried) women may feel stigmatized or discriminated by health worker or other individual at health care facility. Because of these perception of feeling uncomfortable, single mother may choose not to receive antenatal care to avoid embarrassment. However, one study conducted in the Ethiopia found that married women are 40% more likely to receive antenatal care from a health professional than unmarried (35).

Conceptual Frame Works

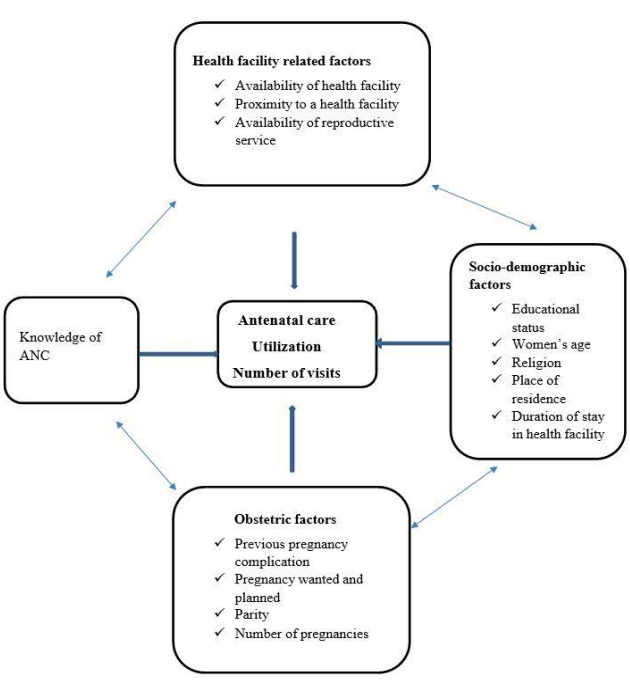

Figure 1. The adapted conceptual framework from different literature review and Anderson Newman's model (14).

Objectives

General Objective

• To assessment of antenatal care utilization and associated factors among pregnant women in Akaky- kality sub city, Addis Ababa, Ethiopia 2025.

Specific Objective

• To determine the prevalence of antenatal care utilization among women in Akaki-kality sub city, Addis Ababa, Ethiopia 2025.

• To identify factors associated with antenatal care service utilization among women in Akaky- kality sub city, Addis Ababa, Ethiopia 2025.

METHODS

Study Area and Period

The study will take place in the Akaki/Kality sub-city, which is one of the ten sub-cities in Addis Ababa. Addis Ababa is the capital city of Ethiopia and is home to people from all ethnic groups in the country. The city is divided into 11 sub-cities, called kifle ketema, and 116 woredas, which are the smallest administrative units. According to the 2007 census by the Central Statistical Agency of Ethiopia (CSA), Addis Ababa has a total population of around 6 million. It lies at an attitude of 7,546 feet (2,300 meters). The city has surface area of about 530.14 km2. Languages spoken include Amharic (71.0%), Oromiffa (10.7%), Gurage (8.37%), Tigrigna (3.60%), Silit'e

(1.82) and Gamo (1.03%) (27). Projected population size of Addis Ababa in 2022 is 3,859,638((28)). According to 2012 (EFY) health and health related indicators published by MOH, there are 49 hospitals, 13 are public which 6 are owned by Addis Ababa city administration health bureau, 5 NGOs and 32 privet, 27 public health centers, and 130 public health stations, 700 different levels of privet clinics are found in Addis Ababa city administrative region.

. Akaki kality sub city is found in the western part of Addis Ababa, Ethiopia. Administratively, the sub city is divided in to 12 woreda and 520 blocks. There are 1 hospital under health bureau and 7 health centers and 152 privet clinics. The total population of the sub city in 2011 population 195,273 (29). In 2021 population 252,387 (30),in 2022 population projection 255,348 and the annual population change is by 2.3% and males 123,823, females 131,525, population density 2,163 /Km2, Areas 61.494 Square kilometers, and is considered a major industrial zone (31). From those females reproductive age group is 31,727 and pregnant and lactating mother is 23,369.

The research will be conducted from November 2024 to July 2025 with a specific period for data collection, analysis and reporting.

Study Design

Community based cross-sectional study design will be used.

Populations

Source Population

All mothers who gave birth for at least one child and who are in reproductive age group living in Akaki kality sub city.

Study Population

All pregnant women and mothers who gave birth within one year in the selected (woredas) households.

Study Unit

An individual pregnant woman from the selected households during data collection periods.

Inclusion Criteria

Mothers who pregnant and give birth within one year Who are all willing to participate in the study?

Exclusion Criteria

Mothers who may be too sick to be interviewed or to respond Mothers refused to participate in the study.

Mothers who cannot communicate with the data collectors by no means Women give birth more than one year.

Sample Size Determination and Procedure

Sample Size Determination

To determine the sample size for the study on antenatal care (ANC) utilization and associated factors among women Akaki kality sub city Addis Ababa, Ethiopia by using the formula for estimating a single population proportion.

The sample size can be calculated using the formula for estimating a single population proportion.

$$n = \frac{(z\alpha/2)^2 P (1-P)}{d^2}$$

Where

n= Minimum sample size required

Zα/2= the standard normal variable at1.96 (for 95% confidence interval level)

p= 85.5 %(Utilizations of maternal healthcare services and influencing factors in public health facilities in Addis Ababa, Ethiopia 2024 (32)

d = Margin of error tolerated 0.05%

α= Confidence Interval at 5% CI

$$n = \frac{(1.96)^2 0.86(0.14)}{(0.05)^2} = 185$$

The calculated sample sizes will be 185.

n = 185x 2(due to design effect of multistage sampling) =370 n = 370 + 37(10% of non-respondent rate)

The final sample will be 407.

Sample Size Determination From Secondary Objectives

Sample size for the second objective was determined by Epi info version 7.3... Software using the following assumptions.

Table 1. Sample size determination for factors associated with ANC utilization among pregnant women attending ANC in Akaky kality sub-city.

Predictors	Prevalence	CI	Power	AOR	Non response rate	Sample size	Reference	
No formal education	50.6%	95%	80	8.2	10%	52(58)	(33)	
Maternal Income	47.4%	95%	80	4.12	10%	86(94.6)	(34)	
Occupation(house wife)	65.4%	95%	80	2.252	10%	278(306)	(34)	
Number of children	50%	95%	80	2	10%	296(326)	(33)	

Sampling Procedure and Techniques

Multistage sampling technique will be employed to select woredas. The town has 12 woredas. From which four woredas will be selected through simple random sampling technique. Sample mothers will select proportionally based on the size of population in the selected woredas. Survey will conducted before the actual data collection period to identify households in which mothers having less than one year child will living for

the sampling frame. Mothers will be selected proportionally based on number of mothers in each selected woredas using systematic random sampling technique. The total population in the 4 selected woreda is 7,358(w-2=1506), (w-6 = 1503),(w-8=2294) and (w-12=2055).

Population Proportion to Size

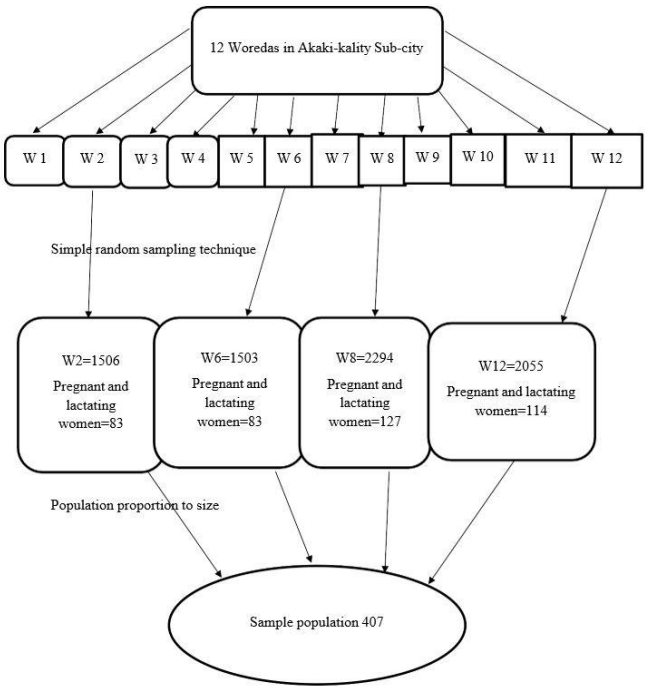

Figure 2. Schematic presentation of sampling procedure.

Data Collection Instrument

Structured questionnaire where used to collect the data. It is prepared based on different literatures done in the area. First the questionnaire were prepared in English language, and then translated in to Amharic and Oromia language (optional). The data will be collected in the Amharic Version of the questionnaire.

We used structured questionnaires to collect data on ANC utilization and associated factors from the selected participants. This approach ensures that sample the sample is representative of the target population, allowing for meaningful analysis of utilization in specified health institution.

Data Quality Management

We'll translate the questionnaire into Amharic and then back to English to make sure the data is consistent. We'll do a pre-test and tweak the questionnaire to help get more responses.

Data collectors and supervisors will have a two-day training on the study's purpose and the data collection process. The main investigator and supervisors will keep a close eye on everything during data collection. We'll check the questionnaires daily to ensure they're complete and make corrections as needed. Finally, we'll clean up the data, code it, and enter it into a computer to minimize mistakes.

Pre Testing

Pre-test will be conducted one week before the actual data collection start, to test the questionnaires at Akaky/kality sub-city which is outside of the study area on 5% of the total sample size to ensure the validity of the tool. After the pre-test, some adjustments will be making. Intensive supervision will be done by principal investigator and supervisor and the collected data will be chalked for completeness, accuracy, and consistency throughout the data collection period.

Data Processing and Analysis

Data will be code, edited and entered into Epi Data 3.1. After completion of data entry, it will be exported to SPSS version 20.0 for statistical analysis. Descriptive will be done to describe the study population and the prevalence of substance use. Bivariate and multivariate analyses will be employed to identify factors associated with the outcome variable. Multivariable logistic regression will be employed to identify the independent predictors of the substance use and to control confounders. Odds ratio with 95% confidence interval will be compute to assess the level of association and statistical significance. The results will be presented using tables, graph and figures.

Ethical Considerations

The study obtained ethical approval from Karvard college school of Public health ethical clearance committee. And Addis Ababa Health Burea. Informed consent was obtained from all participants after the purpose, risks and benefits the research were told to the potential respondents so that they could have the information needed to decide whether to participate in the research. The respondents was told that they are not forced to participate, or that they could refuse to answer any question (s) and that they could quit any time, and that participants' confidentiality and privacy was protected. Before data collection, and maintain confidentiality and anonymity of participants throughout the study process.

Operational Definitions

This is about how many antenatal care (ANC) visits pregnant moms have gone to during their current pregnancy. They need to have at least one visit (ANC 1) to count.

To say they're using the services properly, they need to complete at least four visits (ANC 4+) as recommended by the World Health Organization (WHO). This can be shown through memory or health records like an ANC card.when it comes to timing, an early start means: the first ANC visit happens in the first trimester, which is before 12 weeks of pregnancy.

For visit frequency, here's how it breaks down:

- 0 visits means no use at all.

- 1 to 3 visits are not enough and fall short of the WHO recommendation.

- 4 or more visits are considered good and meet WHO guidelines for antenatal care.

Basically, this looks at how women are using health care services during pregnancy, labor, and after giving birth.

Dissemination of Result

The result of this study will be presented to Karvard College, and a copy of this study will be distributed to Addis Ababa health administration Bureau, for organizations which support this study in funding and the concerned bodies who are working on maternal health care services in the Akaky kality sub-city. Publication will also be considered.

RESULTS

Table 2. Socio-demographic characteristics of the respondents.

Variables		Timing of ANC initiation		Total (%)
		Early (%)	Late (%)	
Age(in year)	15-19	13(6.1)	13(6.9)	26(6.5)
	20-24	60(28.2)	34(18.1)	94(23.4)
	25-29	72(33.8)	46(24.5)	118(29.4)
	30-49	68((31.9)	95(50.5)	163(40.6)
Ethnicity	Amhara	76(35.7)	41(21.8)	117(29.2)
	Oromo	53(24.9)	57(30.3)	110(27.4)
	Gurage	31(14.6)	37(19.7)	68(17.0)
	Tigray	30(14.1)	25(13.3)	55(13.7)
	Others	23(10.8)	28(14.9)	51(12.7)
Religion	Orthodox	121(56.8)	86(45.7)	207(51.6)
	Muslim	48(22.5)	45(23.9)	93(23.2)
	Protestant	43(20.2)	47(25.0)	90(22.4)
	Others	1(0.5)	10(5.3)	11(2.7)
Marital status	Single	22(10.4)	42(22.3)	64(16.0)
	Married	190((89.6)	147(77.7)	337(84.0)
Educational	Illiterate	48(22.5)	55(29.3)	103(25.7)

Socio - Demographic Characteristics of the Respondents

Out of 407 pregnant women, 401 included in this study giving the response rate of 98.5%. The mean age of respondents was (28 ± 5 SD) years. Three hundred thirty-six (84%) of the respondent were married and 154 (38.4%) attended secondary school and above level.

A half of of the respondents who delayed the timing of first ANC initiation were in the age group of 30 years and above (Table 2).

Table 3. Obstetric history of respondent.

Variable	**Late (%)**	**Early (%)**	**Total (%)**
Parity(n=401)			
1-2	131(69.7)	137(64.3)	268(66.8)
3-4	52(27.7)	69(32.4)	121(30.2)
5 and above	5(2.7)	7(3.3)	12(3.0)

History of abortion(n=401)			
No	150(79.8)	172(80.8)	322(80.3)
Yes	38(20.2)	41(19.2)	79(19.7)
Types of abortion(n=79)			
Spontaneous	27(84.4)	40(85.0)	67(84.8)
Induced	5(15.6)	7(15.0)	12(15.2)
History of child death(n=401)			
Yes	11(7.9)	9(3.4)	20(5.0)
No	129(92.1)	252(96.6)	381(95.0)
Gestational age (n=401)			
≤ 12 weeks	71(35.5)	142(71.0)	213(53.1)
≥ 12weeks	129(64.5)	59(29.0)	

Obstetric History of the Respondents

Of the total respondents, 268 (66.8%) reported to have 1-2 parity. About one fifths of respondents reported to have experienced abortion and 20 (5%) reported to encounter child death. (Table 3).

Table 4. History of current pregnancy of the respondents.

Variable	**Late (%)**	**Early (%)**	**Total (%)**
Methods of pregnancy confirmation			
Delayed menstrual period for one month	43(23.0)	47(22.0)	90(22.6)
Delayed menstrual period for two month	71(37.4)	91(42.8)	162(40.4)
Delayed menstrual period for three month	20(10.7)	10(4.7)	30(7.4)
By pregnancy test	54(28.9)	65(30.5)	119(29.7)
Planed pregnancy			
No	31(16.6)	29(13.6)	61(15.2)
Yes	156(83.3)	184(86.4)	340(84.8)
Received advice from someone on ANC			
No	33(17.6)	31(14.6)	64(16.0)
Yes	154(82.4)	183(85.5)	337(84.0)
Reason for deciding to start ANC follow up			
Perceived appropriate time	135(71.7)	145(68.1)	280(69.8)
From-previous experience	31(16.6)	45(21.1)	76(19.1)
Pregnancy-danger signs	5(2.7)	10(4.7)	15(3.8)
Others	17(9.0)	13(6.1)	30(7.5)
Transport cost paid for getting health service			
Yes	25(13.3)	45(21.1)	70(17.5)
No	163(86.7)	168(78.9)	

*Others Advice from relatives, partners and family.

History of Current Pregnancy and Timing of First ANC Visits

Of 401 respondents, 188(46.9%) started their first ANC late. One hundred sixty-one (40.2%) respondents confirmed their current pregnancy when menstruation period was late for two month and 119(29.8%) confirmed their pregnancy by urine test offered by a health care provider. Among respondents, 339(85%) reported that their current pregnancy was planned and 60 (15%) reported that the pregnancy was unplanned (Table 4).

Table 5. Perception of respondents towards about the benefits and timing of ANC initiation.

Timing of ANC initiation.

Variable	Late (%)	Early (%)	Total (%)
Impotence of ANC for your own health			
Highly important	137(72.9)	177(83.1)	314(78.3)
Medium	48(25.5)	33(15.5)	81(20.2)
Less important	3(1.6)	1(0.5)	4(1.0)
I don't know	1(0.5)	2(0.9)	3(0.8)
Perceived timing of the first ANC visit			
≤ 12 weeks	69(35.8)	173(83.2)	242(60.3)
≥ 12 weeks	124(64.2)	35(16.8)	159(39.6)
Previous ANC follow up			
No	100(54.1)	48(22.6)	152(38.0)
Yes	85(45.9)	164(77.4)	249(62.0)

Three hundred fourteen (78.3%) of the respondents perceived that ANC is highly important to the health of mother and about 72% perceived that ANC is highly important for the fetus. Regarding the correct time of ANC booking, 242(62.7%) of the women perceived that ANC should be initiated within or before 12 weeks gestation and 144(37.3%) perceived that ANC should begin after 12 weeks of gestation. Most of respondents, 249(62%), had previous ANC follow up (Table 5).

Table 6. Factors associated with late initiation of ANC at selected woredas in Akaky kality sub- city Addis Ababa, 2025(n=401).

Timing of ANC initiation - Odds ratio with 95% CI.

Variable	Late (%)	Early (%)	COR	AOR	P-value
Age(in year)					
15-19	13(6.9)	13(6.1)	1	1	
20-24	34(18.1)	60(28.0)	1.83(0.72 , 4.24)	0.98(0.29 ,3.3)	0.97
25-29	46(24.5)	72(34.0)	1.61(0.66 , 3.67)	0.66(0.20 , 2.2)	0.50
30-49	95(50.5)	68(32.0)	0.57(0.31 , 0.83)	0.25(0.06 , 0.94)	0.02
Marital status					
Single	42(22.3)	22(10.0)	1	1	
Married	146(78.0)	190(89.0)	2.53(1.42 , 4.33)	2.8(1.3 , 6.1)	0.01
Educational status					
Illiterate	55(29.3)	48(23.0)	1	1	
Primary education	80(42.6)	64(30.0)	0.92(0.63 , 1.54)	1.05(0.53 , 2.1)	0.87
Secondary and above	53(28.2)	101(47.0)	2.20(1.31 , 3.62)	1.8(0.8 , 3.8)	0.12

Occupation					
Self employed	106(57.0)	94(44.0)	1	1	
Government employee	27(14.5)	51(24.0)	2.10(1.23 , 3.70)	1.43(0.62 , 3.30)	0.40
House wife	47(25.3)	60(28.0)	1.43(0.89 , 2.30)	0.87(0.46 , 1.62)	0.65
Others	6(3.2)	8(3.8)	1.50(0.50 , 4.51)	2.20(0.43 , 11.12)	0.34
Planned pregnancy					
No	155(83.3)	184(86.4)	1	1	
Yes	31(16.7)	29(13.6)	1.27(1.23 , 5.12)	2.17(1.44 , 4.67	0.01
Transportation cost					
No	25(13.3)	45(21.0)	1	1	
Yes	163(87.0)	168(79.0)	0.62(0.34 , 1.14)	0.73(0.42 , 1.50)	0.38
Perceived timing of the first ANC visit					
≤ 12 weeks	69(38.8)	173(83.2)	1	1	
≥ 12 weeks	109(61.2)	35(16.8)	7.80(7.12 , 30.71)	8.58(5.75 , 14.80)	0.01
Previous ANC follow up					
No	100(54.0)	48(23.0)	1	1	
Yes	85(45.9)	164(77.0)	4.01(2.60 , 6.23)	5.45(3.02 , 9.83)	0.001

In a bivariate analysis, maternal age, marital status, educational status, occupation, transportation cost for ANC, pregnancy intention, perceived timing of ANC initiation, and previous history of ANC follow up were found to be associated with late initiation of ANC. However, in a multivariable logistic regression, maternal age, marital status, unplanned pregnancy, perceived timing of first ANC visit, and previous ANC follow up were found to be significantly associated with late initiation of ANC after adjusting for confounders.

The odds of late ANC initiation were 25% lower among women with the age of 30 and above compared to other age groups (AOR=0.25,95% CI 0.06,0,83). The odds of the first ANC visit were 2.8 times higher among married women than single women (AOR=2.81, 95% CI 1.29, 6.09). Pregnant women who perceived the correct time of ANC booking was after 12 weeks of gestation were 8.58 times more likely to delay the ANC initiation compared to those who perceived that correct time of ANC booking was before 12 weeks of gestation (AOR=8.58, 95% CI 5.75,14.80).

Pregnant women with an unplanned pregnancy were 2.17 times more likely to start their ANC late compared to those women with planned pregnancies (AOR=2.17, 95% CI 1.4, 4.67).

Pregnant women who had no ANC for previous pregnancy were 5.45 times more likely to start their ANC lately compared to those who had ANC for previous pregnancy (AOR=5.45, 95% CI 3.02, 9.83) (Table 6).

DISCUSSION

This community based cross-sectional study tried to assess factors affecting utilization of antenatal care (ANC) in selected woreda, Akaky kality sub-city. The current study showed the study found significant proportion of pregnant women in Akaky kality sub-city utilize ANC service with 62% respondents having attended ANC during their current or most recent pregnancy. However 46.9% initiated ANC early (within the first trimester) which aligns with national data from the 2019 Ethiopian Demographic and Health Survey (EDHS), where early initiation was reported at 28%. This suggested that while ANC attendance is relatively high, timely initiation remains a challenge, potentially due to lack of awareness, cultural practice, or systemic barrier such as distance to health facility, waiting time, quality of care, and economic factors with transportations. Which reported that 74% of Ethiopian women attended at least one ANC visit, but only 28% started ANC in the first trimester (35).

When to comparison Urban with Rural disparities while Addis Ababa has higher ANC utilization (82.7%) compared to rural regions like Somali (11.3%). Akaky kality's figures suggest suboptimal early initiation, likely due to urban-specific barriers such as long Waite times, perceived low service quality or competing economic priorities (36).

A 2024 studies in rural Ethiopia found that 92.3% of women attended a least one ANC visit, but only 28.8% completed four visits and none met the WHO's 8 visit target. This highlights a

nationwide gap in quality and continuity of care, even in urban setting like Akaky kality (37).

This study has identified a number of factors that have important influence on utilization of ANC in Akaky kality sub-city. Women's education level, family income, Religion, age of the mother and number of children found to affect utilization of ANC utilization significantly. Which is similar to the study done in eastern Sudan and in- depth analysis of the Ethiopian Demographic and Health Survey (2005) (38).

On the other hand this study finding is higher compared to a study done in debre Markose (33.4%). This variation could be due to classification of the outcome. Because the study in Debre Markos classified mothers has late for ANC initiation. Yet the prevalence of late ANC initiation in our study in lower than studies conducted in Tanzania (70.4%), Zambia (72%), and studies conducted in other parts of Ethiopia such as Ilu Ababor (71.2%), and Tigray (98.5%) (39).

The study is community-based, therefore all mothers who gave birth within one year before the study period were included in the study population. The sampling frame included 12 woredas, from which four were randomly selected, allowing the results to be generalized to the town. The study identified a wide range of socio-demographic and maternal factors associated with the utilization of ANC. A multistage sampling technique was employed to ensure representation from different woredas (districts) in Akaky Kality Sub-city, which enhances the generalizability of the findings to similar urban settings in Ethiopia.

With an adequate sample size of 407 participants and 401 respondents (98.5% response rate), the study has sufficient statistical power to detect associations between ANC utilization and key factors. Standardized tools were used, as data were collected through a structured questionnaire validated by pretesting, which improved the reliability and consistency of the measurements.

However, there are some limitations. A qualitative method is needed to identify important reasons for not utilizing the service. Responses to certain questions, such as the number of ANC visits, may depend on the mother's memory. Since the study used a cross-sectional design, it limits the ability to establish causal relationships between ANC utilization and associated factors. The data relied on self-reported ANC, which may be subject to recall bias. Finally, as the study was conducted in Akaky Kality Sub-city (urban Addis Ababa), the findings may not reflect the challenges faced in rural areas, such as distance to health facilities and lower education levels.

CONCLUSION

In conclusion this study showed better utilization of Antenatal care utilization as compared to the national coverage. The most important factors influencing utilization of antenatal care services were and socio-demographic in nature like maternal education, family income, maternal age, religion and parity were associated factors.

The reasons given by the individual women for not attending ANC were found to be "Ignorance for the purpose of ANC "not having enough information about the purpose of ANC "Not being satisfied with previous ANC" long waiting time was being too busy and bad conduct of service providers. The study result revealed that non-attendance was highest for those women whose monthly income is low. Illiterate and with age < 25. Antenatal coverage in the study area was very high, family income, women education, number of children, maternal age and religion were important determinant factors for ANC.

Mother's educational level, monthly family income, age, religion, number of children, showed statistically significance association with antenatal care. This study has showed similar results to those documented in some studies done in Ethiopia and other developing countries. Such finding can therefore be used as the basis for a number of recommendations. On the other hand this study reveals critical gaps in antenatal care (ANC) utilization among pregnant women in Akaky kality. While 62% attended ANC, only 46.9% initiated care early (≤ 12 weeks) falling short of WHO recommendations, unplanned pregnancies (2.17x higher risk of late initiation), Limited awareness of ANC timing (women believing ANC should start after 12 weeks were 8.58x more likely to delay). Lack of prior ANC experience (2.17x higher risk), socio-economic barriers (e.g. low education, unmarred status). These finding align with national trends, where urban areas like Addis Ababa report higher ANC coverage than rural regions but struggle with timely initiation and service quality. Urgent interventions are needed to avert preventable maternal and neonatal mortality.

REFERENCES

1. Dinagde DD, Feyisa GT, Afework HT, Wada HW. Level of optimal antenatal care utilization and its associated factors among pregnant women in Arba Minch town, southern Ethiopia: new WHO-recommended ANC 8+ model. Front Glob Womens Health. 2024;5:1259637.
2. Mouhoumed HM, Nimetcan M. Utilization pattern of antenatal care and determining factors among reproductive-age women in Borama, Somaliland. J Prev Med Hyg. 2021;62(2):E439–E446.
3. Belay AT, Fenta SM, Biresaw HB, Moyehodie YA, Yelam MM, Mekie M. The magnitude of optimal antenatal care utilization and its associated factors among pregnant women in South Gondar Zone, Northwest Ethiopia: a cross-sectional study. Int J Reprod Med. 2021;2022:1415247.
4. Dinagde D, Feyisa GT, Afework HT, Chewaka MT, Wada HW. Level of optimal antenatal care utilization and its associated factors among pregnant women in Arba Minch town, southern Ethiopia: new WHO-recommended ANC 8+ model. Front Glob Womens Health. 2024;5:1259637. doi:10.3389/fgwh.2024.1259637.
5. Lateef MA, Kuupiel D, Mchunu GG, Pillay JD. Utilization of antenatal care and skilled birth delivery services in sub-Saharan Africa: a systematic scoping review. Healthcare (Basel). 2024;12(4):.
6. Awoke N, Ababulgu SA, Hanfore LK, Wake SK. Regional disparities in antenatal care utilization among pregnant women and its determinants in Ethiopia. Front Glob Womens Health. 2024;5:1230975.
7. Lateef MA, Kuupiel D, Mchunu GG, Pillay JD. Utilization of antenatal care and skilled birth delivery services in sub-Saharan Africa: a systematic scoping review. Healthcare (Basel). 2024;12(4):.
8. Dinagde DD, Feyisa GT, Afework HT, Chewaka MT, Wada HW. Level of optimal antenatal care utilization and its associated factors among pregnant women in Arba Minch town, southern Ethiopia: new WHO-recommended ANC 8+ model. Front Glob Womens Health. 2024;5:1259637.

9. Temesgen G, Tadesse ZS. Adequate antenatal care service utilizations after the onset of COVID-19 pandemic in Ethiopia: a systematic review and meta-analysis. Front Public Health. 2024;12:1395190.

10. Temesgen GW, Tadesse ZS. Adequate antenatal care service utilization after the onset of COVID-19 pandemic in Ethiopia. Front Public Health. 2024;12:.

11. Temesgen SA, Netangaheni TR. Utilisation of maternal healthcare services and influencing factors in public health facilities in Addis Ababa, Ethiopia. Afr J Prim Health Care Fam Med. 2024;29:a2694.

12. Ethiopian Public Health Institute (EPHI); ICF. Ethiopia Demographic and Health Survey 2019. Addis Ababa: EPHI and ICF; 2019.

13. Alemu AA, Welsh A, Getachew T, Khajehei M. Assessment of antenatal care quality in Ethiopia: facility-based study using service provision assessment data. PLoS One. 2025;20(1):e0313527.

14. Ayalew B, Tsegaye B, Mohammed M. Prevalence and factors associated with antenatal care utilization in Ethiopia: evidence from Demographic and Health Survey 2016. [Journal unknown].

15. Meseret H. Antenatal care utilization and associated factors among internally displaced reproductive age Amhara women (15–49 years) in the North-Shewa camps of Amhara Region, 2023 [thesis]. Addis Ababa: Addis Ababa University; 2023.

16. Gebeyehu AA, Dessie AM, Anteneh RM, et al. Inadequacy of antenatal care attendance and its determinants amongst pregnant women in Ethiopia based on the 2019 Mini-Ethiopian Demographic Health Survey: secondary data analysis. BMC Pregnancy Childbirth. 2024;24:682.

17. Shiferaw D, Feyisa BR, Biru B, Yesse M. Antenatal care component utilization and associated factors among pregnant women in Ethiopia: multilevel analysis of Ethiopian Mini Demographic and Health Survey 2019. PLoS One. 2024;19(5):e0303118.

18. Yehualashet DE, Seboka BT, Tesfa GA, Mamo TT, Seid E. Determinants of optimal antenatal care visit among pregnant women in Ethiopia: a multilevel analysis of Ethiopian Mini Demographic and Health Survey 2019 data. BMC [journal]. 2022;1:1–8.

19. Tsega Y, Endawkie A, Tsega G, Mekonen AM, Ali Y, Dawed YA, Stecher C. Trends and socioeconomic inequalities of recommended antenatal care services utilization in Ethiopia: a decomposition analysis using Ethiopian nationwide Demographic Health Surveys 2011–2019. PLoS One. 2025;20(2):e0318337.

20. Chilot D, Belay DG, Ferede TA, et al. Pooled prevalence and determinants of antenatal care visits in countries with high maternal mortality: a multi-country analysis. Front Public Health. 2023;11:1035759.

21. Kuhnt J, Vollmer S. Antenatal care services and its implications for vital and health outcomes of children: evidence from 193 surveys in 69 low-income and middle-income countries. BMJ Open. 2017;7(11):e017122.

22. Alemu AA, Welsh A, Getachew T, Khajehei M. Assessment of antenatal care quality in Ethiopia: facility-based study using service provision assessment data. PLoS One. 2025;20(1):e0313527.

23. Gebresilase YH. What drives the rural-urban disparities in maternity-care services utilisation? Evidence from Ethiopia. PLoS One. 2013;12:666.

24. Omona K. Factors affecting the utilization of antenatal care 4th visit among mothers in Rubirizi District, Uganda. J Health Med Nurs. 2022; (May 11):.

25. Alibhai KM, Ziegler BR, Meddings L, Batung E, Luginaah I. Factors impacting antenatal care utilization: a systematic review of 37 fragile and conflict-affected situations. Confl Health. 2022;16:59.

26. Dickson KS, Okyere J, Ahinkorah BO, et al. Skilled antenatal care services utilisation in sub-Saharan Africa: a pooled analysis of demographic and health surveys from 32 countries. BMC Health Serv Res. 2022;22:831.

27. Central Statistical Agency (CSA) of Ethiopia. The 2007 Population and Housing Census of Ethiopia. Addis Ababa: CSA; 2007.

28. Central Statistical Agency (CSA) of Ethiopia. Population Projection of Ethiopia for All Regions at Woreda Level, 2014–2017. Addis Ababa: CSA; 2014–2017.

29. Belaynesh T, Trhas TB, Getachew WT, Addisu TS, Eskedar S. Assessment of reproductive health service utilization and associated factors among adolescents and youth in Akaki Kaliti Sub City and youth centers. Open J Public Health. 2022;5(1):1046.

30. Kebede A, Getaneh D, Asfaw D, Birhanu A. Determinants of under-nutrition among children aged 6–59 months in Akaki Kaliti Sub-City, Addis Ababa: unmatched case-control study. Jimma Univ Dep Epidemiol. 2023;.

31. Ethiopian Statistics Service. Akaki Kaliti: sub city profile and related information. 2022;.

32. Temesgen SA, Netangaheni TR. Utilisations of maternal healthcare services and influencing factors in public health facilities in Addis Ababa, Ethiopia. Afr J Prim Health Care Fam Med. 2024;29:a2694.

33. Assefa Z. Assessment of factors affecting utilization of antenatal care [BSc thesis]. Addis Ababa: Addis Ababa University; 2011.

34. Dulla D, Daka D, Wakgari N. Antenatal care utilization and its associated factors among pregnant women in Boricha District, Southern Ethiopia. J Women's Health Care. 2017;.

35. Zarocostas J. Global maternal mortality rates stagnating. Lancet. 2025;401(10377):632.

36. Awoke N, Ababulgu SA, Hanfore LK, Gebeyehu EG, Wake SK. Regional disparities in antenatal care utilization among pregnant women and its determinants in Ethiopia. Front Glob Womens Health. 2024;5:.

37. Gebeyehu AA, Dessie AM, Zemene MA, et al. Inadequacy of antenatal care attendance and its determinants amongst pregnant women in Ethiopia based on the 2019 Mini-Ethiopian Demographic Health Survey: secondary data analysis. BMC Pregnancy Childbirth. 2024;24:682.

38. Alemu AA, Welsh A, Getachew T, Khajehei M. Assessment of antenatal care quality in Ethiopia: facility-based study using service provision assessment data. PLoS One. 2025;20(1):e0313527. doi:10.1371/journal.pone.0313527.

39. Robro M, Deresse W, Lindtjorn B. Antenatal care utilization and compliance with national and WHO guidelines in rural Ethiopia: a cohort study. Int J Gynaecol Obstet. 2022 Nov 17;.

40. Tsegaye B, Kassa M. Factors associated with antenatal care utilization in Ethiopia: a systematic review. BMC Pregnancy Childbirth. 2018;.

41. Fekadu GA, Kassa GM. Factors associated with [health service utilization] among women of reproductive age in Ethiopia. BMC Health Serv Res. 2020;20:485.

42. Tessema ZT, Teshale AB, Tesema GA, Tamirat KS. Determinants of completing recommended antenatal care utilization in sub-Saharan Africa from 2006 to 2018: evidence from 36 countries using Demographic and Health Surveys. BMC Pregnancy Childbirth. 2021;21:369. doi:10.1186/s12884-021-03669-w.

43. Abdissa Z, Alemu K, Lemma S, et al. Effective coverage of antenatal care services in Ethiopia: a population-based cross-sectional study. BMC Pregnancy Childbirth. 2024;24:536. doi:10.1186/s12884-024-06536-6.

44. Awoke N, Ababulgu SA, Hanfore LK, Wake SK. Regional disparities in antenatal care utilization among pregnant women and its determinants in Ethiopia. Front Glob Womens Health. 2024;5:1230975. doi:10.3389/fgwh.2024.1230975.

45. Abdissa Z, Alemu K, Lemma S, et al. Effective coverage of antenatal care services in Ethiopia: a population-based cross-sectional study. BMC Pregnancy Childbirth. 2024;24:536.

46. Mekonen H. Dietary diversity and associated factors among pregnant women in East Belessa District, Central Gondar, Ethiopia: community-based cross-sectional study [thesis]. Gondar: DSpace; 2020.

47. Tessema Y. Dietary diversity and associated factors among pregnant women attending antenatal care at Injibara General Hospital, Northwest Ethiopia [thesis]. Injibara: DSpace; 2020.

48. Mesfin BA, Argaw AT, Negash FG, Emiru DA, Aserese AD, Matebe GY. Minimum dietary diversity and associated factors among pregnant women living in Arba Minch Health and Demographic Surveillance Sites, Southern Ethiopia, 2022. Health Serv Res Manag Epidemiol. 2023;10:.

49. Kebede AN, Sahile AT, Kelile BC. Dietary diversity and associated factors among pregnant women in Ethiopia. Int J Public Health. 2021;67:.

50. Saaka M, Mutaru S, Osman SM. Determinants of dietary diversity and its relationship with the nutritional status of pregnant women. J Nutr Sci. 2021;10:e8.

51. Ali F, Thaver I, Khan SA. Assessment of dietary diversity and nutritional status of pregnant women in Pakistan. J Health Res. 2014;26(4):122–126.

52. Teshome A, Haile A, Alemteshay. Determinants of dietary diversity consumption and nutritional status of pregnant women attending Armed Forces Comprehensive Specialized Hospital, Ethiopia. Food Process Nutr Sci. 2020;1(1):1–7.

53. Tadesse E, et al. Minimum dietary diversity and associated factors among pregnant women attending antenatal care in government health facilities of Soro District, Hadiya Zone, Southern Ethiopia. Res Square. 2022 Jan 3:.

54. Uwase A, Nsereko E, Pillay N, Levin J. Dietary diversity and associated factors among pregnant women in the Southern Province of Rwanda: a facility-based cross-sectional study. PLoS One. 2024;19(2):e0297112.

55. Tefera W, Brhanie TW, Dereje M. Dietary diversity practice and associated factors among pregnant women attending ANC in Kolfe Keranyo Sub-City health centers, Ethiopia. Bahir Dar Univ. 2020 May 3:.

56. Getahun GK, Ahmed SM, Degif AB, Haile MG. Assessment of dietary diversity score and associated factors among pregnant women of Batu District, Southern Ethiopia. Ann Med Surg (Lond). 2023;85(3):383–389.

57. Mohammed F, Abdirizak N, Jibril A, Oumer A. Minimum dietary diversity among pregnant women on antenatal care follow-up at public health facilities in Puntland, Somalia. Sci Rep. 2023;13:21935. doi:10.1038/s41598-023-48983-9.

58. Weerasekara PC, Withanachchi CR, Ginigaddara GAS, Ploeger A. Understanding dietary diversity, dietary practices and changes in food patterns in marginalised societies. Foods. 2020;9(11):1659.

59. Kahanya KW. Dietary diversity, nutrient intake and nutritional status among pregnant women in Laikipia County, Kenya. Int J Health Sci Res. 2016;6(4):378–385.

60. Heri R, Malqvist M, Yahya-Malima K, Mselle LT. Dietary diversity and associated factors among women attending antenatal clinics in the Coast Region of Tanzania. BMC Nutr. 2024;10:16. doi:10.1186/s40795-024-00825-1.

61. Black RE, Allen LH, Bhutta ZA, et al. Maternal and child undernutrition: global and regional exposures and health consequences. Lancet. 2008;371(9608):243–260.

62. Delil R, Zinab B, Hassen M. Determinants of dietary diversity practice among pregnant women attending antenatal clinic at Wachemo University Nigist Eleni Mohammed Memorial Referral Hospital. PLoS One. 2021;16(4):e0250037.

63. Mohammed F, Abdirizak N, Jibril A, Oumer A. Correlates of minimum dietary diversity among pregnant women on antenatal care follow-up at public health facilities in Puntland, Somalia. Sci Rep. 2023;13:21935.

64. Desta M, Akibu M, Tadese M, Tesfaye M. Dietary diversity among pregnant women and associated factors in Shashemane, Oromia, Central Ethiopia. J Nutr Metab. 2019;2019:3916864.

65. Azene AG, Aragaw AM, Wubetie HT, et al. Dietary diversity among pregnant women in Ethiopia: systematic review and meta-analysis. PLoS One. 2021;16(6):e0251906.

66. Nigussie E, Ferede A, Markos M. Diversified dietary intake and associated factors among pregnant mothers attending antenatal care follow-up in public health facilities, Dire Dawa, Ethiopia. PLoS Glob Public Health. 2022;2(6):e0000002.

67. Bikill KW, Berhe TT, Tedla GW. Dietary diversity practice and associated factors among pregnant mothers in Sebeta Awas District, Oromia Special Zone Surrounding Finfine, Oromia, Central Ethiopia, 2022. Am J Health Res. 2023;11(5):140–148.

68. Awol KJ, Mukemil M. Minimum dietary diversity score and associated factors among pregnant women at Alamata General Hospital, Raya Azebo Zone, Tigray Region, Ethiopia. J Nutr Metab. 2019;2019:8314359.

69. Alemu FT, Desta AA, Tola AG. Dietary diversity and associated factors among pregnant women attending antenatal care at public hospitals in North Shewa, Oromia, Ethiopia, 2023. Front Nutr. 2024;11:1400813. doi:10.3389/fnut.2024.1400813.

70. Shamim AA, Mashreky SR, Ferdous T, et al. Diet quality and its sociodemographic determinants in southwestern Bangladesh. Food Nutr Bull. 2016;37(1):14–26. doi:10.1177/0379572116632137.

71. Atosona A, Ali Z, Abubakari A, Wemakor A. Dietary diversity and associated factors among pregnant women in urban Northern Ghana. Ann Med Lab Sci. 2022;2(2):55–62.

72. Wondmeneh TG. Dietary diversity practice and its influencing factors among pregnant women in Afar region of Ethiopia: mixed-method study. BMC Pregnancy Childbirth. 2022;22:46. doi:10.1186/s12884-022-04641-y.

73. Geta TG, Gebremedhin S, Omigbodun AO. Dietary diversity among pregnant women in Gurage Zone, South-Central Ethiopia: assessment based on longitudinal repeated measurement. Int J Womens Health. 2022;14: . doi:10.2147/IJWH.S361679.

74. Olatona FA, Olowu OJ, Goodman OO, Amu EO. Dietary habits, diversity, and predictors among pregnant women attending primary health care centers for antenatal care in Lagos, Nigeria. J Family Med Prim Care. 2021;10(10):3580–3586. doi:10.4103/jfmpc.jfmpc_397_21.

75. Kennedy G, Ballard T, Dop MC. Guidelines for measuring household and individual dietary diversity. Rome: FAO; 2013.