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Factors in Maternal Healthcare Service Utilization in Ethiopia

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Directed by Professor Sunjoo Kang

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Acronyms and Abbreviations

ANC	Antenatal Care
CI	Confidence Interval
DHS	Demographic and Health Survey
EHSP	Essential Health Service Package
EMDHS	Ethiopian Mini-DHS
EPHI	Ethiopian Public Health Institute
HEP	Health Extension Program
HEW	Health Extension Worker
HO	Health Officer
HSTP	Health Sector Transformation Plan
ID/FD	Institutional/Facility Delivery
MCH	Maternal and Child Health
MMR	Maternal Mortality Ratio
OR	Odds Ratio
PHCU	Primary Health Care Unit
PNC	Postnatal Care
SDG	Sustainable Development Goal
SNNPR	Southern Nations, Nationalities, and Peoples Region
TV	Television
WHO	World Health Organization

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Abstract

Background: Ethiopia is among the sub-Saharan African countries with the highest maternal mortalities. According to a study by Tiruneh et al. (2022) the maternal mortality ratio (MMR) was 401/100,000 LBs in 2017. The most maternal deaths result from preventable causes and modifiable factors. The Optimal utilization of antenatal-care, institutional delivery and postnatal care services is a pivotal intervention in substantially reducing these deaths through early problem identification and management, the promotion of health-seeking behavior, preparation of pregnant women for birth, provision of safe and clean delivery, and monitoring of maternal health during 42 days after delivery. The aim of this study was to assess the prevalence of the three major maternal healthcare services utilization and associated factors among Ethiopian mothers in the child bearing age in 2019.

Method: Secondary data analysis was performed based on the Ethiopian mini-demographic and health survey 2019. The survey design was stratified, two-stage cluster sampling. The analysis was restricted to antenatal care, institutional delivery and postnatal care service utilization among women in the age group15-49 years who delivered at least one live child in the previous five years at the survey date. Descriptive statistics, Chi-square tests and binomial logistic regression were performed. Odds ratios with 95% confidence interval was calculated, while p-value less than 0.05 was used to determine statistically significant associations among the independent and outcome variables.

Result: Prevalence of Antenatal Care, Institutional Delivery and Postnatal Care services utilization rates were: 73.8% [95% CI: 72.4, 75.1], 11.7% [95% CI: 10.7, 12.8], and 53.7% [95% CI: 52.12, 55.24], respectively. The utilization of Antenatal Care, Institutional Delivery and Postnatal Care services were significantly associated with the educational status, media exposure (Radio, Television), region of residence, and skilled healthcare providers. Age of the woman, religion and residence type (urban/rural) are shared determinants of Antenatal Care and Institutional Delivery service utilization, whereas

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Antenatal Care attendance and frequency of Antenatal Care visits are common significant influencers of Institutional Delivery and Postnatal Care service utilization among the study participants.

Conclusion: The utilization rates for Antenatal Care, Institutional Delivery and Postnatal Care services were substantially low. Educational status, media exposure (Radio, Television), region of residence, and skilled healthcare provider were factors significantly associated with all the three components of maternal and child health. Therefore, maternal health-related, policies, strategies, and plans should be designed and approached in a comprehensive, integrated, multi-sectorial and collaborative manner. The common factors associated with the main maternity-services utilization and socioeconomically less privileged regions should be accorded first priority in maternal-healthcare intervention plans in Ethiopia.

Key Words: Maternal Mortality Ratio, Antenatal Care, Institutional Delivery, Postnatal Care, Service Utilization, Ethiopia, Associated Factors.

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CHAPTER 1. INTRODUCTION

1.1 Background/ Statement of the Problem

The term “maternal mortality” refers to the loss of women for any reason related to or made worse by pregnancy during pregnancy, childbirth, and the first 42 days following delivery (Berhan & Berhan, 2014). Maternal mortality and morbidity represent the biggest global threat to human development (Tsegaye & Ayalew, 2020). Every day in 2017, nearly 810 women died from preventable causes related to pregnancy and delivery globally, the vast majority (94%) being from low- and lower-middle-income nations, according to a World Health Organization (WHO) analysis (WHO, 2019). Despite the millennium development goals’ agenda 5 target to reduce by 75% between 2000 and 2015, it was only managed to cut by 38% from 342 to 211 fatalities per 100,000 live births between 2000 and 2017 globally based on the UN inter-agency estimates. This implies an average annual reduction of 2.9%, less than half of the 6.4% annual rate needed to achieve the contemporary Sustainable Development Goals, SDG target 3.1 of 70 maternal deaths/100,000 LBs by 2030. In spite of the goal of ending preventable maternal deaths by 2030, the world would lose more than a million lives below this goal at the current pace of development (TEAM & Research, 2019).

In the same year of 2017, 196,000 (66%) of the estimated more than 295,000 maternal fatalities worldwide were from Sub-Saharan Africa (Musarandega et al., 2021).

Ethiopia is one of the top six Sub-Saharan countries with the highest MMR, (401/100,000 LBs) (Tsegaye & Ayalew, 2020). In reality, during the previous three decades and beyond, Ethiopia's Maternal Mortality Ratio (MMR) trends have

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likewise been declining (708, 601, 561, and 401 per 100,000 LBs in the years 1990, 2000, 2010 and 2017 respectively) (Tessema et al., 2017). However, Ethiopia had not met the MDGs and the national Health Sector Transformation Plan-I (HSTP-I) targets from 2015/16 to 2019/20 despite all stakeholders making their absolute best efforts to reduce the high Maternal Mortality Ratio (MMR) (Berhan & Berhan, 2014; Tessema et al., 2017). In spite of the two major goals' overly ambitious targets of 267 and 199 deaths/100,000 LBs, respectively, the MMR remained at 401 deaths/100,000LBs in Ethiopia (Tessema et al., 2017; Tiruneh et al., 2022).

It is important to note that this persistently high maternal death ratio results from preventable causalities and related factors through the delivery and proper utilization of the basic quality maternal healthcare services to all women in the child bearing age in need. More than half of maternal deaths globally occurred between 2003 and 2009 as a result of bleeding, hypertensive diseases, and sepsis and over a quarter (27.5%) of the deaths were caused by indirect factors (Say et al., 2014). Similar to this, more than three-quarters of maternal deaths in Sub-Saharan Africa between July 2012 and February 2016 were due to obstetric bleeding, non-obstetric complications, hypertensive disorders of pregnancy, and infections related to pregnancy (Ahmed et al., 2018). According to facility-based studies, the top four direct causes of maternal mortality in Ethiopia in the first decade of the twenty-first century were obstructed labor/uterine rupture (36%), hemorrhage (22%), hypertensive disorders of pregnancy (19%), and sepsis/infection (13%) (Berhan & Berhan, 2014). All these direct causes have their own bulks of associated factors behind.

As it is true with other public health problems, the maternal health status of a country is actually not attributable to a single, limited number of causes and/or associated factors, rather it is a result of complex web of interrelated multiple

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causes and/or multifactorial relationships. Majority of these complex problems can be tackled by optimal utilization by women of the child bearing age of the three primary maternal healthcare services namely: antenatal care, delivery by a skilled attendant and postnatal care. Unfortunately, the maternity healthcare service utilization by women of the child bearing age in Ethiopia is sub-optimal. According to evidence from the 2016 Ethiopian DHS report the coverages of antenatal (first visit), delivery, perinatal care (within two days of delivery), were 62%, 26%, and 17% respectively; and utilization of the services by the women aged 15 to 49 are significantly correlated with their and/or spouses'/partners' socioeconomic and demographic background characteristics (Central Statistical Agency - CSA/Ethiopia & ICF, 2017). A community based cross-sectional study in the northern part of Ethiopia, Enderta district of Tigray region, in 2014 has shown that the antenatal, delivery by a skilled attendant, and postnatal care service utilization prevalence were 72, 37.9 and 49.7 percent respectively: women's own monthly income, their knowledge on danger signs during pregnancy affected the antenatal care service utilization while their husbands' educational status might have influenced their place of delivery (Aregay et al., 2014).

Most of other studies conducted at different times, in either the national or sub-national level in Ethiopia, and Sindh province of Pakistan, which focused on one or two of the basic maternity services, revealed sub-optimal prevalence of the maternal service use; and socioeconomic, demographic, residence, cultural, healthcare service delivery system, sources of health information, parity, their spouses' educational status, etc. were factors affecting utilization of maternal healthcare services among women of child bearing age (Abraha et al., 2019; Kebede et al., 2016; Kidist Birmeta1*, 2013; Kifle et al., 2017; Noh, Kim, Akram, et al., 2019; Noh, Kim, Lee, et al., 2019; Tsegaye & Ayalew, 2020; Tsegaye et al., 2021; Yaya et al., 2018).

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There are no many recent studies that comprehensively present the factors associated with the utilization of the three major maternal healthcare services among women of child-bearing age in Ethiopia. The major goal of this study is to assess the prevalence of the three main maternal healthcare service utilization and the factors influencing it among women age 15-49 in Ethiopia; as implications to the persistently high maternal mortality ratio of the nation.

1.2 Purpose of the Study

The major goal of this study is to describe the primary maternity healthcare services utilization status among women aged 15-49 years and identify the contributing factors to utilization of maternal healthcare services in Ethiopia. The results of this study will therefore be helpful for policy makers, academics, and healthcare service providers in designing and prioritizing interventions, adding context and igniting interest in related researches, and offering comprehensive, integrated maternal healthcare services, taking into account the associated factors, respectively.

1.2.1 General objective: To explore the antenatal care institutional delivery and postnatal care service utilization prevalence and identify the contributing factors.

1.2.2 Specific objectives

a) To describe the Antenatal Care (ANC), Postnatal Care (PNC), and Institutional Delivery (ID) Prevalence Rates.

b) To analyze the difference of those utilizations by maternal, healthcare providers, and environmental variables

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c) To explore the factors affecting Antenatal, Facility Delivery and Postnatal service use

1.3 Definition of terms

1.3.1 Maternal Mortality: Maternal death refers to the death of women during pregnancy, childbirth and the first 42 days of the postpartum period from any cause related to or aggravated by pregnancy.

1.3.2 Maternal Mortality Ratio: The maternal mortality ratio (MMR) is the most commonly used indicator of maternal mortality and is defined as the number of maternal deaths per 100,000 live births

1.3.3 Institutional delivery/Facility delivery: is a delivery of newborns taking place in a healthcare facility under the assistance of a skilled healthcare provider.

1.3.4 Antenatal Care (ANC) is the care provided by skilled health care professionals to pregnant women and adolescent girls to ensure the best health conditions for both mother and baby during pregnancy.

1.3.5 ANC User a woman who had at least one or more antenatal care visits in her gestational period of the last child born in the past 5 years of the survey date.

1.3.6 ANC – Non-user a woman who did not have any ANC visit history throughout her pregnancy period of the last child born in the past 5 years of the survey date.

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1.3.7 PNC Users are those mothers who had made at least one health check after being discharged from their place of delivery within 42 days of child birth.

1.3.8 PNC Non-users are mothers who did not make any health check after being discharged from their place of delivery within 42 days postpartum.

1.3.9 Skilled healthcare providers are healthcare workers who had got a special training to provide maternity healthcare services (ANC, PNC ID/FD) in Ethiopia and it includes: Doctors, Nurses, Midwives, Health Officers, and Health Extension Workers in this study.

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CHAPTER 2. LITERATURE REVIEW

2.1 Overview of Maternal Healthcare Service in Ethiopia

Maternal health has become one of the major public health concerns for developing countries following the first safe motherhood conference held in Kenya in 1987. The Millennium Development Goal (MDG) set the target in 2000 for reducing maternal mortality by 75% for World Health Organization (WHO) member countries (Tessema et al., 2017). It was possible to reduce worldwide maternal mortality from 342 to 211 maternal deaths per 100,000 live births during the period 2000 to 2017. In 2017, two thirds of all maternal deaths occurred in sub-Saharan Africa, where the maternal mortality ratio was 542 deaths per 100,000 live births. Although this region has achieved significant progress in lowering maternal mortality since 2000, maternal mortality is still almost 78 times higher than in Australia and New Zealand, which has the lowest ratio of any region (TEAM & Research, 2019). As a member of these regional countries, in Ethiopia the MMR remains high, ranging from 266–1667 per 100,000 Live Births (LB) between 1990 and 2015 (Tessema et al., 2017).

In practice, like any other public health problems, maternal health state of a nation is not traceable to a single or a few causes and/or associations rather it is a result of complex, multi-causal and/or multi-factorial nature. A systematic review by WHO that deployed Bayesian hierarchical model, found about 73% of all maternal deaths between 2003 and 2009 were due to direct obstetric causes and deaths due to indirect causes accounted for 27·5% of all deaths. Hemorrhage accounted for 27·1%, hypertensive disorders 14·0%, and sepsis 10·7% of maternal deaths. The rest of deaths were due to abortion 7·9% , embolism 3·2%, and all other direct causes of death 9·6% (Say et al., 2014).

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The great majority of the causes of maternal death (direct/indirect) are preventable and/or treatable through the provision and optimal utilization of quality, affordable, and acceptable basic maternal healthcare services to all women in child bearing age group.

Ethiopia has made significant efforts to make high-quality essential health services available, accessible, acceptable, and affordable to the community. In 2005, the first essential health services package (EHSP) consisting of a set of health promotive, disease preventive, curative, and rehabilitative services was defined. This was revised in 2019 to include 1,019 interventions that are now parts of the EHSP. Health services are provided by a network of health facilities arranged in a three-tier health care delivery model. Primary Health care units (PHCUs) comprising of 17,550 health posts and 3,735 health centers, are the main source of primary care services, especially for the great majority rural communities in Ethiopia. The Health Extension Program (HEP), which has helped to reduce maternal and child mortality by increasing service utilization among mothers, provides a package of 18 primary health care services in family health, health promotion and disease prevention, hygiene, and environmental sanitation. Hospital-based services are provided by 353 hospitals that are categorized into primary, general, and specialized hospitals. Maternal healthcare services are delivered in all levels of the three tier system from the health post to the specialized hospital, the type and content of the service being different, as per the national standards of the facilities (MOH-ETHIOPIA, 2021).

However, evidences from several studies show that maternal healthcare service utilization amongst women in the child bearing age group in Ethiopia is quite low, and present a number of factors that influence the service utilization (Abraha et al., 2019; Addisu et al., 2022; Aregay et al., 2014; Atnafu et al., 2020; Central Statistical Agency - CSA/Ethiopia & ICF, 2017; Kifle et al., 2017; Yaya et al., 2018). These factors can be summarized into three main categories:

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2.2 Individual (Maternal) Factors Influencing Maternity Healthcare Service Utilization

Maternal factors affecting maternity healthcare service utilization under this session of the review were made to include variables like: age, literacy, marital status and media exposure, for convenience.

A community based cross-sectional study based on a secondary data from the DHS 2016 of Ethiopia, reveals prevalence of antenatal care utilization was 62.8% and maternal educational status, media exposure (listening to radio) were positively associated with antenatal care utilization (19. Tsegaye & Ayalew, 2020). Another similar community based cross-sectional study in the northern part of Ethiopia, Enderta district of Tigray region, in 2014 has shown that the antenatal, delivery by a skilled attendant, and postnatal care service utilization prevalence were 72, 37.9 and 49.7 percent respectively: whereby women's own monthly income, their knowledge on danger signs during pregnancy affected the antenatal care service utilization (Aregay et al., 2014).

In a cross-sectional survey in the Eastern Ethiopian Haramaya district of the Oromia Regional state conducted in 2015, antenatal care was provided to 74.3% (95% confidence interval: 72.5, 76.14), institutional deliveries were attended by 28.7% (95% confidence interval: 26.8, 30.6), and postnatal care was provided to 22.6% (95% interval: 20.84, 24.36). Use of antenatal health care, delivery, and postnatal health care services was found to be substantially correlated with knowledge of pregnancy problems, educational attainment (Kifle et al., 2017).

Evidences from studies in the Pakistani province of Sindh revealed that 57.3% of women made the recommended four or more and 83.5% at least one ANC visits, while it was linked with the educational levels of the women and the different sources of MCH information.

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Meanwhile, health facility delivery prevalence was found to be 65% where the women's age, education and the sources MCH information were correlated with facility births.

Other literatures on maternal healthcare services in general, conducted at different times in sub-national levels in Ethiopia, and published between 2014 and 2022 revealed that: educational statuses of the women and their spouses, knowledge of maternal healthcare services of the woman are among the associated factors of maternal healthcare service use (Addisu et al., 2022; Atnafu et al., 2020; Kebede et al., 2016; Kidist Birmeta1*, 2013; Tsegaye et al., 2021).

2.3 Environmental Factors Affecting Maternity Healthcare Service Utilization

Many literatures used different approaches to present the socioeconomic, cultural, and demographic variables that determine the maternity healthcare service uptake. In this paper those dimensions are organized as 'Environmental Factors' comprising of such characteristics as wealth index, religion, region of residence, type of place of residence (as urban/rural) and the autonomy of the woman in the household, just for the sake of purposive convenience.

The great majority of the articles cited in the previous sections and others have found out that these variables like wealth index/income level of the households, religion, and place of residence (urban/rural), gender equality parameters in the communities are among the determinant factors of maternal healthcare service utilization in different parts of the world as well as Ethiopia.

Women in the richest/highest wealth/income level have higher probability of utilizing all the three main maternal healthcare services, namely, ANC, Institutional/Facility/ Delivery,

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and PNC than their counterparts (Addisu et al., 2022; Aregay et al., 2014; Central Statistical Agency - CSA/Ethiopia & ICF, 2017; Gebre et al., 2018; Kidist Birmeta1*, 2013; Noh, Kim, Akram, et al., 2019; Noh, Kim, Lee, et al., 2019; Tsegaye & Ayalew, 2020; Tsegaye et al., 2021; Yaya et al., 2018). In a similar fashion, women living in urban areas have better maternal healthcare service consumption than their counter parts in the rural areas (Central Statistical Agency - CSA/Ethiopia & ICF, 2017; Gebre et al., 2018; Kebede et al., 2016; Mersha, 2018; Noh, Kim, Lee, et al., 2019; Yaya et al., 2018). Autonomy of the woman in making decisions on her own healthcare and managing her household has been positively associated with the maternity service utilization in one and/or all components (Addisu et al., 2022; Aregay et al., 2014; Tsegaye et al., 2021).

Religion including traditional beliefs has shown significant associations with one and/or the of the basic maternal healthcare service utilization (Kifle et al., 2017; Tsegaye & Ayalew, 2020); and regional variation in the service uptake of women is also common in many DHS analyses (Central Statistical Agency - CSA/Ethiopia & ICF, 2017).

2.4 Health System Factors (Healthcare Providers)

The healthcare service delivery system, particularly the provider related factors constitute the third category of factors influencing the women maternity service uptake. This includes measurements like: what services were provided, where the services were received, who provides those services, etc. Obviously, there are distinctions in the numbers and of components of care in maternity healthcare services at different levels of the facilities such as: health posts, health centers, clinics, hospitals, and so forth. On the other hand, receiving maternity healthcare services from skilled health providers of varying levels has tremendous quality and service satisfaction implications which determines the extent of service uptake by the women directly. Even there were differences in the credibility of the information on MCH delivered to the women by different groups of health professionals

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which has impacted their preferences of place of delivery (Central Statistical Agency - CSA/Ethiopia & ICF, 2017; Noh, Kim, Lee, et al., 2019).

In summary, all causes (direct or indirect) of maternal death are either preventable or treatable given that the women had utilized at least the three major maternal healthcare services properly; and the problem behind is the no or suboptimal maternal healthcare service utilization. There are no many recent researches that address the factors influencing how frequently Ethiopian women of childbearing age use the three main maternity healthcare services all together. This study focused in the evaluation of the prevalence of the three main maternal healthcare services consumption and associated characteristics among Ethiopian women aged 15 to 49 in order to draw conclusions forward suggestions about the country's continuingly high maternal death ratio.

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CHAPTER 3. CONCEPTUAL FRAMEWORK

Antenatal care, institutional delivery and postnatal care services utilization is dependent on:

a) Individual (Maternal) factors like: age, educational status, media exposure, marital status

b) Environmental factors such as: income/wealth index, region of residence, religion, residence type (urban/rural), and autonomy of the woman in the household and

c) Health System factors: Healthcare providers (Doctors, nurses, midwives, Health officers, Health extension workers)

A conceptual framework adapted from literature (Tarekegn et al., 2014) and Andersen and Newman's behavioral model, was utilized to better understand how maternal healthcare services were used in Ethiopia. This model was created to help explain and predict the social and demographic determinants for utilization of health services, as well as to detect access issues and other hurdles to these services. Studies on the usage of health services have frequently employed this behavioral model. The behavioral model suggests that three demographic factors contributed to the use of health services: (a) a person's propensity to use services (predisposing qualities), (b) a person's capacity to access services (enabling resources), and (c) a person's severity of sickness (Tarekegn et al., 2014). This model was used in this study to assist in evaluating the ANC, PNC and Institutional/Facility Delivery (ID/FD) services utilization status in Ethiopia among women of childbearing age and how the women's predisposing, enabling, and need characteristics influence their utilization of maternity healthcare services.

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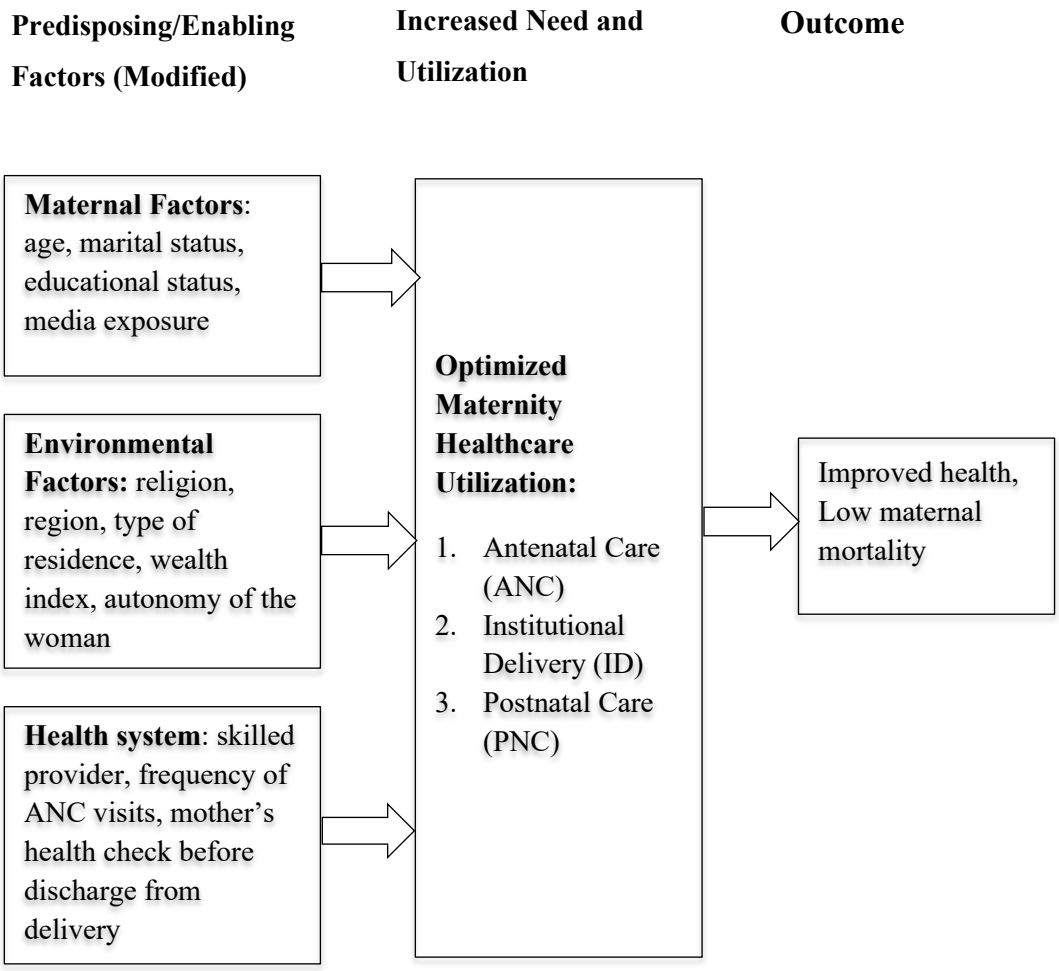

Figure 1. Conceptual framework, Andersen and Newman's modified behavioral model, adapted from literature (Tarekegn et al., 2014)

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CHAPTER 4. METHODS

4.1 Study Design:

This study deployed cross-sectional analytic study design.

4.2 Research Period

This is a study conducted based on the 2019 Ethiopian Mini-DHS dataset which was collected from March to June 2019. The period for this particular analysis is ideally from May – December 2022.

4.3 Study Participants

The 2019 Ethiopia Mini Demographic and Health Survey (EMDHS) is a nationwide survey with a nationally representative sample of 9,150 selected households. All women age 15-49 who were usual members of the selected households and those who spent the night before the survey day in the selected households were eligible to be interviewed in the survey. From the 9,150 households selected for the sample, of which 8,794 were occupied. Of the occupied households, 8,663 were successfully interviewed.

In the interviewed households, 9,012 eligible women were identified for individual interviews; interviews were completed with 8,885 women. From those 8,885 women of childbearing age, 3,979 of them had at least one live birth in the past five years before the survey date. Those 3,979 women are the final destination study participants of this maternity healthcare services utilization analysis.

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4.4 Inclusion Criteria

All resident or visitor women, who spent the night before the interview day in that household, of age 15-49 who gave birth within the last 5years of the interview day, who gave consent for the interview and were mentally healthy were included in the study for maternity healthcare service utilization.

4.5 Exclusion Criteria

Those women age 15-49 years who didn't give consent and those with mental problems. And those who gave birth more than five years back of the interview and visitors who didn't spend the night before the interview day in that household.

4.6 Study Setting

Ethiopia is divided into 9 regional states, and two city administrations. These regional states and city administrations are further sub-divided into 75 plus Zones, 551 plus districts (Woredas) and more than 10,000 Kebeles. In 2018/19, there were 353 hospitals, 3735 health centers, 17,550 health posts (MOH-ETHIOPIA, 2021). Ethiopia has a three-tier healthcare service delivery system; the primary, secondary and tertiary. Primary health care service comprises of preventive, promotive and curative service packages. All the health facilities from the lowest health post to the highest tertiary level specialized hospitals deliver maternity healthcare services in a varying level based upon their capacity and overall setup.

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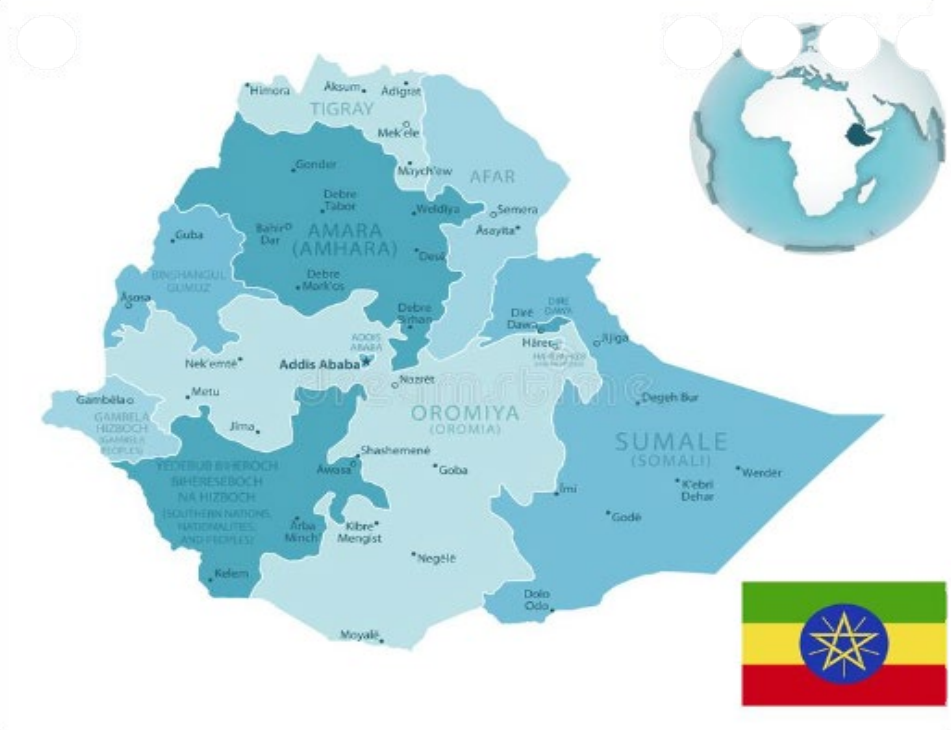

Figure 2 . Former administrative map of Ethiopia

(Source: Google, Dreamstime.com - Map of Ethiopia Administrative Regions, Departments, Icons.)

4.7 Data Source and Collecting Process

Formal request to get the permit to access the 2019 Ethiopian Mini-DHS (EMDHS) secondary comprehensive datasets was sent to the DHS – ICF Head Office through their website and the official permit letter was sent within 24 hours of request via personal email. The individual interview (IR) for the woman data file was taken exported to the Jamovi statistical software app and this was in turn exported to the excel worksheet. The necessary

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clearance, sorting, filtering and recoding of the dataset was made using excel sheet and Jamovi app to meet the purposes of this study.

The 2019 Ethiopia Mini Demographic and Health Survey (EMDHS) is a nationwide survey with a nationally representative sample of 9,150 selected households. All women age 15-49 who were usual members of the selected households and those who spent the night before the survey day in the selected households were eligible to be interviewed in the survey. The sampling frame used for the 2019 EMDHS was a frame of all census enumeration areas (EAs) created for the 2019 Population and Housing Census (PHC) and provided by the Central Statistical Agency (CSA) of Ethiopia. An EA is a geographic area that covers an average of 131 households. Administratively, Ethiopia is divided into 11 geographical regions. Each region is subdivided into zones, each zone into woredas, each woreda into towns, and each town into kebeles. The average EA size is 131 households; on average, rural EAs are smaller than urban EAs (119 households versus 170 households). The EA size in the survey is adequate in terms of the primary sampling unit (PSU), with a sample of 30 households per EA (Ethiopian Public Health Institute - EPHI et al., 2021).

4.8 Statistical Analysis and calculations

a) Descriptive statistics is used to analyze the sociodemographic and economic background characteristics, as well as the antenatal, facility delivery and postnatal care prevalence rates.
b) Chi-square test, was used to determine the differences in antenatal, delivery and postnatal care service utilization by maternal, healthcare provider and environmental variables
c) Associations amongst the antenatal, delivery, and postnatal care use and the predictor variables were explored by logistic regression analytic tests.

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The 95% confidence interval and p-value < 0.05 was used to determine whether the associations between the predictors and outcome variables were significant or not.

4.9 Ethical Approval

Access to the dataset was requested from the DHS-IFC Head Office by filling out the application form through their official website and formal letter of approval was obtained to get and use the datasets for the specified purpose via personal email (Appendix 2). The DHS datasets are standardized global dataset collected by the concerned nations' government agencies with the technical and financial assistance from development partners. The data are collected through questionnaire-based interviews after getting written consents from the respondents. Respondents were told about the aim of the survey and confidentiality of the information which they are giving. In addition, they are told that they have full right to withdraw from the study at any time if they feel uncomfortable. The data are coded so that no one can identify or trace back the respondents or their households.

4.10 Expected Benefits

- The findings of this study would add insights on the factors associated with maternal healthcare service utilization in Ethiopia and will help policy makers in designing effective policies, programs and strategies in maternal healthcare.
- It will also help program implementers and service providers in identifying and prioritizing the intervention measures in maternal healthcare programs and service provision.

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4.11 Potential Risks

- Less than minimal risk because this data is of the past information pertaining to a period of at least 3-8 years back.

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CHAPTER 5. RESULTS

5.1 General Characteristics of the Study Participants

A total of 3979 study participants from the women data file of EMDHS 2019 were selected and prevalence and factors associated with utilization of the three major maternity healthcare (antenatal care, postnatal care and facility delivery) services were analyzed. This analysis was limited to mothers who delivered at least one live child within the past 5 years of the survey date and information with regard to the most recent birth history were gathered if they had more than one births in the specified period of time to minimize re-call bias. The response rate was 100%. The general characteristics of the study participants are shown in Tables 1-3 under three main categories: maternal, environmental, and systemic Factors.

5.2 Individual/Maternal Factors

The mean age of the participants was 28.7 ± 6.72 years while 2842(71.4%) of them are in the age category of 20-34 years; and the great majority 3651(91.8%) of whom were married. More than half i.e., 2065(51.9%) of the mothers involved in this analysis have no education at all. 1038(26.1%) of the mothers have radio in their households, whereas only 793(19.9%) have a TV. (Table 1)

5.3 Environmental Factors

In relation to the environmental factors: 1862(46.8%), and 1004(31.8%) of the participants were Muslims and Orthodox Christians in religion respectively. 2975(74.8%) of the participants lived in rural areas, while 1004(25.2%) were urban dwellers. Nearly half 1872(47.1%) of mothers in this study were from households under the middle and the rest 2107(53%) of mothers being from the middle and beyond wealth index households. Furthermore, only 815(20.5%) of the women were in the position of managing and leading

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their households, where they may have the autonomous power to decide on their own and their households' health and other issues. (Table2)

5.4 Health System Factors

Antenatal care (ANC) is the fundamental maternal healthcare service which serves as the entry point to all other maternity health services in many healthcare service delivery platforms. In this analysis women having at least one and more ANC visits were considered as 'ANC Users' otherwise 'ANC Non-Users', taking into account of the suboptimal service utilization statuses of most low-income countries including Ethiopia. In the Ethiopian context, skilled healthcare providers for all of the maternity healthcare services included Doctors, Nurses, Midwives, Health Officers (HO) and Health Extension Workers (HEW). Based on this, out of the 3979 mothers participated in this analysis, 2922(73.4%) of them had got at least one ANC service from a skilled healthcare provider in the gestational period of their most recent birth within the past 5 years of the survey. 479(12%), 974(24.5%), and 761(19.1%) of mothers got ANC service by Doctors, Nurses, and Midwives respectively among others. Only 1656(41.60%) had the then recommended number of ANC visits which is 4 or more visits per a pregnancy (Table 3).

Among a total of 3979 mothers who had given birth to a live baby in the previous 5 years of the survey date, 2136(53.7%) reported delivering in a health facility; whereas, grossly 2656(66.7%) of the total participants claimed of getting delivery assistance by skilled birth attendants (Table 3).

Postnatal care (PNC) is the healthcare delivered to the mother and the newborn from the complete expulsion of placental tissue to the 42 days of the postpartum period to keep them safe and healthy. Herein the maternal healthcare part was the main focus area and mothers who had made any health checks after being discharged from the place of delivery within the 42 days of delivery were considered as 'Users' and otherwise 'Non-users' of the PNC service. Based on the descriptive statistical analysis of the data in this study, out of the

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2,136 mothers who delivered in the health facilities, 1,383(64.7%) got their health checked before discharge from the facility of delivery as their first PNC continuum of care. Out of the total of 3,979 women who had at least one livebirth in past 5 years of the survey, only 466(11.7%), who are considered as the users of PNC service, made their health checks after being discharged from their place of delivery within 6 weeks postpartum at least once. 455(97.6%) who got their health checked, were served by skilled healthcare providers. 220(47.2%) of the PNC service users got served at their homes, whereas 246(52.8%) of them were served in public, private, and NGO health institutions; the great majority 212(45.5%) being in the public institutions.

Table 1. Frequency Distribution of Individual/Maternal Background Characteristics of Mothers who had a livebirth in the past 5 years of the EMDHS 2019

Variables	**Description**	**Number**	**Percent**
Current Age (Years)	<20	246	6.2 %
	20-34	2,842	71.4 %
	35-49	891	22.4 %
	Mean Age ± SD	28.7 ± 6.72	
Current Marital Status	Married	3,715	93.40%
	Single	264	6.60%
Educational Status	No education	2,065	51.9 %
	Primary	1,306	32.8 %

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Variables		Description	Number	Percent
		Secondary	376	9.4 %
		Beyond secondary	232	5.8 %
Media Exposure	Has a TV (HH)	Yes	793	19.90%
		No	3,186	80.10%
	Has a radio (HH)	Yes	1,038	26.10%
		No	2,941	73.90%

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Table 2. Frequency Distribution of Environmental Background Characteristics of Mothers who had a livebirth in the past 5 years of the 2019 EMDHS

Variables	**Description**	**Number**	**Percent**
Religion	Orthodox	1,264	31.80%
	Catholic	25	0.60%
	Protestant	780	19.60%
	Muslim	1,862	46.80%
	Traditional beliefs & Others	48	1.20%
Region	Tigray	346	8.70%
	Afar	389	9.80%
	Amhara	408	10.30%
	Oromia	491	12.30%
	Somali	342	8.60%
	Benishangul-Gumuz	371	9.30%
	SNNPR	469	11.80%
	Gambella	338	8.50%
	Harari	307	7.70%
	Addis Ababa	236	5.90%
	Dire Dewa	282	7.10%
Residence	Urban	1,004	25.20%
	Rural	2,975	74.80%
Wealth Index	Poorest	1,189	29.90%
	Poorer	683	17.20%
	Middle	586	14.70%
	Richer	543	13.60%

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Variables	Description	Number	Percent
	Richest	978	24.60%
Autonomy of women (Sex of HH Head)	Male	3,164	79.50%
	Female	815	20.50%

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Table 3. Frequency Distribution of Health System Background Characteristics of Mothers who had a livebirth in the past 5 years of the 2019 EMDHS

Variables	**Description**	**Number**	**Percent**
Skilled Antenatal Care Provider	Doctor	479	12.00%
	Nurse	974	24.50%
	Midwife	761	19.10%
	Health Officer	285	7.20%
	Health Extension Worker (HEW)	423	10.60%
Non-skilled Antenatal Care Provider	Traditional Birth Attendant (TBA) & Others	28	0.70%
	No one	1,044	26.20%
Skilled Delivery Service Provider	Doctor	511	12.80%
	Nurse	693	17.40%
	Midwife	1,156	29.10%
	Health Officer	152	3.80%
	HEW	144	3.60%
Non-skilled Delivery Service Provider	TBA	1,184	29.80%
	Other	236	5.90%
	No one	356	8.90%

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Variables	Description	Number	Percent
Frequency of Antenatal Care Visits	0	1,044	26.20%
	1	141	3.50%
	2 to 3	1,121	28.20%
	4 and beyond	1,656	41.60%
	Don't know	17	0.40%
Place of Delivery	Home	1,843	46.30%
	Health facility	2,136	53.70%
Mother's health check before discharge from the facility of delivery(N=2136)	Yes	1,383	64.70%
	No	753	35.30%
PNC checkup by Skilled Provider before discharge from the facility of delivery (1383)	Doctor	348	25.20%
	Nurse	421	30.40%
	Midwife	465	33.60%
	Health Officer	93	6.70%
	HEW	53	3.80%
Non-skilled PNC Provider before discharge	TBA and Others	3	0.20%

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Variables	Description	Number	Percent
Mother's health check after discharge from the place of delivery (3979)	Yes	466	11.70%
	No	3,513	88.30%
Skilled PNC Provider after discharge (N=466)	Doctor	81	17.40%
	Nurse	95	20.40%
	Midwife	67	14.40%
	Health Officer	23	4.90%
	HEW	189	40.60%
Non-skilled PNC Provider after discharge	TBA and Other	11	2.30%
Place of health check after discharge (N=466)	Home	220	47.20%
	Public health facility	212	45.50%
	Private & NGO health facility	34	7.30%

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5.5 Antenatal Care, Postnatal Care Health Facility/Institution Delivery Services Utilization Prevalence Rates

The service utilization prevalence rates at 95% confidence interval for the three major maternity healthcare services: ANC, PNC and FD/ID were calculated using binomial proportion test as presented in Table 4 below. The ANC service utilization, with at least one visit per a pregnancy for mothers who gave birth within 5years before the survey in 2019, prevalence rate was found to be 73.8% [72.4%,75.1%, 95% CI, p-value <.001]. Institutional Delivery service utilization prevalence 53.7% [52.12%,55.24% ,95% CI, p-value < .001]; whereas 11.7% [10.7%,12.8% 95% CI, p-value <.001] was the PNC service use prevalence rate for any visit in which a mother made her health checks from discharge after delivery to 42 days postpartum.

Table 4. Prevalence Rates of Antenatal Care, Postnatal Care and Health Facility Delivery Services Utilization in Ethiopia, 2019

Variable	**Levels**	**Number**	**Proportion (%)**	**95% Confidence Interval**	
				Lower (%)	**Upper (%)**
ANC Utilization	Non-users	1,044	0.262(26.2)	0.249(24.9)	0.276(27.6)
	Users	2,935	0.738(73.8)	0.724(72.4)	0.751(75.1)
PNC Utilization	Users	466	0.117(11.7)	0.107(10.7)	0.128(12.8)
	Non-users	3,513	0.883(88.3)	0.872(87.2)	0.893(89.3)
Place of Delivery	Health Facility/Inst.	2,136	0.537(53.7)	0.521(52.12)	0.5524 (55.24)
	Home & Other	1,843	0.463(46.3)	0.448(44.8)	0.479(47.9)

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5.6 The Differences by Maternal, Environmental and Health System Variables of the Three Major Maternity Healthcare Service Utilization

The Chi-square statistical test was used to determine whether there are significant differences by maternal, environmental and health system, specifically the healthcare service provider, variables in the utilization of maternity healthcare services among the Ethiopian mothers of childbearing age or not. A p-value of less than 0.05 was taken as statistically significant for the Chi-square analysis test. These can be presented in the following sub-sections, as depicted in Tables 5-10.

5.6.1 Maternity Healthcare Service Utilization Differences by Maternal Factors

In this analysis educational status of the women and having a Radio and Television in their household were significant difference makers with p-value < 0.001 in the utilization of ANC, PNC and FD/ID amongst mothers and there was significant difference (p-value < 0.001) by age in utilizing ANC and FD/ID services. Marital status was the only variable that did not show any statistical difference in the utilization of all the three maternity healthcare services by mothers in this analysis. (Tables 5 & 8)

5.6.2 Service Utilization Differences by Environmental Factors

This category of factors in this study consisted of socioeconomic, cultural and demographic factors such as: region of residence, the type of residence (urban rural), wealth index of the household, religion of the women, autonomy of the woman in the household determined by the variable ‘sex of head of the household’ during the analysis. Accordingly, religion, region of residence, and wealth index of the household were found to be statistically significant determinants (p-value <.001) of all the three maternity service use among mothers of childbearing age in Ethiopia in the survey period. Type of residence as

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urban/rural has shown significant statistical difference in ANC and ID/FD/ whereas it did not for PNC. Autonomy of the woman, in being head of the household, had been statistically significant determinant only for the utilization of institutional/facility/ delivery service by mothers. (Tables 6 & 9)

5.6.3 Differences in Service Utilization by Health System Factors

The health system as a whole is a bit complex and broader area to study, but here the focus of this study is mainly on the maternal healthcare service providers-side. Therefore, antenatal care service provision by Doctors and Health Officers has a statistically significant difference in the utilization of all the three maternal healthcare services in the Chi-square test meanwhile, ANC provision by Nurses and Midwives is significant for ANC & ID/FD service utilization (p-value < .001). Similarly, there are significant differences seen in ANC, PNC and ID/FD service utilization prevalence by delivery assistance from Doctors, Nurses, Midwives and HEWs and the same is true for the HOs except the case of PNC. Place of delivery, one of the dependent variables in the study, has shown a significant difference in the utilization of ANC and PNC services by mothers. Maternal health check before being discharged from the facility of delivery has influences on ANC and PNC service utilization, whereas the same checkup by the mother after discharge from the delivery place has been associated with ANC and institutional delivery. ANC utilization and the number of ANC visits have been significant differentiator in facility delivery and PNC service utilization. PNC provider after discharge from the place of delivery has been a significant influencer for ID/FD. (Tables 7 & 10)

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Table 5. The difference by Individual/Maternal Characteristics of ANC Service Utilization of Women 15-49 years in Ethiopia, 2019

Variables		Category	ANC Utilization		Chi-square p-value
			Users N (%)	Non-users N (%)	
Age (Years)		<20	170(69.1)	76(30.9)	< 0.001
		20-34	2,170(76.4)	672(23.6)	
		35-49	595(66.8)	296(33.2)	
Marital Status		Married	2,735(73.6)	980(26.4)	0.446
		Single	200(75.8)	64(24.2)	
Educational Status		No education	1,274(61.7)	791(38.3)	< 0.001
		Primary	1,074(82.3)	232(17.7)	
		Secondary	359(95.5)	17(4.5)	
		Beyond secondary	228(98.3)	4(1.7)	
Media Exposure	Has a TV (HH)	Yes	746(94.1)	47(5.9)	< 0.001
		No	2,189(68.7)	997(31.3)	
	Has a Radio (HH)	Yes	872(84.0)	166(16.0)	< 0.001
		No	2,063(70.3)	878(29.7)	

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Table 6. The difference by Environmental Characteristics of ANC Service Utilization of Women 15-49 years in Ethiopia, 2019

Variables	Category	ANC Utilization		Chi-square p-value
		Users N (%)	Non-users N (%)	
Religion	Orthodox	1,095(86.6)	169(13.4)	< 0.001
	Catholic	19(67.8)	6(32.2)	
	Protestant	586(75.1)	194(24.9)	
	Muslim	1,212(65.1)	650(34.9)	
	Traditional beliefs & Others	23(47.9)	25(52.1)	
Region	Tigray	323(93.4)	23(6.6)	< 0.001
	Afar	231(59.4)	158(40.6)	
	Amhara	337(82.6)	71(17.4)	
	Oromia	346(70.5)	145(29.5)	
	Somali	90(26.3)	252(73.7)	
	Benishangul-Gumuz	300(80.9)	71(18.1)	
	SNNPR	327(69.7)	142(30.3)	
	Gambella	268(79.3)	70(20.7)	
	Harari	250(81.4)	57(18.6)	
	Addis Ababa	229(97.0)	7(3.0)	
	Dire Dewa	234(83.0)	48(17.0)	
Residence	Urban	901(89.7)	103(10.3)	< 0.001
	Rural	2,034(68.4)	941(31.6)	
Wealth Index	Poorest	598(50.3)	591(49.7)	< 0.001
	Poorer	503(73.6)	180(26.4)	
	Middle	458(78.2)	128(21.8)	
	Richer	461(84.9)	82(15.1)	
	Richest	915(93.6)	63(6.4)	
Autonomy of women (Sex of HH Head)	Male	2,339(73.9)	825(26.1)	0.645
	Female	596(73.1)	219(26.9)	

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Table 7. The difference by Health System Characteristics of ANC Service Utilization of Women 15-49 years in Ethiopia, 2019

Variables		Category	ANC Utilization		Chi-square p-value
			Users N (%)	Non-users N (%)	
Skilled Antenatal Care Provider	Doctor	Yes	479(100.0)	0(0.0)	< 0.001
		No	2,456(70.2)	1,044(29.8)	
	Nurse	Yes	974(100.0)	0(0.0)	< 0.001
		No	1,961(65.2)	1,044(34.8)	
	Midwife	Yes	761(100.0)	0(0.0)	< 0.001
		No	2,174(67.6)	1,044(32.4)	
	Health	Yes	285(100.0)	0(0.0)	< 0.001
	Officer	No	2,650(71.7)	1,044(28.3)	
	HEW	Yes	423(100.0)	0(0.0)	< 0.001
		No	2,512(70.6)	1,044(29.4)	
Non-skilled Antenatal Care Provider	TBA	Yes	8(100.0)	0(0.0)	0.091
		No	2,927(73.7)	1,044(26.3)	
	Other	Yes	20(100.0)	0(0.0)	0.007
		No	2,915(73.6)	1,044(26.4)	
	No one	Yes	0(0.0)	1,044(100.0)	< 0.001
		No	2,935(100.0)	0(0.0)	

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Variables		Category	ANC Utilization		Chi square p-value
			Users N (%)	Non-users N (%)	
Skilled Delivery Service Providers	Doctor	Yes	477(93.3)	34(6.7)	< 0.001
		No	2,458(70.9)	1,010(29.1)	
	Nurse	Yes	652(94.1)	41(5.9)	< 0.001
		No	2,283(69.5)	1,003(30.5)	
	Midwife	Yes	1,091(94.4)	65(5.6)	< 0.001
		No	1,844(65.5)	979(34.5)	
	Health Officer	Yes	142(93.4)	10(6.6)	< 0.001
		No	2,793(73.0)	1,034(27.0)	
	HEW	Yes	131(91.0)	13(9.0)	< 0.001
		No	2,804(73.1)	1,031(26.9)	
Non-skilled Skilled Delivery Service Providers	TBA	Yes	525(44.3)	659(55.7)	< 0.001
		No	2,410(86.2)	385(13.8)	
	Other	Yes	161(68.2)	75(31.8)	0.039
		No	2,774(74.1)	969(25.9)	
	No one	Yes	188(52.8)	168(47.2)	< 0.001
		No	2,747(75.8)	876(24.2)	

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Variables	Category	ANC Utilization		Chi-square p-value
		Users N (%)	Non-users N (%)	
Place of Delivery	Health facility	2,003(93.8)	133(6.2)	< 0.001
	Home	932(50.6)	911(49.4)	
Mother's health check before discharge from the facility of delivery(N=2136)	Yes	1,316(95.2)	67(4.8)	< 0.001
	No	687(91.2)	66(8.8)	
Skilled PNC checkup before discharge from the place of delivery (N=1383)	Doctor	329(94.5)	19(5.5)	0.082
	Nurse	409(97.1)	12(2.9)	
	Midwife	442(95.0)	23(5.0)	
	Health Officer	83(89.2)	10(10.8)	
	HEW	50(94.3)	3(5.7)	
Non-skilled PNC checkup before discharge from the place of delivery (N=1383)	TBA & other	3(100.0)	0(0.0)	
Mother's health check after discharge from the place of delivery (3979)	Yes	426(91.4)	40(8.6)	< 0.001
	No	2,509(71.4)	1,004(28.6)	

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Table 8. The Difference by Individual/Maternal characteristics of PNC and ID Service Utilization among women 15-49, Ethiopia 2019

Variables		Description	Place of Delivery			Mother's health check after discharge from the place of delivery		
			Health Facility, N (%)	Home & Other, N (%)	Chi-sq. p-value	Yes, N (%)	No, N (%)	Chi-sq. p-value
Age		<20	123(50.0)	123(50.0)	< 0.001	22(8.9)	224(91.1)	0.316
		20-34	1,597(56.2)	1,245(43.8)		333(11.7)	2,509(88.3)	
		35-49	416(46.7)	475(53.3)		111(12.4)	780(77.6)	
Marital Status		Married	1,982(53.4)	1,733(46.6)	0.117	442(11.9)	3,273(88.1)	0.171
		Single	154(58.3)	110(41.7)		24(9.1)	240(90.9)	
Educational Status		No education	752(36.4)	1,313(63.6)	< 0.001	202(9.8)	1,863(90.2)	< 0.001
		Primary	837(64.1)	469(35.9)		160(12.2)	1,146(87.8)	
		Secondary	325(86.4)	51(13.6)		57(15.2)	319(84.8)	
		Beyond secondary	222(95.7)	10(4.3)		47(20.2)	185(79.8)	
Media Exposure	Has a TV (HH)	Yes	719(90.7)	74(9.3)	< 0.001	128(16.4)	665(83.6)	< 0.001
		No	1,417(44.5)	1769(55.5)		338(10.6)	2,848(90.4)	
	Has a radio (HH)	Yes	708(68.2)	330(31.8)	< 0.001	138(13.3)	900(86.7)	0.065
		No	1,428(48.6)	1,513(51.4)		328(11.2)	2,613(88.8)	

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Table 9. The Difference by Environmental characteristics of PNC and ID Service Utilization among women 15-49, Ethiopia 2019

Variables	Description	Place of Delivery			Mother's health check after discharge from the place of delivery		
		Health Facility, N (%)	Home & Other, N (%)	Chi-sq. p-value	Yes N (%)	No N (%)	Chi-sq. p-value
Religion	Orthodox	807(63.8)	457(36.2)	< 0.001	185(14.6)	1,079(85.4)	< 0.001
	Catholic	8(32.0)	17(68.0)		5(20.0)	20(80.0)	
	Protestant	393(50.4)	387(49.6)		83(10.6)	697(89.4)	
	Muslim	910(48.9)	952(51.1)		192(10.3)	1670(89.7)	
	Traditional beliefs & Others	18(37.5)	30(62.5)		1(2.1)	47(97.9)	
Region	Tigray	230(66.5)	116(33.5)	< 0.001	55(15.9)	291(84.1)	< 0.001
	Afar	107(27.5)	282(72.5)		22(5.6)	367(94.4)	
	Amhara	217(53.2)	191(46.8)		54(13.2)	354(86.8)	
	Oromia	218(44.4)	273(55.6)		36(7.3)	455(92.7)	
	Somali	72(21.0)	270(79.0)		14(4.1)	328(95.9)	
	Benishangul-Gumuz	233(62.8)	138(37.2)		77(20.8)	294(79.2)	
	SNNPR	219(46.7)	250(53.3)		59(12.6)	410(87.4)	
	Gambella	198(58.6)	140(41.4)		27(8.0)	311(92.0)	
	Harari	220(71.7)	87(28.3)		36(11.7)	271(88.3)	
	Addis Ababa	224(94.9)	12(5.1)		40(16.9)	196(83.1)	
	Dire Dewa	198(70.2)	84(29.8)		46(16.3)	236(83.7)	

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Variables	Description	Place of Delivery			Mother's health check after discharge from the place of delivery		
		Health Facility N (%)	Home & Other N (%)	Chi-sq. p-value	Yes, N (%)	No, N (%)	Chi-sq. p-value
Residence	Urban	856(85.2)	148(14.8)	< 0.001	134(13.3)	870(86.7)	0.062
	Rural	1,280(43.0)	1,695(57.0)		332(11.2)	2,643(88.8)	
Wealth Index	Poorest	281(23.6)	908(76.4)	< 0.001	85(7.1)	1,104(92.9)	< 0.001
	Poorer	317(46.4)	366(53.6)		71(10.4)	612(89.6)	
	Middle	295(50.3)	291(49.7)	< 0.001	89(15.2)	497(84.8)	< 0.001
	Richer	364(67.0)	179(33.0)		79(14.5)	464(85.5)	
	Richest	879(89.9)	99(10.1)		142(14.5)	836(85.5)	
Autonomy of women (Sex of HH Head)	Male	1,661(52.5)	1,503(47.5)	0.012	372(11.8)	2,792(88.2)	0.86
	Female	475(58.3)	340(41.7)		94(11.5)	721(88.5)	

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Table 10. The Difference by Health System Characteristics of PNC and ID Service Utilization among women 15-49, Ethiopia 2019

Variables		Description	Place of Delivery			Mother's health check after discharge from the place of delivery		
			Health Facility N (%)	Home & Other N (%)	Chi-sq. p-value	Yes N (%)	No N (%)	Chi-sq. p-value
Skilled Antenatal Care Service Provider	Doctor	Yes	427(89.1)	52(10.9)	< 0.001	86(18.0)	393(82.0)	< 0.001
		No	1,709(48.8)	1,791(51.2)		380(10.9)	3,120(89.1)	
	Nurse	Yes	656(67.4)	318(32.6)	< 0.001	123(12.6)	851(87.4)	0.306
		No	1,480(49.2)	1,525(50.8)		343(11.4)	2,662(88.6)	
	Midwife	Yes	528(69.4)	233(30.6)	< 0.001	101(13.3)	660(86.7)	0.137
		No	1,608(50.0)	1,610(50.0)		365(11.3)	2,853(88.7)	
	Health Officer	Yes	190(66.7)	95(33.3)	< 0.001	53(18.6)	232(81.4)	< 0.001
		No	1,946(52.7)	1,748(47.3)		413(11.2)	3,281(88.8)	
	HEW	Yes	204(48.2)	219(51.8)	0.056	61(14.4)	362(85.6)	0.067
		No	1932(54.3)	1624(45.7)		405(11.4)	3,151(88.6)	
Non-skilled ANC Service Provider	TBA	Yes	1(12.5)	7(87.5)	0.055	3(37.5)	5(62.5)	0.023
		No	2,135(53.8)	1,836(46.2)		463(11.6)	3,508(88.4)	
	Other	Yes	8(25.0)	24(75.0)	0.386	1(5.0)	19(95.0)	0.349
		No	2,128(53.8)	1,831(46.2)		465(11.7)	3,494(88.3)	
	ANC Utilization	Non-users	133(12.7)	911(87.3)	< 0.001	40(3.8)	1,004(96.2)	< 0.001
		Users	2,003(68.2)	932(31.8)		426(14.5)	2,509(85.5)	

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Variables	Description		Place of Delivery			Mother's health check after discharge from the place of delivery		
			Health Facility N (%)	Home & Other N (%)	Chi-sq. p-value	Yes N (%)	No N (%)	Chi-sq. p-value
Skilled Delivery Service Providers	Doctor	Yes	503(98.4)	8(1.6)	< 0.001	89(17.4)	422(82.6)	< 0.001
		No	1,633(47.1)	1,835(52.9)		377(10.9)	3,091(90.1)	
	Nurse	Yes	660(95.2)	33(4.8)	< 0.001	107(15.4)	586(84.6)	< 0.001
		No	1,476(44.9)	1,810(55.1)		359(10.9)	2,927(90.1)	
	Midwife	Yes	1128(97.6)	28(2.4)	< 0.001	154(13.3)	1,002(86.7)	0.043
		No	1,008(35.7)	1,815(64.3)		312(11.0)	2,511(89.0)	
	Health Officer	Yes	1,48(97.4)	4(2.6)	< 0.001	23(15.1)	129(84.9)	0.181
		No	1,988(51.9)	1,839(48.1)		443(11.6)	3,384(88.4)	
	HEW	Yes	118(81.9)	26(18.1)	< 0.001	31(21.5)	113(78.5)	< 0.001
		No	2,018(52.6)	1,817(47.4)		435(11.3)	3,400(88.7)	
Non-skilled Delivery Service Providers	TBA	Yes	8(0.7)	1,176(99.3)	< 0.001	75(6.3)	1,109(93.7)	< 0.001
		No	2,128(76.1)	667(23.9)		391(14.0)	2,404(86.0)	
	Other	Yes	6(2.5)	230(97.5)	< 0.001	36(15.2)	200(84.8)	0.059
		No	2,130(56.9)	1,613(43.1)		430(11.5)	3,313(88.5)	
	No one	Yes	3(0.8)	353(99.2)	< 0.001	19(5.3)	337(94.7)	< 0.001
		No	2,133(58.9)	1,490(41.1)		447(12.3)	3,176(87.7)	

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Variables	Description	Place of Delivery			Mother's health check after discharge from the place of delivery		
		Health Facility N (%)	Home & Other N (%)	Chi-sq. p-value	Yes N (%)	No N (%)	Chi-sq. p-value
Number of ANC Visits	0	133(12.7)	911(87.3)	< 0.001	40(3.8)	1,004(96.2)	< 0.001
	1	49(34.8)	92(65.2)		9(6.4)	132(93.6)	
	2 to 3	645(57.5)	476(42.5)		116(10.3)	1,005(89.7)	
	4+	1,297(78.3)	359(21.7)		300(18.1)	1,356(81.9)	
	Don't know	12(70.6)	5(29.4)		1(5.9)	16(94.1)	
Place of Delivery	H. Facility	NA			319(14.9)	1,817(85.1)	< .001
	Home & other				147(8.0)	1,696(92.0)	
Mother's health check before discharge from the facility of delivery(N=2136)	Yes	1,383(100.0)	0(0.0)	NA	256(66.8)	1127(33.2)	< 0.001
	No	753(100.0)	0(0.0)		63(8.4)	690(91.5)	
PNC checkup by skilled Provider before discharge from the place of delivery (1383)	Doctor	348(100.0)	0(0.0)	NA	64(18.4)	284(81.6)	< 0.001
	Nurse	421(100.0)	0(0.0)		76(18.0)	345(82.0)	
	Midwife	465(100.0)	0(0.0)		80(17.2)	385(82.8)	
	HO	93(100.0)	0(0.0)		13(14.0)	80(86.0)	
	HEW	53(100.0)	0(0.0)		22(41.5)	31(58.5)	
PNC by Non-skilled Provider before discharge	TBA	1(100.0)	0(0.0)		1(100.0)	0(0.0)	
	Other	2(100.0)	0(0.0)		0(0.0)	2(100.0)	

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Variables	Description	Place of Delivery		Chi-sq. p-value	Mother's health check after discharge from the place of delivery		Chi-sq. p-value
		Health Facility, N (%)	Home & Other N (%)		Yes N (%)	No N (%)	
Mother's health check after discharge from the place of delivery (3979)	Yes	319(68.4)	147(31.6)	< 0.001	NA		
	No	1,817(51.8)	1,691(48.2)				
Skilled PNC Provider after discharge (N=466)	Doctor	66(81.5)	15(18.5)	< 0.001	81(100.0)	0(0.0)	NA
	Nurse	64(67.4)	31(32.6)		95(100.0)	0(0.0)	
	Midwife	39(58.2)	28(41.8)		67(100.0)	0(0.0)	
	HO	12(52.2)	11(47.8)		23(100.0)	0(0.0)	
	HEW	138(73.0)	51(27.0)		189(100.0)	0(0.0)	
Non-skilled PNC Provider after discharge	TBA	0(0.0)	10(100.0)		10(100.0)	0(0.0)	
	Other	0(0.0)	1(100.0)		1(100.0)	0(0.0)	
Place of health check after discharge (N=466)	Home	150(68.2)	70(31.8)	0.148	220(100.0)	0(0.0)	NA
	Public health facility	141(66.5)	71(33.5)		212(100.0)	0(0.0)	
	Private & NGO health facility	28(82.4)	6(17.6)		34(100.0)	0(0.0)	

Key: NA= Not Applicable/no association, HEW= Health Extension Worker, HO= Health Officer, TBA= Traditional Birth Attendant, PNC= Postnatal Care, N=Number

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5.7 The Association between Maternal, Environmental and Health System Factors and the Maternity service Utilization

The binomial logistic regression analysis was used to determine the presence of any statistically significant associations between the predictor and outcome variables. The 95% confidence interval odds ratios and p-value of less than 0.05 were used to determine whether the relations observed are statistically significant or not. The analysis results are presented in three sections and Tables 11–19 as following:

5.7.1 Individual/Maternal Factors and Maternity service utilization

Under this category educational statuses of the mothers and having a Television in their households have revealed significant positive association with the utilization of all the three maternity healthcare services. Those mothers with a higher level of education are more likely to use maternal healthcare services than their counterparts; women having beyond secondary educational status are 12.31-, 12.44- and 1.82-times more likely to use ANC, ID/FD and PNC than those who are in the primary level of education with the 95% confidence interval, odds ratios of: 12.31[4.54,33.42],12.44[6.54,23.67] and 1.82[1.27,2.61], respectively. (Tables 11, 14 and 17)

Mothers in the age category of 20-34 years are more likely to utilize ANC services than those in < 20 and 35-49 years, 95% CI OR of 1.44[1.09,1.92] and 1.61[1.36,1.89] respectively. Women in the same age category are more likely to deliver in health facility than those in the 35-49 years of age, OR=1.465[1.259,1.703 95% CI], whereas, no significant association was observed with the teen age category. Marital status was not related to any of the ANC, ID/FD and PNC service uptake by the mothers. (Tables 11, 14 and 17)

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5.7.2 Environmental Factors and Maternity Healthcare service Use

In this section religion, region of residence, and wealth index of the household have revealed significant influences over the ANC, ID, and PNC service utilization, meanwhile residence type has been influential in ANC and ID service consumption among the mothers. And being head of the household of the women (autonomy of the woman) had significant association with ID service utilization by mothers. (Tables 12, 15 and 18)

An Orthodox Christian mother is 4.42 times more likely to deliver in a health institution, 5.83 and 8.64 times more likely to use PNC and ANC respectively, than those who are traditional believers (95% CI OR: 4.42[2.10,9.27], 5.83[0.79,42.85], 8.64[4.34,17.20]). Mothers who live in Tigray region are 39.32, 9.61 and 6.10 times more likely to have ANC service utilization than those living in the Somali, Afar and SNNPR regions (95% CI OR: 39.32[24.17,63.97], 9.61[6.01,15.35], 6.10[3.82,9.72]) respectively. Similarly, women in the same region of Tigray will have 7.44, 5.23- and 2.26-times higher probability of delivering in a health institution than their counter parts in Somali, Afar and SNNPR regions (95% CI OR: 7.44[5.28,10.47], 5.23[3.81,7.16] and 2.26[1.70,3.02]) respectively. Urban dwelling women are more likely to make use of ANC and ID/FD services than their rural counter parts (95% CI OR: 4.05[3.25,5.03], 7.66[6.34,9.25]) respectively. (Tables 12, 15 and 18)

Mothers from the richest households are 14.35 & 2.21-times more likely to use ANC & PNC, 28.69-times more likely to deliver in a health facility than those from the poorest households respectively (95% CI OR: 14.35[10.85,18.98], 2.21[1.66,2.93] and 28.69[22.41,36.73]) respectively. Women who are heads of their households deliver a child 1.26-times more likely in a health facility than those who are not (95%CI OR: 1.26[1.08,1.48]). (Tables 12, 15 and 18)

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5.7.3 Health System (Healthcare Provider) Factors

In this subsection the binomial regression analysis test results that were performed on health system predictor variables such as: person providing maternal healthcare services in particular and other components like frequency of ANC visits, mother's health check before and after discharge from the place of delivery and any statistically significant associations amongst the outcome variables are presented.

Delivery assistance by a skilled provider was significantly related with all the three components of maternal healthcare service utilization (95% CI, OR of: 2.80[2.24,3.48], 168.44[53.97,525.78] and 2.50[1.56,4.00]) for ANC, ID/FD and PNC respectively; whereas, ANC provision by a skilled healthcare provider was correlated with facility delivery and PNC service use by mothers (95% CI, OR of: 14.72[12.08,17.94] and 4.26[3.06,5.94] respectively). The frequency and number of ANC visits is also correlated with ID and PNC. Women who had 4 or more ANC visits are 24.75-times more likely (95% CI, OR = 24.75[19.93,30.72]) to deliver in a health facility and 5.55-times more likely to use PNC service after discharge from delivery place (95% CI, OR = 5.55[3.95,7.80]) than those who had zero ANC visits, respectively. Mothers who had their health checks before discharge from the facility of delivery are in a better probability to use ANC (95% CI, OR=1.89[1.33,2.68]) and PNC after discharge within 42 days postpartum (95% CI, OR=2.49[1.86,3.33]) than those who did not have. Person providing health check before discharge has been significantly influential for the continuation of the next PNC service use after discharge. For instance, mothers who had their health checked by HEWs before discharge are more likely to have their health checked after discharge from the place of delivery (95% CI, OR=3.15[1.71,5.80], 3.22[1.77,5.87] and 3.42[1.88,6.21] for Doctors, Nurses and Midwives respectively) than those who got the checkups by other providers. A mother who got her health checked after discharge from her place of delivery is more likely to be ANC user (95% CI, OR=4.26[3.06,5.94]) than her counterpart who did not get the health check after discharge. (Tables 13, 16 and 19)

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Table 11. Individual/Maternal Factors Affecting ANC Utilization among Women 15-49 years in Ethiopia in the past five years, 2019

Variables		**Category**	**ANC Utilization (Ref.=Users)**	
			Users	**Non-users**
			OR [95% CI]	**P-Value**
Age		<20	1.44[1.09,1.92]	0.011
		20-34	1	
		35-49	1.61[1.36,1.89]	< 0.001
Marital Status		Married	1	
		Single	0.89[0.67,1.19]	0.446
Educational Status		No education	35.39[13.12,95.47]	< 0.001
		Primary	12.31[4.54,33.42]	< 0.001
		Secondary	2.70[0.90,8.12]	0.077
		Beyond secondary	1	
Media Exposure	Has a TV (HH)	Yes	1	
		No	7.23[5.33,9.78]	< 0.001
	Has a radio (HH)	Yes	1	
		No	2.24[1.86,2.69]	< 0.001

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Table 12. Environmental Factors Affecting ANC Utilization among Women 15-49 years in Ethiopia in the past five years, 2019

Variables	**Category**	**ANC Utilization (Ref.=Users)**	
		Users	**Non-users**
		OR [95% CI]	**P-Value**
Religion	Orthodox	1	
	Catholic	2.05[0.81,5.20]	0.132
	Protestant	2.14[1.70,2.70]	< 0.001
	Muslim	3.48[2.88,4.19]	< 0.001
	Traditional beliefs & Other	8.64[4.34,17.20]	< 0.001
Region	Tigray	1	
	Afar	9.61[6.01,15.35]	< 0.001
	Amhara	2.96[1.80,4.85]	< 0.001
	Oromia	5.89[3.70,9.37]	< 0.001
	Somali	39.32[24.17,63.97]	< 0.001
	Benishangul-Gumuz	3.32[2.02,5.46]	< 0.001
	SNNPR	6.10[3.82,9.72]	< 0.001
	Gambella	3.67[2.23,6.04]	< 0.001
	Harari	3.20[1.92,5.34]	< 0.001
	Addis Ababa	0.43[0.18,1.02]	0.055
	Dire Dewa	2.88[1.70,4.87]	< 0.001
Residence	Urban	1	
	Rural	4.05[3.25,]	< 0.001
Wealth Index	Poorest	14.35[10.85,18.98]	< 0.001
	Poorer	5.20[3.82,7.06]	< 0.001
	Middle	4.06[2.94,5.60]	< 0.001
	Richer	2.58[1.83,3.65]	< 0.001
	Richest	1	
Autonomy of women (Sex of HH Head)	Male	0.96[0.81,1.14]	0.645
	Female	1	

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Table 13. Health System Factors Affecting ANC Utilization among Women 15-49 years in Ethiopia in the past five years, 2019

Variables		**Category**	**ANC Utilization (Ref.=Users)**	
			Users	**Non-users**
			OR [95% CI]	**P-Value**
Skilled Delivery Service Provider	Doctor	Yes	1	
		No	5.76[4.04,8.23]	<0.001
	Nurse	Yes	1	
		No	6.99[5.05,9.66]	< 0.001
	Midwife	Yes	1	< 0.001
		No	8.91[6.86,11.56]	
	Health Officer	Yes	1	< 0.001
		No	5.26[2.76,10.02]	
	HEW	Yes	1	< 0.001
		No	3.71[2.09,6.58]	
Non-skilled Delivery Service Provider	TBA	Yes	1	
		No	0.13[0.11,0.15]	< 0.001
	Other	Yes	1	
		No	0.74[0.56,0.99]	0.04
	No one	Yes	2.80[2.24,3.48]	< 0.001
		No	1	
Place of delivery		Health facility	1	
		Home & Other	14.72[12.08,17.94]	< 0.001
Mother's health check before discharge from the facility of delivery (N=2136)		Yes	1	
		No	1.89[1.33,2.68]	< 0.001
Mother's health check after discharge from the place of delivery (N=3979)		Yes	1	
		No	4.26[3.06,5.94]	< 0.001

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Table 14. Individual/Maternal Factors associated with PNC Service Utilization after the delivery of their last child in the past 5 years before the 2019 EMDHS survey

Variables		**Description**	**Mother's health check after discharge from the place of delivery (Ref. Yes)**	
			Yes	**No**
			OR [95% CI]	**P-value**
Age		< 20	1.35[0.860,2.12]	0.192
		20-34	1	
		35-49	0.933[0.742,1.17]	0.551
Marital Status		Married	1	
		Single	1.35[0.88,2.08]	0.172
Educational Status		No education	2.34[1.65,3.33]	< 0.001
		Primary	1.82[1.27,2.61]	< 0.001
		Secondary	1.42[0.93,2.18]	0.106
		Beyond secondary	1	
Media Exposure	Has a TV (HH)	Yes	1	< 0.001
		No	1.62[1.30,2.02]	
	Has a radio (HH)	Yes	1	0.065
		No	1.22[0.99,1.51]	

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Table 15. Environmental Factors associated with PNC Service Utilization after the delivery of their last child in the past 5 years before the 2019 EMDHS survey

Variables	**Description**	**Mother's health check after discharge from the place of delivery (Ref. Yes)**	
		Yes	**No**
		OR [95% CI]	**P-value**
Religion	Orthodox	1	
	Catholic	0.69[0.25,1.85]	0.456
	Protestant	1.44[1.09,1.90]	0.01
	Muslim	1.49[1.20,1.85]	< 0.001
	Traditional beliefs & Other	5.83[0.79,42.85]	0.083
Region	Tigray	0.42[0.27,0.65]	< 0.001
	Afar	1.32[0.76,2.28]	0.321
	Amhara	0.52[0.33,0.81]	0.004
	Oromia	1	
	Somali	1.85[0.98,3.49]	0.056
	Benishangul-Gumuz	0.30[0.20,0.46]	< 0.001
	SNNPR	0.55[0.36,0.85]	0.007
	Gambella	0.91[0.54,1.53]	0.726
	Harari	0.57[0.37,0.97]	0.037
	Addis Ababa	0.39[0.24,0.63]	< 0.001
	Dire Dawa	0.41[0.26,0.64]	< 0.001
Residence	Urban	1	
	Rural	1.23[0.99,1.52]	0.063
Wealth Index	Poorest	2.21[1.66,2.93]	< 0.001
	Poorer	1.46[1.08,1.98]	0.014
	Middle	0.95[0.71,1.26]	0.718
	Richer	0.99[0.74,1.34]	0.988
	Richest	1	
Autonomy of women (Sex of HH Head)	Male	0.98[0.77,1.24]	0.86
	Female	1	

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Table 16. Health System Factors associated with PNC Service Utilization after the delivery of their last child in the past 5 years before the 2019 EMDHS survey

Variables		**Description**	**Mother's health check after discharge from the place of delivery (Ref. =Yes)**	
			Yes **OR [95% CI]**	**No** **P-value**
Skilled ANC Service Provider	Doctor	Yes	1	< 0.001
		No	1.80[1.39,2.32]	
	Nurse	Yes	1	0.306
		No	1.12[0.90,1.40]	
	Midwife	Yes	1.20[0.94,1.52]	0.137
		No	1	
	Health Officer	Yes	1	< 0.001
		No	1.81[1.32,2.49]	
	HEW	Yes	1	0.068
		No	1.31[0.98,1.75]	
Non-skilled ANC Service Provider	TBA	Yes	1	0.039
		No	4.55[1.08,19.08]	
	Other	Yes	1	0.366
		No	0.40[0.05,2.96]	
	ANC Utilization	Non-users	4.26[3.06,5.94]	< 0.001
		Users	1	
Place of delivery		Health Facility	1	< 0.001
		Home & Other	2.03[1.65,2.49]	

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Key: 1=Reference level, HH=Household, ANC=Antenatal Care, HEW=Health Extension

Variables		Description	Mother's health check after discharge from the place of delivery (Ref. =Yes)	
			Yes OR [95% CI]	No P-value
Skilled Delivery Service Provider	Doctor	Yes	1	< 0.001
		No	1.73[1.34,2.23]	
	Nurse	Yes	1	< 0.001
		No	1.49[1.18,1.88]	
	Midwife	Yes	1	0.044
		No	1.24[1.01,1.52]	
	Health Officer	Yes	1	0.183
		No	1.36[0.86,2.15]	
	HEW	Yes	1	< 0.001
		No	2.14[1.42,3.23]	
Non-skilled Delivery Service Provider	TBA	Yes	1	< 0.001
		No	0.42[0.32,0.54]	
	Other	Yes	1	0.06
		No	1.42[0.98,2.06]	
	No one	Yes	2.50[1.56,4.00]	< 0.001
		No	1	
Number of ANC Visits		0	5.55[3.95,7.80]	< 0.001
		1	3.24[1.63,6.45]	< 0.001
		2 to 3	1.92[1.52,2.41]	< 0.001
		4 and beyond	1	
Mother's health check before discharge from the facility of delivery (N=2136)		Yes	1	< 0.001
		No	2.49[1.86,3.33]	
Skilled PNC checkup before discharge from the place of delivery (N=1383)		Doctor	3.15[1.71,5.80]	< 0.001
		Nurse	3.22[1.77,5.87]	< 0.001
		Midwife	3.42[1.88,6.21]	< 0.001
		Health Officer	4.37[1.96,9.73]	< 0.001
		HEW	1	
Non-skilled PNC checkup before discharge from the place of delivery (N=1383)		TBA and Other	NA	

Worker, TBA=Traditional Birth Attendant, PNC=Postnatal Care, EMDHS=Ethiopian Mini-Demographic and Health Survey, NA=Not Applicable/no association.

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Table 17. Individual/Maternal Factors associated with Health Facility Delivery (FD) among mothers 15-49 years in Ethiopia, 2019

Variables		Description	Place of Delivery (Ref. =H. Facility)	
			Health Facility	Home & Other
			OR [95% CI]	P-value
Age		<20	1.283[0.988,1.665]	0.061
		20-34	1	
		35-49	1.465[1.259,1.703]	< 0.001
Marital Status		Married	1	
		Single	0.817[0.634,1.052]	0.117
Educational Status		No education	38.76[20.44,73.50]	< 0.001
		Primary	12.44[6.54,23.67]	< 0.001
		Secondary	3.48[1.73,7.01]	< 0.001
		Beyond secondary	1	
Media Exposure	Has a TV (HH)	Yes	1	
		No	12.13[9.45,15.56]	< 0.001
	Has a Radio (HH)	Yes	1	
		No	2.27[1.96,2.64]	< 0.001

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Table 18. Environmental Factors associated with Health Facility Delivery (FD) among mothers 15-49 years in Ethiopia, 2019

Variables	Description	Place of Delivery (Ref. H. Facility) Health Facility OR [95% CI]	Home & Other P-value
Religion	Orthodox	1	
	Catholic	3.75[1.61,8.76]	0.002
	Protestant	1.74[1.45,2.09]	< 0.001
	Muslim	1.85[1.60,2.14]	< 0.001
	Traditional beliefs & Other	4.42[2.10,9.27]	< 0.001
Region	Tigray	1	
	Afar	5.23[3.81,7.16]	< 0.001
	Amhara	1.74[1.30,2.35]	< 0.001
	Oromia	2.48[1.87,3.30]	< 0.001
	Somali	7.44[5.28,10.47]	< 0.001
	Benishangul-Gumuz	1.17[0.86,1.57]	0.305
	SNNPR	2.26[1.70,3.02]	< 0.001
	Gambella	1.40[1.03,1.91]	0.033
	Harari	0.78[0.56,1.10]	0.153
	Addis Ababa	0.11[0.06,0.20]	< 0.001
	Dire Dewa	0.84[0.60,1.20	0.317
Residence	Urban	1	
	Rural	7.66[6.34,9.25]	< 0.001
Wealth Index	Poorest	28.69[22.41,36.73]	< 0.001
	Poorer	10.25[7.93,13.25]	< 0.001
	Middle	8.76[6.73,11.34]	< 0.001
	Richer	4.37[3.32,5.74]	< 0.001
	Richest	1	
Autonomy of women (Sex of HH Head)	Male	1.26[1.08,1.48]	0.003
	Female	1	

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Table 19. Health System Factors associated with Health Facility Delivery (FD) among mothers 15-49 years in Ethiopia, 2019

Variables		**Description**	**Place of Delivery (Ref. H. Facility)**	
			Health Facility	**Home & Other**
			OR [95% CI]	**P-value**
Skilled ANC Service Provider	Doctor	Yes	1	
		No	8.61[6.40,11.56]	< 0.001
	Nurse	Yes	1	
		No	2.13[1.83,2.47]	< 0.001
	Midwife	Yes	1	
		No	2.27[1.92,2.69]	< 0.001
	Health Officer	Yes	1	
		No	1.80[1.39,2.32]	< 0.001
	HEW	Yes	1	
		No	0.78[0.64,0.96]	0.018
Non-skilled ANC Service Provider	TBA	Yes	1	
		No	0.12[0.02,0.995]	0.049
	Other	Yes	1	
		No	0.57[0.23,1.41]	0.224
	ANC Utilization (ANC by no one)	Non-users (Yes)	14.72[12.08,17.94]	< 0.001
		Users (No)	1	

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Variables		Description	Place of Delivery (Ref. H. =Facility)	
			Health Facility	Home & Other
			OR [95% CI]	P-value
Skilled Delivery Service Provider	Doctor	Yes	1	
		No	70.65[35.04,142.48]	< 0.001
	Nurse	Yes	1	
		No	24.53[17.17,35.02]	< 0.001
	Midwife	Yes	1	
		No	72.54[49.47,106.37]	< 0.001
	Health Officer	Yes	1	
		No	34.23[12.65,92.59]	< 0.001
	HEW	Yes	1	
		No	4.09[2.66,6.23]	< 0.001
Non-skilled Delivery Service Provider	TBA	Yes	1	
		No	0.002[0.001,0.004]	< 0.001
	Other	Yes	1	
		No	0.010[0.003,0.031]	< 0.001
	No one	Yes	168.44[53.97,525.78]	< 0.001
		No	1	
Number of ANC Visits		0	24.75[19.93,30.72]	< 0.001
		1	6.78[4.70,9.78]	< 0.001
		2 to 3	2.67[2.26,3.15]	< 0.001
		4 and beyond	1	
		Don't know	1.50[0.53,4.30]	0.445

Key: 1=Reference level, HH=Household, ANC=Antenatal Care, HEW=Health Extension Worker, TBA=Traditional Birth Attendant

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CHAPTER 6. DISCUSSION

6.1 Maternity Healthcare service Utilization Prevalence Rates

This study revealed that the Antenatal (ANC), Postnatal (PNC) and health Institution/Facility delivery (ID/FD) service utilization prevalence rates were 73.8% [72.4%,75.1%, 95% CI, p-value <.001], 11.7% [10.7%,12.8% 95% CI, p-value <.001], and 53.7% [52.12%,55.24% ,95% CI, p-value < .001] respectively. The proportion of ANC service utilization in this study (73.8%) is higher than the findings of a similar cross-sectional analysis based on the 2016 Ethiopian DHS data in Ethiopia by (19. Tsegaye & Ayalew, 2020), 62.8%, and that of the Sindh province of Pakistan 2019 by (Noh, Kim, Lee, et al., 2019) 57.3% (for ANC 4+). The result is lower than the findings of study in conducted in Holeta town, central Shewa, Ethiopia (87%) by (Kidist Birmeta1*, 2013) and it is almost in line with those of the Enderta District of Tigray, Ethiopia (72%) (Aregay et al., 2014) and the one carried out in Haramaya District Oromia region, Eastern Ethiopia (74.3%) by (Kifle et al., 2017). These differences may be due to differences in the scopes, settings, timing and peculiar interests and aims of the researchers; and improvement in healthcare service coverage, increasing education and training of healthcare providers, better understanding of their health and health services amongst mothers and the community in general, the revolutions in Information Communication Technology (ICT) and digital health through time.

The Postnatal Care (PNC) service utilization prevalence rate in this study (11.7%) is quite lower than almost all other studies such as: Enderta District of Tigray, Ethiopia (Aregay et al., 2014) (49.7%), Haramaya District Oromia region east Ethiopia (Kifle et al., 2017) (22.6%), Ethiopia 2016 DHS (Central Statistical Agency - CSA/Ethiopia & ICF, 2017) (17%), EMDHS 2019 (Ethiopian Public Health Institute - EPHI et al., 2021) (34%), and Dale-Wonsho, south Ethiopia (Tsegaye et al., 2021) (32.7%). This is because, unlike many

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other surveys conducted in Ethiopia, in this study PNC service users were defined as ‘mothers who had made at least one health check after being discharged from their place of delivery, despite the timing and number of PNC visits within 6 weeks of the postpartum period’, where many of the mothers who deliver in the health institutions and compulsorily stay for the first 24 hours after delivery in the health institutions as per the standard guideline and who will have higher chance of health checks over there, are excluded; since it does not show the actual health seeking behavior of the mothers for PNC. These group of mothers who start their health checks during the 24 hours compulsory stay in the facilities of delivery as their first PNC visit, will dropout from the PNC continuum of care latter. This can be proven from the findings of those surveys which analyze completion of the full course of PNC service utilization prevalence rates as in case of the four rural districts of Tigray region, Ethiopia (Abraha et al., 2019) (16.1%).

Institutional delivery service utilization prevalence rate was 53.7% in this analysis which is higher than those of the Enderta District (37.9%), 2016 Ethiopian DHS (26%), Haramaya District (28.7%) and lower than the findings of Holeta town of central Ethiopia (61.6%) and Sindh province of Pakistan (65%) (Aregay et al., 2014; Central Statistical Agency - CSA/Ethiopia & ICF, 2017; Kidist Birmeta1*, 2013; Kifle et al., 2017; Noh, Kim, Akram, et al., 2019); whereas it is consistent with the result of the survey in Dale-Wonsho of southern Ethiopia (52.1%) (Tsegaye et al., 2021). This may result from differences in time, place, scope and settings of the studies, socioeconomic, cultural and religious diversities in addition to the expansion of healthcare services and dramatic advancements in ICT.

6.2 Maternal Factors Affecting Maternity Healthcare Service Utilization

This study has revealed that age of the women, educational status and exposure to main stream media are among maternal factors that are significantly correlated with utilization of ANC and Institutional Delivery (ID) services in Ethiopia. Higher levels of maternal education and having a radio and television in their households were positively associated

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with ANC and ID service utilization practice, whereas advancing age of the mothers was negatively associated with the utilization of services. This is in line with findings other studies conducted in Ethiopia and Sindh province of Pakistan. (Kidist Birmeta1*, 2013; Noh, Kim, Akram, et al., 2019; Noh, Kim, Lee, et al., 2019; Tsegaye & Ayalew, 2020; Yaya et al., 2018). This may be due some socio-cultural similarities and universality of the impacts of the variable (education) in changing behaviors of people.

6.3 Environmental Factors Influencing Maternal Health Service Utilization

In this survey region of residence, the type of residence (urban/rural) and wealth index of the household have been significantly influential in almost all their levels in the utilization of ANC and ID service utilization among women of childbearing age in Ethiopia. Women specially in the less developed pastoralist regions, rural parts of the nation, the poorest and poorer wealth quintiles, who are traditional believers in their religion were much less likely to utilize the services than their counterparts. For instance, a woman in Tigray region was 39.32-times and 9.61-times more likely to use ANC service than her counters in Somali and Afar regions respectively (p-value < .001); and the same woman in Tigray region is 7.44 and 5.23-times more likely to deliver in a health facility than her counterparts in the Somali and Afar regions respectively (p-value < .001). Similarly, a woman in the richest wealth index is 28.69 and 14.35 times more likely to deliver in a health facility and to use ANC services as compared to a woman in the poorest wealth index respectively (p-value < .001). Additionally, a woman who is an Orthodox Christianity follower is 8.64 and 4.42-times more likely to use ANC and ID/FD services than the traditional believer mother respectively (p-value < .001). This was supported by many other studies (Central Statistical Agency - CSA/Ethiopia & ICF, 2017; Kidist Birmeta1*, 2013; Kifle et al., 2017; Noh, Kim, Akram, et al., 2019; Noh, Kim, Lee, et al., 2019; Tsegaye & Ayalew, 2020; Tsegaye et al., 2021; Yaya et al., 2018). This similarity may be due to the fact that the variables are either

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shared societal values or characteristics that are not easily transformed from a level to the next within shorter period of time.

Autonomy of the women in terms of being heads of their households was significantly associated only with the utilization of id services, women who are heads of their households were 1.26-times more likely to deliver in health facility than those who are not (p-value = .003).

Religion, region of residence and wealth index were environmental factors that significantly influenced PNC service utilization among Ethiopian mothers in this study. This result is consistent with the findings of other surveys (Central Statistical Agency - CSA/Ethiopia & ICF, 2017; Kifle et al., 2017).

6.4 Health System Factors Associated with Maternity Health service Utilization

In this study the three major maternal healthcare service utilization prevalence and factors affecting them were analyzed and the associations among the outcome variables were tested besides the predictors. And interestingly there was significant positive association observed amongst the outcome variables. This analysis has also evidenced that delivery assistance by a skilled healthcare provider is significantly associated with all outcome variables: ANC, ID and PNC service utilization. Additionally, mothers' health check before discharge from the facility of delivery was significantly correlated with ANC and PNC service utilization. Frequency of ANC visits was also positively linked with ID and PNC services consumption among Ethiopian mothers in this survey (p-value < .001) in the logistic regression analysis. Person providing health check for mothers before discharge from their place of delivery was also significantly associated with the PNC service utilization. In brief explanation, mothers who have ever used ANC service are 14.72- and 4.26-times more likely to deliver in health facility and use PNC service respectively than

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those who had never used ANC service during their gestational period. Mothers who had delivery assistance by skilled provider are 2.80-, 168.44- and 2.50-times more likely to utilize ANC, ID and PNC services than their counterparts. A woman who made 4 and above ANC visits was found 24.75- and 5.55-times more likely to deliver in health facility and use PNC service than a woman with no visit (p-value < .001). these results are consistent with the findings of studies conducted in different parts of Ethiopia and the Sindh district of Pakistan (Abraha et al., 2019; Kidist Birmeta1*, 2013; Noh, Kim, Akram, et al., 2019; Tsegaye et al., 2021; Yaya et al., 2018).

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CHAPTER 7. CONCLUSION AND RECOMMENDATION

7.1 Key Findings

- The Antenatal Care (ANC), Institutional Delivery (ID) and Postnatal Care (PNC) service utilization prevalence rates, 73.8%, 53.7% and 11.7% respectively, among women 15-49 in Ethiopia are still quite low in accordance to the global and national strategic targets, to meet the goals (SDGs & HSTP II).
- There are significant variations in the ANC, ID and PNC service utilization prevalence amongst women 15-49 years by Maternal, Environmental and Health System Factors.
- The utilization of Antenatal Care, Institutional Delivery and Postnatal Care services were significantly associated with the educational status, media exposure (Radio, TV), region of residence, and skilled healthcare providers, altogether.
- Age of the woman, religion and residence type (urban/rural) are shared determinants of ANC and ID service utilization; whereas, ANC attendance and frequency of ANC visits are common significant influencers of ID and PNC services utilization among the study participants.
- Autonomous women (in their households) were more likely significant determinants of their place of delivery than their counterparts (p-value=.003)
- Institutional Delivery was a significant predictor of PNC service utilization (p-value < .001).

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7.2 Strengths and Limitations of the study

7.2.1 Strengths

This study has strived to investigate the prevalence rates of the three major maternity healthcare services utilization and factors affecting them altogether among the Ethiopian mothers of childbearing age.

It has been able to investigate, analyze and present shared among the three, between the two and independent factors that are significantly associated with ANC, ID and PNC service utilization, that will assist in prioritizing areas of action in the designing and planning of healthcare policies, programs and service delivery.

7.2.2 Limitations

This is a study based on the 2019 Ethiopian Mini-DHS data (a secondary data) hence control over the type and quality of data was not possible by the author.

The data was a community-based cross-sectional quantitative data which lacks facility-based and qualitative components to triangulate and get better quality results.

7.3 Recommendations

1. **Scholars:** Further studies should be conducted as a continuum of maternity healthcare using mixed facility- and community-based quantitative and qualitative data components are highly suggested to produce better quality results.
2. **Policy makers and programmers:**

a) Policies and programs of the MCH should be designed in a comprehensive and integrated way prioritizing the shared maternal, environmental and systemic factors affecting the maternal health service utilization

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b) Multi-sectoral approaches in improving the overall living standards of households, education of girls and adults, engaging religious and community leaders in the maternal health agenda should be prioritized in the national development plans.

3. Healthcare service providers:

a) the maternal healthcare service packages should be designed in an integrated and mother-friendly environment as a single service delivery platform

b) strong tracing and follow up mechanisms for mothers within and out of (in the community) facility should be established and integrated to the facility's short-, medium and long-term service delivery plans.

7.4 Conclusion

According to the findings of this study, the proportions of Antenatal Care, Facility Delivery and Postnatal Care services utilization among women 15-49 in Ethiopia are quite low in accordance with the set national and global strategic plans and goals. Significant disparities in the service utilization by maternal, environmental and systemic dimensions are prominent.

Maternal education, media exposure, region of residence, wealth index of the households skilled healthcare service providers are the major factors which significantly affected ANC, ID and PNC services utilization among mothers in Ethiopia, altogether. Significant associations amongst the outcome variables themselves were also evident in this analysis. Frequency of ANC for ID and PNC, the type of residence and religion for ID and ANC respectively, were significant predictors of service utilization amongst Ethiopian mothers (p-value < .001). Hence, maternal health related, policies, strategies and plans should be designed and approached in a comprehensive, integrated, multi-sectorial and collaborative ways. The shared associated factors with the three major maternity healthcare service utilization altogether and the socioeconomically less privileged regions should be given the first priority in maternal healthcare intervention plans and actions in Ethiopia

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Appendix 1. Table of Evidence (TOE)

Author (Year), Journal	Title	Purpose	Design	Sampling	Variables	Measurement	Analysis	Findings	Strength /Weakness
Asfawosen Aregay, Mussie Alemayehu, Huruy Assefa, Wondeweson Terefe (2014) American Journal of nursing Science	Factors associated with maternal health care services in Enderta District, Tigray, Northern Ethiopia: A cross sectional study	To assess the magnitude and factors associated with maternal health care service utilization.	Community based cross sectional study	Multistage sampling technique used to get a sample of 574 married women in Enderta district , Tigray, Northern Ethiopia	socio demographic and economic variables, knowledge on maternal health services, cultural factors.	structured administered questionnaire focus group discussions (FGD) Focus group guide line	Descriptive analyses : (to estimate the level of ANC, delivery service, postnatal care (PNC), utilization, descriptions of women characteristics). Multiple logistic regression(predictors)	Proportions of utilization: ANC=72%, delivery=37.9%, PNC=49.7%. Women's own monthly income and their knowledge on danger sign that could occur during pregnancy could influence ANC utilization. Women husband s' educational status might have influences on women decision to deliver at health institution.	**Strength**: Used two measurements, and primary data. All primary maternity healthcare packages **Weakness:** Took only married women. Narrower scope of area (single district)

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Author (Year), Journal	Title	Purpose	Design	Sampling	Variables	Measurement	Analysis	Findings	Strength /Weakness
Teklehaymanot Huluf Abraha, Berhe Bevene Gebrezgiabher Lidiya Tsegay Tikue, Ermyas Brhane Reda, (2019) Korean Journal of Family medicine	Factors Associated with Compliance with the Recommended Frequency of Postnatal Care Services in Four Rural Districts of Tigray Region, North Ethiopia	To assess the level of full PNC visits and factors associated with it among mothers	community-based cross-sectional study	Random multistage cluster sampling technique 1,109 mothers who gave birth 12 months before the interview	socio demographic: age, educational status, marital status, occupation, wealth, birth order, Birth interval, ANC visit, place of delivery, place PNC received, number of PNC visits, PNC counseling	Face to face interview through a structured questionnaire	Descriptive statistics, Multivariate logistic regression model was applied to assess the predictors of compliance with the WHO recommended frequency of PNC services.	Status of compliance with the use of full PNC services was found to be 16.1%, Women who had antenatal care follow-up (5.60 times) and women who delivered at health institutions (3.66 times) were more likely to have full PNC visits. district of residence remains a predictor of service use.	**Strength:** Scope of the areas (4 districts), used primary data, included mothers with more recent birth history **Weakness:** only Quantitative data used.

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Author (Year), Journal	Title	Purpose	Design	Sampling	Variables	Measurement	Analysis	Findings	Strength/Weakness
Berhan Tsegaye and Mohammed Avalew, 2020 BMC pregnancy and childbirth	Prevalence and factors associated with antenatal care utilization in Ethiopia: an evidence from demographic health survey 2016	to assess prevalence and factors associated with antenatal care utilization at least once in the past five years before Ethiopian demographic health survey of 2016.	Cross-sectional study based on secondary data	Stratified, two stage cluster sampling strategy was applied in EDHS 2016. Sample size: 7591 women of childbearing age	age, place of residence, educational status, husband educational status, religion, ethnicity, marital status and wealth index, Age at first pregnancy, number of alive children, current pregnancy status, place of delivery and frequency of listening radio.	Face to face interview using a structured questionnaire	Descriptive statistics Bivariate and multivariate logistic regression Chi-square test was performed to observe any association between independent variables and an outcome variable.	- Prevalence of antenatal care utilization was low (62.8%). - Higher maternal educational status, frequent radio listening, higher wealth quintile, traditional belief, and greater number of children were found to be associated significantly with antenatal care utilization.	**Strength:** National level analysis (scope) **Weakness:** single service package, secondary data, used quantitative data only

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Author (Year), Journal	Title	Purpose	Design	Sampling	Variables	Measurement	Analysis	Findings	Strength /Weakness
S. Yaya et al. (2018) The Royal Society of Tropical Medicine & Hygiene	Factors associated with maternal utilization of health facilities for delivery in Ethiopia	to identify the correlates of facility delivery among urban and rural women in Ethiopia.	cross-sectional study based on data from the 2011 Ethiopian Demographic and Health Survey.	7540 women aged between 15 and 49 years with a history of at least one birth. Selected by stratified two stage sampling	Dependent: choice of place of delivery Independents: age, religion, educational level, wealth index, number of ANC visits, age at firs birth, sex of household head	Face to face interview using a structured questionnaire	bivariate and multivariable regression techniques. Chi-square test	prevalence of health facility delivery was 17.1% education, wealth status, frequency of antenatal care visits and mother's age at first birth were found to be significantly associated with women's choice of place of delivery.	Strength: The first of kind in this title and large sample size, national level(area scope) Weakness: No control over the type & quality of data(author), single maternal healthcare service package

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Author (Year), Journal	Title	Purpose	Design	Sampling	Variables	Measurement	Analysis	Findings	Strength /Weakness
Kidist Birmeta, Yohannes Dibaba and Desalegn Woldeyohannes,2013 BMC Health service research	Determinants of maternal health care utilization in Holeta town, central Ethiopia	to assess the determinants of maternal health care utilization among women who had given birth in the past three years prior to the survey.	Cross-sectional study	A multi-stage sampling scheme was used to identify the study subjects A sample size of 422 women aged 15-49 years was determined using the formula for single population proportion	age, educational status, marital status, occupation, family size, media exposure, average monthly family income, Age at last birth, parity, planned pregnancy, knowledge on danger signs, presence of husband approval on ANC	Structured questionnaire and focus group discussion guides	Descriptive, bivariate and multivariate logistic regression analyses were conducted	87% of the women had at least one antenatal visit during their last pregnancy. age at last birth, literacy status of women, average monthly family income, media exposure, attitude towards pregnancy, knowledge on danger signs of pregnancy and presence of husband approval on ANC associated with ANC Institutional delivery=61.6 Parity, literacy status of women, average monthly family income, media exposure, decision where to give birth, perception of distance to health institutions (HI) and ANC attendance were found to be significantly associated (P<0.05) with delivery care (DC) attendance.	**Strength:** Quantitative & qualitative data. Used primary data. Included two maternal healthcare service packages **Weakness:** narrow area scope Can't assess temporal relations. Recall bias (3 years) may exist

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Author (Year), Journal	Title	Purpose	Design	Sampling	Variables	Measurement	Analysis	Findings	Strength/Weakness
Jin-Won Noh, Young-mi Kim, Nabeel Akram, Ki-Bong Yoo, Joovoung Cheon, Lena J. Lee, Young Dae Kwon and Jelle Stekelenburg (2019) International Journal of Environmental Research and Public Health	Impact of Socio-Economic Factors and Health Information Sources on Place of Birth in Sindh Province, Pakistan: A Secondary Analysis of Cross-Sectional Survey Data	Assess impacts of socioeconomic factors and sources of varied health information on choice of place of delivery	Secondary analysis of cross-sectional survey data	Pooled data MCH Program Indicator Survey 2013&2014	Demographic characteristics, socioeconomic factors, sources of health information	Structured Questionnaire	Generalized linear model with log link & Poisson distribution	(35%) women gave birth at home, and 6316 (65%) women gave birth at a medical facility. Age, Number of children, education, wealth, source of health information affect birth place choice	**Strength**: used a different analysis model, second level (province) **Weakness:** secondary data, single service coverage, limited number of factors dealt

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Author (Year), Journal	Title	Purpose	Design	Sampling	Variables	Measurement	Analysis	Findings	Strength/Weakness
Jin-Won Noh, Young-mi Kim, Lena J. Lee, Nabeel Akram, Farhana Shahid, Young Dae Kwon, Jelle Stekelenburg (2019) PLOS/ONE	Factors associated with the use of antenatal care in Sindh province, Pakistan: A population based study	To assess the utilization of ANC in Sindh province, Pakistan, and identify the factors that affect its use.	Secondary analysis of cross-sectional survey data	Subset of data from the MCH Program Indicator Survey 2013& 2014	Demographic(household) socioeconomic(education, wealth), characteristics of ANC, and informational factors associated with ANC use(Lady health workers, mother-in-law, relatives/friends, midwife, nurse)	At least 4 visits of ANC	Used logistic regression model	- Only 57.3% of them made the recommended four or more visits, - Making four or more ANC visits was associated with: fewer household occupants, large city residence, higher women's education greater household wealth and receiving MCH information from lady health worker, mother-in-law, other relatives/friends, or nurse/midwife,	**Strength:** second level (province), better number of variables (factors) **Weakness:** secondary data, single service coverage,

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Appendix 2 Letter of Data Access Approval

Apr 25, 2022

Teshome Fekadu
Yonsei University-Graduate school of Public Health
Korea Republic of
Request Date: 04/24/2022

Dear Teshome Fekadu:

This is to confirm that you are approved to use the following Survey Datasets for your registered research paper titled: "Currently, I am an 'MPH in global health policy and financing fellow at Yonsei University Seoul, South Korea. I am planning to conduct my thesis project & need data in MCH & RH areas..":

Ethiopia

To access the datasets, please login at: https://www.dhsprogram.com/data/dataset_admin/login_main.cfm. The user name is the registered email address, and the password is the one selected during registration.

The IRB-approved procedures for DHS public-use datasets do not in any way allow respondents, households, or sample communities to be identified. There are no names of individuals or household addresses in the data files. The geographic identifiers only go down to the regional level (where regions are typically very large geographical areas encompassing several states/provinces). Each enumeration area (Primary Sampling Unit) has a PSU number in the data file, but the PSU numbers do not have any labels to indicate their names or locations. In surveys that collect GIS coordinates in the field, the coordinates are only for the enumeration area (EA) as a whole, and not for individual households, and the measured coordinates are randomly displaced within a large geographic area so that specific enumeration areas cannot be identified.

The DHS Data may be used only for the purpose of statistical reporting and analysis, and only for your registered research. To use the data for another purpose, a new research project must be registered. All DHS data should be treated as confidential, and no effort should be made to identify any household or individual respondent interviewed in the survey. Also, be aware that re-distribution of any DHS micro-level data, either directly or within any tool/dashboard, is not permitted. Please reference the complete terms of use at: https://dhsprogram.com/Data/terms-of-use.cfm.

The data must not be passed on to other researchers without the written consent of DHS. However, if you have coresearchers registered in your account for this research paper, you are authorized to share the data with them. All data users are required to submit an electronic copy (pdf) of any reports/publications resulting from using the DHS data files to: references@dhsprogram.com.

Sincerely,

Bridgette Wellington

Bridgette Wellington
Data Archivist
The Demographic and Health Surveys (DHS) Program

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