RESEARCH

Provision of recommended antenatal care services in Ethiopia: missed opportunity for screening and counselling

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Abstract

Background Utilisation of Antenatal care (ANC) in Ethiopia has shown a steady increase in the last two decades, from 27% in 2000 to 74% in 2019. While it is encouraging to see more women attending and receiving ANC, attention to ensuring the quality of the ANC services provided to the visiting women is important. Therefore, this study aimed to assess the provision of recommended ANC services and to identify client related factors associated with the provision of the services.

Methods The study was conducted using the 2019 Ethiopian Demographic and Health Survey (EDHS) data. Provision of recommended ANC services was assessed for the EDHS sub-set of 1573 women who had a live birth in the two years preceding the survey and at least one ANC visit. Four components of ANC (i.e. blood pressure measurement, blood and urine test, and counselling on signs of pregnancy complications) were used to measure the provision of recommended ANC services. Bivariable and multivariable analysis was performed to identify client related factors associated with the provision of recommended ANC services. An adjustment was made to account for the complex survey design throughout the analysis (weight, stratification, and clustering).

Results About one in two women (49.7%; 95% CI: 44.6–55.0) reported receiving the four components of ANC during their pregnancy. Having a higher educational level (adjusted Odds Ratio [aOR] = 2.84; 95% CI: 1.15–6.97), being in the middle (aOR = 1.87;95% CI: 1.14–3.06), richer (aOR = 2.56; 95% CI: 1.46–4.49), and richest (aOR = 4.21;95% CI: 1.93–9.21) wealth quintiles, and having two to three (aOR = 5.40;95% CI: 2.00–14.60) and four or more (aOR = 13.45; 95% CI: 4.81–37.58) ANC visits were client related factors associated with the provision of recommended ANC services.

Conclusion Despite the high ANC1 coverage, only one in two women reported receiving the four recommended services. To produce the desired health outcome from ANC utilisation, expanding the coverage should be accompanied by a strong focus on the contents and quality of care. Moreover, regardless of their educational and economic status, all women should receive all components of care as per the recommendations.

Keywords Antenatal care (ANC), Antenatal care recommendations, Pregnancy, Maternal health, Ethiopia

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Background

Evidence-based guidelines are important tools to improve the quality of care by promoting effective interventions [1-5]. Well implemented guidelines improve the process [1-3, 6] and consistency of care [4, 5, 7], and quality of decisions made by health workers by offering up-to-date proven recommendations and serve as references for clinician audit [4, 5, 7]. They can also improve efficiency through standardisation of care without sacrificing quality - for instance by avoiding unnecessary hospitalizations and giving priority to less costly drugs among equally effective alternatives [4, 8]. Eventually, all these lead to better health outcomes [1-4].

Antenatal care (ANC) is care provided to pregnant women by skilled health workers to ensure optimal health conditions for both mother and baby during pregnancy [9]. It is a point of entry for pregnant women to receive a wide range of preventive and health promotion services, including counselling on birth preparedness and complication readiness, education about the benefit of skilled attendance at birth, and encouragement to seek intrapartum and postnatal care [9, 10].

ANC guidelines offer concise instructions for health workers on how to provide preventive, screening, and treatment services during pregnancy. Examples of recommended services during ANC are syphilis and hepatitis screening; maternal weight and blood pressure measurements; urine test for infection and protein; fetal condition and position assessments; iron/folic acid and calcium supplementation; Tetanus Toxoid containing vaccine (TTCV); counselling on lifestyle modification, signs of pregnancy complications, and birth preparedness [9–11].

Evidence shows that receiving the recommended services has tremendous benefits for the mother and her fetus. For instance: iron and calcium supplementations reduce the risk of maternal anemia [12, 13] and preeclampsia [14]; TTCV during pregnancy reduces the risk of neonatal mortality caused by tetanus [15–17]; syphilis screening and treatment prevents congenital syphilis and syphilis attributable stillbirth and newborn death [18, 19]. Furthermore, counselling interventions during pregnancy have shown to be effective for smoking cessation [20, 21], abstinence from alcohol [22], increasing use of postpartum family planning [23–25], and increasing institutional delivery/use of skilled attendance at child-birth [26, 27].

Utilisation of ANC in Ethiopia has shown a steady increase in the last two decades. According to the Ethiopia Demographic and Health Survey (EDHS) report, the percentage of women who had at least one ANC visit (ANC1) increased from 27% in 2000 to 74% in 2019, similarly, utilisation of four or more ANC visits (ANC4+) increased from 10% in 2000 to 43% in 2019 [28, 29]. While it is encouraging to see more women attending and receiving ANC, attention to ensuring the quality of the ANC services provided to the visiting women is important.

The percentage of women receiving ANC1 and ANC4+ (i.e. ANC coverages) are routinely used as proxy measures for ANC program performance [30–35]. However, coverage alone does not tell whether the women received all required services during the visits [36]. Information on the provision of recommended ANC services would be helpful for decision-makers and programme managers working on improving maternal health. Moreover, understanding factors associated with the provision of the recommended ANC services helps in priority setting and planning programmes. Therefore, this study aimed to assess the provision of recommended ANC services in Ethiopia and to identify client related factors associated with the provision of the services.

Methods

Data source

The study was conducted using the 2019 EDHS data. The survey was implemented by the Ethiopian Public Health Institute (EPHI) in collaboration with the Central Statistical Agency (CSA) and the Ministry of Health of Ethiopia (MOH) from March to June 2019. EDHS employs a two-stage stratified cluster sampling design. Each region of the country (nine regions and two administrative cities) was stratified into urban and rural areas. In the first stage, Enumeration Areas (EAs) were selected with probability proportional to EA size. In stage two, a fixed number of households were selected from each EA. Adjustments to the survey design are necessary to obtain accurate estimates. Various data collection tools, including the women's questionnaire, were utilised to gather population health data [29].

Study population

Our population of interest included all women of reproductive age (15–49 years) who had a live birth in the two years preceding the survey and had at least one ANC visit during their last pregnancy.

Study variables

The outcome variable of the study was the provision of recommended ANC services. In the survey, women who reported attending ANC were asked whether they received specific services during ANC visits. We found four questions asked to women related to the provision of recommended ANC services: (1) Was your blood pressure measured? (2) Did you give a urine sample? (3) Did you give a blood sample? and (4) During (any of) your ANC visit (s), were you told about the signs of pregnancy complications? Blood pressure monitoring and blood and urine testing are crucial to the detection of pregnancy risks including hypertension, pre-eclampsia, infections, and nutritional deficiencies [9]. Moreover, counselling on signs of pregnancy complications addresses potential danger signs to look out for during pregnancy [37]. According to both the old national ANC guideline (four or more visits), which was implemented at the time of the survey [38], and the new national ANC guideline (eight contacts) [39], all four services should be provided to all pregnant women during ANC1. The provision of recommended ANC services was constructed into a binary variable, coded as "1" if a woman received all four ANC components and "0" otherwise.

Published studies that focussed on the contents/quality of ANC were reviewed [40–46]. Variables that had a significant association with the outcome variable in the previous studies and are available in the 2019 EDHS data set were included as independent variables in the analysis. These variables were maternal age at the time of delivery, residence, marital status, highest level of maternal education, household wealth index, number of children, and number of ANC visits. The variables were coded based on previous studies and the distribution of responses in the data.

Data analysis

First, the data were checked for completeness and cleaned. The outcome variable was computed, and covariates were coded. The descriptive summary of the data was presented in table and figures. Bivariable and multivariable analysis was performed to identify client related factors associated with the provision of recommended ANC services. The association between each independent variable with the dependent variable was tested using logistic regression. Crude Odds Ratio (OR) and adjusted Odds Ratio (aOR) with a 95% Confidence Interval (CI) were calculated to measure the strength of association between the dependent and independent variables. The result from the Variance Inflation Factor (VIF) test indicated no evidence of multi-collinearity among the independent variables. In the multivariable analysis, variables with a P-value < 0.05 were declared as significant client related factors associated with the provision of recommended ANC services. An adjustment was made to account for the complex survey design throughout the analysis (weight, stratification, and clustering). R research software version 4.0.3 was used for data analysis.

Results

Characteristics of the study participants

Out of 1581 women who had a live birth in the two years before the survey and had at least one ANC visit during their last pregnancy, 1573 of them had complete data for the four components of ANC and were included. The mean age of the participants was 26.8 years with the majority (73.6%) between 20 and 34 years. The majority of the participants resided in rural areas (70.1%) and attended primary education (43.5%). Moreover, more than half of the women (59.6%) had four or more ANC visits. The characteristics of the study participants are shown in Table 1.

Provision of recommended ANC services

ANC1 coverage was 73.9% [(95% CI: 69.5–78.0, weighted), (n = 1581/2159, unweighted)] among women who had a live birth in the two years preceding the survey. Out of the 1573 woman who had at least one ANC visit during their last pregnancy and complete data for the four components of ANC, only 49.7% [(95% CI: 44.6–55.0, weighted), (n = 764/1573, unweighted)] of them reported getting their blood pressure checked, their blood and urine tested, and receiving counselling on signs of pregnancy complications at any point during their pregnancy (Fig. 1).

Of the four components, blood pressure measurement was provided for most of the pregnant women (89.0%; 95%CI: 86.1–91.0) (Fig. 2).

We found that the provision of recommended ANC services lagged behind ANC1 coverage the most in Benishangul-Gumuz, where 85.6% of women had at least one ANC but only 40.6% reported receiving the four services. In Addis Ababa, ANC 1 coverage (98.0%) and provision of recommended ANC services (90.0%) were closer together (Fig. 3).

Client related factors associated with the provision of recommended ANC services

Women who attended higher education were more likely to receive all components of care (aOR = 2.84; 95%CI: 1.15-6.97) compared to those who had no education. The odds of receiving all components of ANC were higher for women in the middle (aOR = 1.87;95% CI: 1.14-3.06), richer (aOR = 2.56; 95% CI: 1.46-4.49), and richest (aOR = 4.21;95% CI: 1.93-9.21) wealth quintiles compared to women who are in the poorest wealth quintile. Furthermore, compared to women who had only one ANC visit during their pregnancy, the odds of receiving all components of ANC were higher for women who had two to three (aOR = 5.40;95% CI: 2.00-14.60) and four or more (aOR = 13.45; 95% CI: 4.81-37.58) ANC visits (Table 2).

Discussion

The study assessed the provision of recommended ANC services in Ethiopia based on the 2019 nationally representative household survey. Despite high ANC 1 coverage, we found that only one in two women had their

Variables	Categories	Women reported receiving the four compo- nents of ANC			
			Yes	No	
		n	%*	<i>n</i> n	%*
Maternal age at the time of delivery (years)	< 20	90	5.7	150	8.9
	20–34	594	38.8	576	34.8
	35–49	80	5.2	83	6.6
Residence	Rural	436	30.2	658	39.9
	Urban	328	19.5	151	10.4
Religion	Orthodox	325	23.8	236	17.1
	Catholic	119	9.8	174	15.9
	Muslim	313	16.1	384	16.1
	Other	7	0.03	15	1.2
Marital status	Not married/not living with partner	42	2.0	45	2.6
	Married/living with partner	722	47.7	764	47.7
Highest level of maternal education	No education	234	15.5	395	22.7
	Primary	298	21.0	314	22.5
	Secondary	123	7.4	72	4.1
	Higher	109	5.7	28	1.1
Household wealth index	Poorest	97	3.8	243	9.7
	Poorer	85	7.0	177	14.1
	Middle	103	8.3	127	10.2
	Richer	135	10.6	112	8.9
	Richest	344	20.0	150	7.5
Number of children	1	220	14.3	191	12.5
	2–4	377	24.1	384	23.5
	>=5	167	11.4	234	14.3
Number of ANC visits	1	8	0.4	71	4.6
	2–3	219	12.4	393	22.9
	>=4	537	36.8	345	22.8

Table 1 Characteristics of the study participants (N = 1573)

ANC = Antenatal care; * = Weighted percentage





Fig. 1 Provision of recommended ANC services in Ethiopia



Fig. 2 Percentage of women who reported receiving the components of ANC in Ethiopia



Fig. 3 ANC1 coverage and percentage of women who received the four ANC components across regions of Ethiopia

blood pressure checked, their blood and urine tested, and received counselling on signs of pregnancy complications. This suggests attention to improving the quality of ANC service delivery is essential.

ANC visits offer opportunities for reaching pregnant women with interventions that are vital to their health and well-being and that of the fetus. Ethiopia recently (2022) revised the focused ANC recommendation (four or more ANC visits) to a minimum of eight ANC contacts during pregnancy [38, 39]. However, with poor provision of the recommended ANC services, only increasing the number of visits/contacts is unlikely to produce the desired health outcomes. The MOH and partners working on Maternal and Child Health (MCH) should design tailored strategies to make sure pregnant women who visit health facilities are getting all required health services.

Possible strategies could consider integrating more components of ANC for regular monitoring within facilities' Health Management Information System (HMIS), in addition to syphilis, Human Immunodeficiency Virus (HIV), and Hepatitis B virus (HBV) tests which are

Table 2 Client related factors associated with the provision of recommended ANC services in Ethiopia	
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Variables	Categories	Provision of recommended ANC services				
		Yes	No	cOR (95%CI)	aOR (95%CI)	
Maternal age at the time of delivery (years)	<20	90	150	1	1	
	20–34	594	576	1.75 (1.09–2.80) *	1.35 (0.82–2.24)	
	35–49	80	83	1.26 (0.65–2.44)	0.98 (0.42-2.26)	
Residence	Rural	436	658	1	1	
	Urban	328	151	2.46 (1.42-4.26) **	0.99 (0.51–1.94)	
Marital status	Not married/not living with partner	42	45	1	1	
	Married/living with partner	722	764	1.29 (0.66–2.51)	0.88 (0.41-1.90)	
Highest level of maternal education	No education	234	395	1	1	
	Primary	298	314	1.37 (0.94-2.00)	1.02 (0.67–1.57)	
	Secondary	123	72	2.66 (1.52-4.67) **	1.13 (0.60–2.11)	
	Higher	109	28	7.94 (3.64–17.34) **	2.84 (1.15–6.97) *	
Household wealth index	Poorest	97	243	1	1	
	Poorer	85	177	1.24 (0.71-2.17)	1.04 (0.57–1.88)	
	Middle	103	127	2.05 (1.28-3.28) *	1.87 (1.14–3.06) *	
	Richer	135	112	3.00 (1.75–5.13) **	2.56 (1.46–4.49) *	
	Richest	344	150	6.77 (3.89–11.78) **	4.21(1.93-9.21) **	
Number of children	1	220	191	1	1	
	2–4	377	384	0.90 (0.62-1.31)	1.0 (0.66–1.51)	
	>=5	167	234	0.70 (0.44–1.11)	1.16 (0.64–2.10)	
Number of ANC contacts	1	8	71	1	1	
	2–3	219	393	6.26 (2.38–16.49) **	5.40 (2.00-14.60) *	
	>=4	537	345	15.61 (6.89–50.03) **	13.45 (4.81–37.58) **	

ANC = Antenatal care; OR = crude Odds Ratio; aOR = adjusted Odds Ratio; CI = Confidence Interval; * = p value < 0.05;** = p value < 0.001

included in the current HMIS reporting tool [47], and facility surveys to identify the gap in the provision of recommended ANC services. Moreover, ANC program assessments should include content analysis of ANC contacts in a sample of mothers and explore the reasons why certain recommended services are not provided, which could be a lack of knowledge and skills among healthcare workers or unavailability/stock out of equipment and testing kits, and interventions should be designed and implemented accordingly.

Almost half (49.7%) of the women reported receiving all four components of care. This finding is higher than studies conducted in Ethiopia (22.48%, 27.8%, and 31.38%) [41, 42, 45] and in six East African countries (11.16%) [40]. The difference could be due to the inclusion of more components of ANC (6-77 items/components) in these studies. But the finding is lower than the study conducted by combining 91 Demographic and Health Surveys (DHSs) data from low-and middleincome countries (LMICs) (72.9%) [44]. In this study, only three components (i.e. blood pressure monitoring and urine and blood testing) were considered to measure quality. Moreover, the study population in two of the studies with lower results were women who had a live birth in the five years preceding the surveys [40, 45], the longer recall periods could introduce greater measurement error.

Of the four components, blood pressure measurement was provided for most pregnant women followed by blood test, urine test, and counselling on signs of pregnancy complications. A similar pattern was seen in other studies where some components of ANC were more commonly received than others [42–46]. This could reflect an unavailability of supplies and equipment that might reduce the completion of the components. For example, stock out of supplies to collect urine and blood specimens or reagents to conduct the tests. Importantly, in these instances, pregnant women could still receive counselling on signs of pregnancy complications, even in the absence of the tests.

There was regional variation in ANC coverage and provision of recommended ANC services. ANC 1 coverage was highest in Addis Ababa (98.0%) and lowest in Somali (32.0%). In all regions, there was a gap between ANC1 coverage and provision of recommended ANC services. The smallest gap was seen in Addis Ababa where only 8.0% (98.0% vs. 90.0%) of women who had ANC1 did not receive all of the four components of ANC. Although Benishangul-Gumuz had the fourth highest ANC 1 coverage (85.6%), provision of recommended ANC services lagged the most behind ANC1 coverage in the region (85.6% vs. 40.6%). On the other hand, despite having the lowest ANC 1 coverage, Somali showed a smaller gap between ANC 1 coverage and the provision of recommended ANC services, second only to Addis Ababa (32.0% vs. 17.4%). This shows that high coverage does not mean all women are receiving the recommended services.

Women's education status showed an association with the provision of recommended ANC services. Women who attended higher education were more likely to receive all components of ANC compared to those who had no education. The result is supported by other studies [41, 42, 48]. The possible explanation could be that these women might have good health literacy and knowledge of the care provided during ANC [49–52] which might enable them to request the services. Moreover, women who attended higher education are more likely to receive the recommended number of ANC visits (i.e. ANC4+) [53, 54] which increases their likelihood of receiving all components of ANC.

We observed an association between household economic status and receiving all components of care. Compared to women in the poorest wealth quintile, women in the middle, richer, and richest wealth quintile were more likely to receive all components of care. Other studies also reported wealth-based inequalities in receiving contents of ANC [40, 41, 45, 46, 55]. Studies from Kenva and Tanzania have shown that poor women access care in facilities with poor quality services [56, 57], that might be the case in Ethiopia too. These facilities might not have supplies and equipment (i.e. Blood pressure cuffs, supplies to collect urine and blood specimens, and diagnostic capacity) to provide three out of the four components of ANC analysed in our study (blood pressure measurement, blood, and urine test). Without these inputs, the provision of these components is unlikely. However, the availability of supplies and equipment does not guarantee the provision of all components [58]. We suggest future studies consider assessing other factors (e.g. provider bias or discrimination) that might explain the wealth-based inequality in receiving components of ANC.

Furthermore, the number of ANC visits is significantly associated with receiving all components of ANC. The odds of receiving all components of ANC were higher for women who had two to three and four or more ANC visits. Other studies also showed that having four or more ANC visits has an association with receiving all components of care [45, 55]. The possible reason could be that women who had more visits might have more opportunities to receive the services. Some recommendations are limited to a few visits and others can be provided during the entire pregnancy. The four components included in this study are part of the services provided during the first visit, thus all women should receive them during their first visit/contact. Due to the nature of the DHS data, for women who had more than one ANC visit, it was not possible to ascertain whether the services were provided during the first visit or the subsequent visits.

Strengths and limitations

The study used nationally representative data which makes the result generalizable. Even though EDHS questions were asked for women who had a live birth in the five years preceding the survey, we restricted the analysis to women who had a live birth in the two years preceding the survey to minimize recall bias. We also acknowledge that our study has limitations. Due to data limitations, only four components of ANC were used to measure adherence. These four services do not encompass the entire essential ANC services and present a limited view of the provision of recommended ANC services. The EDHS has no information on the specific urine and blood tests done. Women were asked whether they provided blood and urine specimens but not what the tests were for. Moreover, our effort to investigate the association between the provision of recommended ANC services and client related factors was limited to seven variables. Thus, we were unable to test other potential client related factors that might have an association with the provision of recommended ANC services.

Conclusion

About three out of four women had at least one ANC. However, only one in two of them had their blood pressure checked, their blood and urine tested, and received counselling on signs of pregnancy complications. To produce the desired health outcome from ANC utilisation, expanding the coverage should be accompanied by a strong focus on the contents and quality of care. Moreover, regardless of their educational and economic status, all women should receive all components of care as per the recommendations.

Abbreviations

- ANC Antenatal care
- aOR Adjusted Odds Ratio
- CI Confidence Interval
- CSA Central Statistics Agency
- DHS Demographic and Health Survey
- EA Enumeration Area
- EDHS Ethiopia Demographic and Health Survey
- HBV Hepatitis B Virus
- HIV Human Immunodeficiency Virus
- HMIS Health Management Information System
- LMICs Low and middle income countries
- MCH Maternal and Child Health
- MOH Ministry of Health
- OR Odds Ratio
- TTCV Tetanus Toxoid containing vaccine
- VIF Variance Inflation Factor

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Author contributions

AMH conceptualised the study, analysed the data, and wrote the draft manuscript. MH, JLB, TT, and RM critically reviewed the protocol and draft manuscript. MB, BT, DEG, and ÖT critically reviewed the draft manuscript and

gave valuable feedback. BT, JLB, DEG, and ÖT supervised the work. All authors read and approved the final manuscript.

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Data availability

The dataset analysed during the current study is available at https://dhsprogra m.com/data/ subject to permission from MEASURE DHS.

Declarations

Ethics approval and consent to participate

The study used a publicly available DHS data. The DHS received government permission and followed ethical practices for the primary data collection including asking informed consent from each participant and assuring confidentiality by omitting names and any personal identifiers [29]. Approval for our use of data was sought and received from the DHS Programme.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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