Determinants of Frequency and Content of Antenatal Care in Postnatal Mothers in Arba Minch Zuria District, SNNPR, Ethiopia, 2019

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Background: Antenatal care is one of the strategies for reducing maternal morbidity and mortality directly by affording increased chances of early detection of high-risk pregnancies. WHO recommends a minimum of four ANC visits. In order to make it effective, monitoring of the content and quality of the ANC is needed. However, a number of studies focus on the frequency of ANC, and evidence on core contents of the ANC was limited in this study area. The aim of this study was to determine factors associated with content of the ANC.

Methods and Materials: A cross-sectional study design was employed to collect data from a total of 432 respondents by using a semi-structured questionnaire. Data were entered in EpiData version 3.1 and exported to SPSS version 20 for analysis. Both binary logistic regression and generalized linear regression with Poisson type were applied to determine factors associated with frequency of the ANC and core contents of ANC, respectively.

Results: The majority of the mothers (78.7%) visited first ANC lately, and 25.2% of mothers attended ≥4 ANC visits. Only 17.1% of mothers received all the eight selected elements of ANC services. Predictors of the core contents of the ANC were the frequencies of ANC (AOR: 0.84 (95%CI: 0.76–0.93), pre-pregnancy utilization of contraception (0.63 (95%CI: 0.55–0.72)), pregnancy desire (AOR: 0.82 (95%CI: 0.71–0.94), and birth preparedness and complication readiness (AOR: 0.90 (95%CI: 0.82–0.98).

Conclusion: This study found that low level of WHO minimum recommended ANC and core contents of the ANC. This study suggests that identifying pregnant mothers early increases frequency of the ANC, which improves core content of care.

Keywords: antenatal care, content of care, Ethiopia

Background

Despite progress and efforts made to tackle maternal and neonatal mortality and morbidity they remain an urgent concern and become a major public health problem in low income countries. Globally, near to 100% of maternal deaths occurred in developing countries and out of this, around two third deaths occurred in sub-Saharan Africa. However, the majority of these deaths can be prevented with cost effective interventions.

Evidence has shown that antenatal care (ANC) can improve pregnancy outcomes through implementation of the WHO recommended strategies like early recognition and detection of pregnancy danger signs, birth preparedness and complication readiness, offering of preventive measures like TT vaccination, iron provision, and so on. Although ANC in developing countries has been applied

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for a long time and has made observable achievements, most ANC programs established in low and middle income countries are largely underachieved. According to the WHO 2015 report, in high-income countries, almost all women have at least four ANC visits, while only 40% of all pregnant women in low-income countries had the recommended ANC visits.7 As per a 2016 EDHS report, only 32% of pregnant women utilized the recommended ANC visits in Ethiopia.3 Recently, a number of studies reported that attending ANC before 16 weeks as a predictor for adequate ANC utilization even if it is a challenging issue.8,9

The WHO recommends a minimum of four visits of ANC to improve maternal and newborn health.10 Despite that previous studies have revealed that, in addition to the number of ANC visits, the essential services covered by ANC visits greatly affect the effectiveness of the ANC.11,12 In order to make it effective, monitoring of the content and quality of ANC is needed, which include blood pressure measurement, tetanus toxoid vaccination, urine testing, iron tablet supplementation, body weight measurement, HIV testing and counseling about danger signs.13,14 However, a number of studies from around the globe reported very low level of content of ANC15–18 even if it increases utilization of subsequent services such as maternal, newborn, and the child health continuum of care like skilled birth attendants and postnatal care.19–21

Ethiopian guidelines on prenatal care recommends a minimum of four ANC visit and quality service for women who experience positive pregnancy. It also recommends weight measurement, blood pressure measurement, blood, and urine sample examination, minimum of two doses of tetanus toxoid vaccination, HIV test, counseling on danger signs and nutrition, iron (90+) provision to all pregnant women through respectful maternity care. However, according to the Ethiopia Demographic Health Survey (2016) report, it is underutilized. For instance, 49% of women’s last births were protected against neonatal tetanus, 75% blood pressure measured, 73% blood sample taken, 66% Urine sample taken, and 66% were counseled about nutrition.3 However, there were no data on percentages of mothers who received all the essential elements of ANC care. Furthermore, the majority of studies in sub-national level, mainly focused on timing and frequency of ANC visits rather than the content of ANC care.8,9,22–24 In addition, in this study area, there was limited evidence regarding the level and factors of content of ANC. Thus, the aim of this study was to assess the magnitude and factors associated with frequency of the ANC, and to identify factors that facilitate or hinder the provision of the full contents of ANC.

Methods and Materials

Study Area
The study was conducted at Arba Minch Zuria Woreda, Gamo Zone, Southern Ethiopia, 454 km south of Addis Ababa, the capital city of Ethiopia. The study area has a total of 29 kebeles, of which, two are semi-urban and the remaining 27 are rural.

Study Design and Period
A community based cross-sectional study was conducted from 15 February to 15 March 2019.

Population
The source populations for this study were all postnatal (1–42 days postpartum) women in Arba Minch Zuria Woreda. The study populations were all postnatal (1–42 days postpartum) women who had at least one ANC visit in nine randomly selected kebeles of the Arba Minch Zuria district. Those women reside for <6 months and are critically ill will be excluded from this study.

Sample Size Determination
The single population proportion formula was used to determine sample size for this study. Twenty-two percent proportion of the overall contents of the ANC were obtained from a study in Bangladesh, and assuming 95% confidence level, 5% margin of error, design effect of 1.5, and 10% of nonresponse rate. The final sample size for this study was 436.15

Sampling Technique
To obtain the sampling frame, we used secondary data from health facilities. A total of 1316 postnatal women registered at different health facilities were used as sampling frame. A simple random sampling technique using a computer generated number was used to select a total of 436 eligible women in this study.

Data Collection Techniques, Tools and Personnel's
Data were collected by nine diploma nurses and supervised by three public health officers. Both data collectors and supervisors were given a one-day intensive training on
the data collection methods and instruments. All data were collected from women using an interviewer-administered questionnaire. The questionnaire was adapted from an EDHS tool, other related published literature and after considering constructing from Anderson’s model for health care seeking. The household wealth index tool was adapted from EDHS. The houses of women were assessed by a local guide. Before data collection, pretesting was conducted on 5% of the sample (41 women) outside the study area. After conducting pretest, some modifications were made to alter unclear and confusing questions.

Data Quality Management
Training was given to the data collection team by the team of investigators with particular focus on the content of the questionnaire. A practical role-play on interviewing skills was exchanged between the data collection team. The questionnaire was initially prepared in English and translated to the local language by an expert in the language and finally back-translated by another expert to English to check its consistency with the original meanings. The final questionnaire in the local language was used for data collection. To minimize social desirability bias, women were interviewed in a separate private place in their own household compound.

Data Analysis
The data were analyzed using univariate (frequency distribution), bivariate and multivariate statistical methods. In univariate analysis, percentages were calculated for categorical variables. Chi-squared test was used for checking statistical significance for categorical variables in bivariate analyses.

For the content of ANC received which was the primary outcome variable in this study, ANOVA was used to check statistical significance. Multivariate statistical analyses using generalized linear models (GLM) approach were carried out to identify the determinants of content of ANC. Since the contents of the ANC were count variable, Poisson regression was used. When checking assumption for Poisson regression model, it fulfills assumption of equal dispersion. Because of that Poisson regression was used in this study. Finally, the odd ratios and its 95%CI were used to report the statistical significance of the independent variables. The statistical software packages SPSS 20 is used for all statistical analysis.

For frequency of ANC, bivariate binary logistic regression analysis was done, and variables with p-value <0.25 was considered as a candidate for a multivariate logistic regression model. In multivariate logistic regression, variables with p-value <0.05 were reported as statistically significant. The association between frequency of ANC and explanatory variables was reported with AOR and its 95%CI.

Measurements of Variables
Dependent Variable
Primary response variable: content of care received during ANC visit content of care received during ANC: eight essential elements of ANC services were included in this study; blood pressure measurement, blood sample collection, urine sample collection, weight measurement, tetanus toxoid (TT2+) vaccination, iron folate (90+) supplementation, HIV testing, health education on danger signs and nutrition. The variable was measured as composite variable and had 0 and eight minimum and maximum scores, respectively. If the mother scored zero, she did not use any services and if she scored eight, she had used all services during ANC.

Contents of antenatal care received during pregnancy were assessed as questions like “Was your weight measured? Was your blood pressure measured?”. The answers were recorded as Yes or No.

Secondary response variable: frequency of antenatal care is a dichotomous variable which was measured as whether mothers had four or more ANC visit or not.

Independent Variables
Household wealth index: a composite indicator of socio-economic status of women derived using principal component analysis based on information from housing characteristics and ownership of household durable goods. In this study, the factor scores of the first component were divided into quintiles.

Autonomy in household decision making: a woman was said to have autonomous decision-making power on seeking MNH service if she alone or jointly (with her husband) decides on seeking MNH services; otherwise (husband alone or a third person decides on seeking MNH services) she was categorized as nonautonomous.

Knowledge on key pregnancy danger signs: women were classified as knowledgeable if they spontaneously mentioned at least two of the four key danger signs of pregnancy (vaginal bleeding, severe headache, blurring of vision and feet or face swelling) if not they were classified as not knowledgeable.
Women were classified under “well prepared” for birth and its complications when they reported that they have implemented five or more components of birth preparedness and complication readiness (BPCR) otherwise she was classified under “not well prepared”. The components of BPCR considered in this study were identified place for birth, identified birth attendants, saved money, identified emergency transportation, identified labor and birth companion, identified blood donors if needed, and identified caregiver to children at home when the mother was away.32,33

Ethics Approval and Consent to Participate

Before the study was conducted ethical clearance was obtained from Arba Minch University, College of Medicine and Health Sciences institutional review board (IRB). Written informed consent was obtained from study participants for those aged 18 and above. For those participants, less than 18 years of age written informed consent was obtained from a parent or guardian using standard disclosure procedures. The confidentiality and privacy of participants were actively protected. All participants were assigned a unique identification number. Every effort was made to emphasize the voluntariness of this study and decisions to stop or discontinue in the study was respected. We confirmed that the study was conducted in accordance with the Declaration of Helsinki.

Results

Characteristics of Mothers

Table 1. Shows the sociodemographic characteristics of the respondents, the majority of mothers aged under 35 (87.2%), married (96.3%), protestants (68.6%), more than 33% of mothers were unable to read and write, and only 16.2% were educated secondary grade. Regarding the accessibility of health services, most of the mothers walked as a means of transport (83.1%), around half (51.4%) were insured under community based health insurance system, 79.6% were made decision by both themselves and their husbands.

Level of Antenatal Care Utilization

Table 2 shows obstetric characteristics of the study participants. The majority of the mothers (78.7%) visited the first ANC late, more than three quarters attended ANC 1–3 times (75.8%), and had attended ANC at the health center (58.5%). Most of the mothers had parity 1 or 2 (70%), had

| Table 1 Sociodemographic Characteristics of Postnatal Mothers |
|---------------------------------------------------------------|
| Respondents Characteristics                                    |
| Age (n=432)                                                     |
| 18–24                                                          | 93  21.5 |
| 25–29                                                          | 197 45.6 |
| 30–34                                                          | 88  20.4 |
| ⩾35                                                            | 54  12.5 |
| Marital status (n=432)                                         |
| Single/divorced/ widowed                                      | 16  3.7 |
| Married                                                        | 416 96.3 |
| Religion (n=432)                                               |
| Orthodox                                                       | 255 58.6 |
| Protestant                                                     | 568 68.6 |
| Others                                                         | 6  0.6 |
| Maternal educational status (n=432)                           |
| Unable to read or write                                        | 173 40 |
| Able to read or write                                         | 51 11.8 |
| Primary level of education                                     | 155 35.9 |
| Secondary and above                                           | 53 12.3 |
| Employment status (n=432)                                      |
| Unemployed                                                     | 267 61.8 |
| Employed                                                       | 165 38.2 |
| Husband's educational status (n=432)                           |
| Unable to read or write                                        | 106 24.5 |
| Able to read or write                                         | 64 14.8 |
| Primary level of education                                     | 192 44.4 |
| Secondary education and above                                  | 70 16.2 |
| Household wealth status (432)                                  |
| Lowest                                                         | 57 13.2 |
| Second                                                         | 120 27.8 |
| Middle                                                         | 81 18.8 |
| Fourth                                                         | 88 20.4 |
| Highest                                                        | 86 19.9 |
| Means of transportation to health facilities (n=432)           |
| By motorcycle/car                                              | 73 16.9 |
| On foot                                                        | 359 83.1 |
| Perceived required time to reach health facilities (n=432)     |
| <30 min                                                        | 252 58.3 |
| ⩾30 min                                                       | 180 41.7 |
| Exposure to mass media (radio/TV) (n=432)                      |
| Yes                                                            | 240 55.6 |
| No                                                             | 192 44.4 |
| Once a week                                                    | 115 47.9 |
| Membership of community based health insurance (CBHI) (n=432)   |
| Yes                                                            | 222 51.4 |
| No                                                             | 210 48.6 |
| Women’s autonomy to maternity care (n=432)                     |
| Autonomous                                                    | 344 79.6 |
| Not autonomous                                                | 88 20.4 |

planned the pregnancy (78%), had not well prepared the pregnancy and its complication (69.8%), currently using family planning method (68.1%).
Table 2 Obstetric History of the Respondents

| Respondent’s Characteristics | Category          | Frequency | %     |
|------------------------------|-------------------|-----------|-------|
| Prepregnancy utilization of contraception (any modern methods) (n=432) | Yes               | 294       | 68.1  |
|                              | No                | 138       | 31.9  |
| Women’s knowledge about key pregnancy danger signs (n=432) | Not knowledgeable | 261       | 60.4  |
|                              | Knowledgeable     | 171       | 39.6  |
| Birth order (n=432) | First             | 73        | 16.9  |
|                              | Second            | 95        | 22    |
|                              | Third             | 121       | 28    |
|                              | Four and above    | 143       | 33.1  |
| Women’s desire on recent pregnancy (n=432) | Planned | 337       | 78    |
|                              | Not planned       | 95        | 22    |
| Time for first ANC visit (n=432) | At or after 16 weeks. | 340 | 78.7  |
|                              | Before 16 weeks.  | 92        | 21.3  |
| BPCR (n=432) | Not well prepared | 301       | 69.7  |
|                              | Well prepared     | 131       | 30.3  |
| Place for ANC (432) | Hospital          | 47        | 5.7   |
|                              | Health center     | 484       | 58.5  |
|                              | Health post       | 297       | 35.9  |
| ANC providers                | Skilled           | 290       | 64.8  |
|                              | Unskilled         | 152       | 35.2  |
| Frequency of ANC | 1–3 ANC visit     | 323       | 74.8  |
|                              | ≥4 ANC visit      | 109       | 25.2  |

Determinants of Frequency of Antenatal Care

In multivariable logistic regression analysis time of first antenatal visit, ANC provider, family planning utilization before recent birth, planned for pregnancy, and perceived required time to reach health facilities were identified as significant predictors of frequency of the ANC (Table 4).

Mothers who started first ANC visit early (before three months were 3.8 times more likely to attended ≥4 ANC than their counterparts (AOR: 3.8, 95%CI: 2.2–6.7). The odds of receiving adequate ANC (four or more) among mothers with planned for pregnancy were 2.6 times higher compared to those had an unplanned pregnancy (AOR: 2.6, 95%CI: 1.1–6.9). Mothers who had obtained ANC services from a skilled provider had 1.8 times higher odds of receiving four or more ANC visits than the mothers who had obtained ANC services from unskilled health personnel (AOR: 1.8, 95%CI: 1.1–3.2). The likelihood of attending four or more ANC visits were 3.3 times higher for mothers who reported the perceived required time to reach health facilities was less than 30 minutes compared to the mothers who reported the required time was greater than 30 minutes (AOR: 3.3, 95%CI: 1.8–6.1). Mothers who used pre-pregnancy contraceptive were four times more likely attended ANC visits ≥4 compared to mothers who had not used contraception before recent birth (AOR: 4.0, 95%CI: 1.7–9.2) (Table 3).

Contents of Antenatal Care

In the current study, only 17.1% of mothers received all the eight selected elements of ANC services. Among the elements of ANC, blood pressure measurement was the most frequently used item by 78.5% mothers, closely followed by education on danger signs and nutrition by 78% mothers, weight measurement by 77.8% mothers. More than two thirds (67.4%) of mothers were reported to have blood tests. More than half (56.3%) of mothers were reported to have an HIV test, 53.2% had been vaccinated for tetanus, 54.4% had urine test, and 50% mothers reported that they were taking iron (90+) during the ANC visit.

Determinants of Contents of Antenatal Care

The analysis of this study found that four variables that determine the content of antenatal care. Frequency of antenatal care, birth preparedness and its complication readiness, prepregnancy contraceptive utilization, and pregnancy desire as significant predictors of receiving the items of ANC services.

Mothers who had less than four ANC visit were 16% less likely to receive items of ANC content (AOR: 0.84, 95%CI: 0.76–0.93). Pregnancy desire of mother’s also revealed significant association with the use of ANC service. Mothers were found to have at least 18% lower odds of receiving items of ANC services if the pregnancy was unplanned at the time (AOR: 0.82, 95%CI: 0.71–0.94). Mothers with no history of utilization of contraception before recent birth had a lower chance of using the elements of ANC services than the mothers with a history of contraceptive utilization before recent birth (AOR: 0.63, 95%CI: 0.55–0.72). Mothers who were not well prepared for
Table 3 Results of Bivariable and Multivariable Logistic Regression Analysis to Identify Determinants of Frequency of Antenatal Care Visits

| Variables                                           | ANC Frequency |     | p-value | COR (95%CI) | AOR (95%CI) |
|-----------------------------------------------------|---------------|-----|---------|-------------|-------------|
|                                                     | 1–3 ANC (%)   | ≥4  |         |             |             |
| Women’s education status (n=432)                    |               |     |         |             |             |
| Unable to read or write                              | 149 (90.2)    | 24  | 13.9    |             |             |
| Able to read or write                               | 32 (72.5)     | 19  | 37.3    | <0.001      | 3.7 (1.8–7.5) | 1.8 (0.7–4.6) |
| Primary level of education                           | 110 (77.4)    | 45  | 29      | 0.001       | 2.5 (1.5–4.4) | 0.9 (0.4–2.1) |
| Secondary and above                                  | 32 (73.6)     | 21  | 39.6    | <0.001      | 4.1 (2.0–8.2) | 1.5 (0.6–3.9) |
| Respondents age (n=432)                              |               |     |         |             |             |
| 18–24                                               | 67 (78)       | 26  | (22)    | 0.02        | 3.1 (1.2–8.1) | 1.0 (0.5–2.3) |
| 25–29                                               | 141 (71.6)    | 56  | (28.4)  | 0.01        | 3.2 (1.3–7.8) | 1.1 (0.4–2.9) |
| 30–34                                               | 67 (76.1)     | 21  | (23.9)  | 0.06        | 2.5 (0.9–6.7) | 0.6 (0.2–2.3) |
| ≥35                                                 | 48 (88.9)     | 6   | (11.1)  |             |             |
| Husbands education                                   |               |     |         |             |             |
| Unable to read and write                             | 92 (86.8)     | 14  | (13.2)  |             |             |
| Able to read and write                               | 56 (87.5)     | 8   | (12.5)  | 0.894       | 0.9 (0.4–2.4) | 0.6 (0.2–1.8) |
| Primary level of education                           | 127 (66.1)    | 65  | (33.9)  | <0.001      | 3.4 (1.8–6.4) | 1.5 (0.7–3.3) |
| Secondary and above                                  | 48 (68.6)     | 22  | (31.4)  | 0.004       | 3.0 (1.4–6.4) | 1.3 (0.5–3.2) |
| Wealth index (n=432)                                 |               |     |         |             |             |
| Lowest                                              | 41 (71.9)     | 16  | (28.1)  |             |             |
| Second                                               | 116 (96.7)    | 4   | (3.3)   | <0.001      | 0.08 (0.03–0.3) |             |
| Moderate                                             | 53 (65.4)     | 28  | (34.6)  | 0.42        | 1.3 (0.6–2.8) |             |
| Fourth                                               | 56 (63.6)     | 32  | (36.4)  | 0.31        | 1.5 (0.7–3.0) |             |
| Highest                                              | 57 (66.3)     | 29  | (33.7)  | 0.47        | 1.3 (0.6–2.7) |             |
| Women’s employment status (n=432)                    |               |     |         |             |             |
| Nonemployed                                          | 191 (71.5)    | 76  | (28.5)  |             |             |
| Employed                                             | 132 (80)      | 33  | (20)    | 0.05        | 0.6 (0.4–1.0) | 0.9 (0.5–1.6) |
| Means of transportation (n=432)                      |               |     |         |             |             |
| By foot                                              | 268 (74.7)    | 91  | (25.3)  |             |             |
| By motorcycle/car                                    | 55 (75.3)     | 18  | (24.7)  | 0.901       | 0.9 (0.6–1.7) |             |
| Perceived required time to reach health facilities (n=432) |     |     |         |             |             |
| ≥30 min                                              | 159 (91.1)    | 21  | (11.7)  |             |             |
| <30 min                                              | 164 (74.6)    | 88  | (34.9)  | <0.001      | 4.0 (2.4–6.9) | 3.3 (1.8–6.1) |
| Exposure to mass media (n=432)                       |               |     |         |             |             |
| No                                                   | 148 (77.1)    | 44  | (22.9)  |             |             |
| Yes                                                  | 175 (72.9)    | 65  | (27.1)  | 0.32        | 1.2 (0.8–1.9) |             |
| Women decision making (n=432)                        |               |     |         |             |             |
| Autonomous                                           | 256 (74.4)    | 88  | (25.6)  | 0.74        | 1.1 (0.6–1.9) |             |
| Nonautonomous                                        | 67 (76.1)     | 21  | (23.9)  |             |             |
| Membership of CBHI (n=432)                           |               |     |         |             |             |
| No                                                   | 168 (80)      | 42  | (20)    |             |             |
| Yes                                                  | 155 (69.7)    | 67  | (30.2)  | 0.015       | 1.7 (1.1–2.7) | 1.1 (0.5–2.3) |
| Prepregnancy utilization of contraception (n=432)     |               |     |         |             |             |
| No                                                   | 120 (86.3)    | 19  | (13.7)  | <0.001      | 8.5 (4.0–18.0) | 4.0 (1.7–9.2) |
| Yes                                                  | 203 (69.3)    | 90  | (30.7)  |             |             |

(Continued)
Table 3 (Continued).

| Variables                             | ANC Frequency                  | p-value | COR (95%CI) | AOR (95%CI) |
|---------------------------------------|--------------------------------|---------|-------------|-------------|
|                                       | 1–3 ANC (%) | ≥4 ANC (%) |    |           |             |
| Knowlegableness on key pregnancy danger signs (n=432) | 203 (77.8) | 58 (22.2) | 0.07 | 1.5 (0.9–2.3)* | 1 (0.9–2.6) |
| Not knowledgeable                     | 120 (70.2) | 51 (29.8)  |     |           |             |
| Knowledgeable                         | 114 (79.7) | 29 (20.3)  |     |           |             |
| Birth order (n=432)                   | 52 (71.2) | 21 (28.8) | 0.16 | 1.6 (0.8–3.0)* | 1.5 (0.7–3.4) |
| First                                 | 72 (75.8) | 23 (24.2) | 0.47 | 1.3 (0.7–2.3) | 0.9 (0.4–2.0) |
| Second                                | 85 (70.2) | 36 (29.8) | 0.07 | 1.6 (0.9–3.0)* | 1.2 (0.6–2.3) |
| Third                                 | 114 (79.7) | 29 (20.3) |     |           |             |
| Four and above                        | 62 (70.2) | 26 (29.8) |     |           |             |
| Desire on pregnancy (n=432)           | 81 (81.8) | 18 (18.2) | <0.001 | 6.5 (2.7–15.4)* | 2.6 (1.1–6.9)* |
| Planned                               | 242 (72.7) | 91 (27.3) |  |           |             |
| ANC provider (n=432)                  | 196 (70) | 84 (30) | 0.002 | 2.2 (1.3–3.6)* | 1.8 (1.1–3.2)* |
| Skilled                               | 127 (85.6) | 25 (16.4) |  |           |             |
| Nonskilled                            | 107 (77.8) | 49 (22.2) |  |           |             |
| Time for first ANC booking (n=432)    | 277 (81.5) | 63 (18.5) | <0.001 | 4.4 (2.7–7.2)* | 3.8 (2.2–6.7)* |
| At or after 16 weeks                  | 46 (50) | 46 (50)  |  |           |             |
| Before 16 weeks                       | 239 (79.4) | 62 (20.6) | 0.001 | 2.2 (1.4–3.4)* | 1.3 (0.8–2.3) |
| BPCR (n=432)                          | 84 (64.1) | 47 (35.9) |  |           |             |

Notes: *p* value, * indicates variable candidates for multivariate logistic regression; **p** value, * indicates variables significant in multivariate logistic regression; 1 reference category.

Abbreviations: AOR, adjusted odds ratio; COR, crude odds ratio.

pregnancy and its complications were 10% less likely to receive items of ANC (AOR: 0.90, 95%CI: 0.82–0.98) (Table 4).

**Discussion**

This study revealed low levels of WHO’s recommended minimum ANC visits by mothers (25.2%). Receiving ANC from a skilled provider, perceived required time to reach health facilities, wanted pregnancy, modern contraceptive utilization, time for ANC visit were identified as predictors of frequency of ANC. However, the recent report of the EDHS (2019) revealed four or more ANC of 43%. This indicates unsatisfactory compliance with WHO’s recommendations on optimal antenatal care visits in Ethiopia.

In this study, mothers who had received ANC care from health professionals were more likely to complete the recommended ANC visits compared to their counterparts. This is inconsistent with studies conducted elsewhere. The result suggested that provision of ANC services by skilled professionals increased the chance of adequate ANC visit.

The current study found a significant association between time spent to reach health facilities and frequency of ANC visits. Mothers spending more than 30 min to reach health facilities were less likely to attend adequate ANC compared to their counterparts. Although there is a strong recommendation of universal access to health services and reducing financial hardship, still there is regional variation in easy access to health services. This implies that outreach service should be strengthened to avail maternal services to mothers who reside some distance from the nearest health facilities.

According to this study, time for an ANC visit is identified as a factor of the frequency of the ANC. Those mothers who started ANC early or before 16 weeks were more likely to attend ≥4 ANC compared to late visitors. This is in line with a study elsewhere. This is may be due
Table 4 Results of the Multivariable Generalized Linear Regression Analysis with Poisson Log Link to Identify the Determinants of Utilization of Contents of ANC Visits

| Variables                                | Mean of Number of ANC Items | p-value | AOR (95%CI) |
|------------------------------------------|-----------------------------|---------|-------------|
| Women’s education status (n=432)         |                             |         |             |
| Unable to read or write                  | 3.9                         | <0.001  | 0.87 (0.73–1.04) |
| Able to read or write                    | 5.3                         |         | 0.92 (0.77–1.09) |
| Primary level of education               | 6.0                         |         | 0.95 (0.83–1.04) |
| Secondary and above                      | 6.5                         |         | 1           |
| Respondents age (n=432)                  |                             | <0.001  |             |
| 18–24                                    | 5.1                         |         | 1.09 (0.88–1.34) |
| 25–29                                    | 5.5                         |         | 1.11 (0.93–1.32) |
| 30–34                                    | 5.1                         |         | 1.06 (0.89–1.27) |
| ≥35                                      | 3.7                         |         | 1           |
| Husbands education (n=432)               |                             | <0.001  |             |
| Unable to read and write                 | 3.7                         |         | 0.98 (0.82–1.17) |
| Able to read and write                   | 4.3                         |         | 0.95 (0.80–1.13) |
| Primary level of education               | 5.9                         |         | 1.02 (0.91–1.16) |
| Secondary and above                      | 5.8                         |         | 1           |
| Wealth index (n=432)                     |                             | <0.001  |             |
| Lowest                                   | 5.1                         |         | 0.97 (0.83–1.14) |
| Second                                   | 3.6                         |         | 0.93 (0.79–1.10) |
| Moderate                                 | 5.4                         |         | 1.02 (0.88–1.17) |
| Fourth                                   | 6.2                         |         | 1.01 (0.88–1.14) |
| Highest                                  | 6.0                         |         | 1           |
| Women’s employment status (n=432)        |                             | <0.001  |             |
| Nonemployed                               | 5.5                         |         | 1.02 (0.92–1.13) |
| Employed                                 | 4.5                         |         | 1           |
| Means of transportation (n=432)          |                             | 0.096   |             |
| By foot                                  | 5.2                         |         |             |
| By motorcycle/car                        | 4.8                         |         |             |
| Perceived required time to reach health facilities (n=432) | | <0.001 | 0.93 (0.83–1.04) |
| ≥30 min                                  | 4.0                         |         | 1           |
| <30 min                                  | 6.0                         |         | 1           |
| Exposure to mass media (n=432)           |                             | 0.019   |             |
| No                                       | 4.88                        |         | 1.00 (0.91–1.10) |
| Yes                                      | 5.37                        |         | 1           |
| Women decision making (n=432)            |                             | 0.027   |             |
| Autonomous                               | 5.03                        |         | 0.95 (0.86–1.06) |
| Nonautonomous                            | 5.61                        |         | 1           |
| Membership of CBHI (n=432)               |                             | <0.001  |             |
| No                                       | 4.3                         |         | 0.96 (0.85–1.09) |
| Yes                                      | 5.9                         |         | 1           |
| Prepregnancy utilization of contraception (n=432) | | <0.001 | 0.63 (0.55–0.72) |
| No                                       | 2.9                         |         | 1           |
| Yes                                      | 6.2                         |         | 1           |
| Knowledge on key pregnancy danger signs (n=432) | | 0.71 |             |
| Not knowledgeable                        | 5.18                        |         |             |
| Knowledgeable                            | 5.10                        |         |             |

(Continued)
to early visitors having more time to attend. This is explained by community extension workers should screen and identify pregnancy early. Existing evidence indicates community engagement can be effective in increasing access to early ANC.

The study finding indicates the overall utilization of the items of ANC was 17.1% (95%CI: 13.2–20.6) which is consistent with a study in Uganda, while lower when compared to studies in Nepal and Bangladesh. This might be due to national variation on the minimum recommendation of ANC visits.

The number of antenatal visits is identified as a factor that affects the utilization of ANC content. This is explained as the higher number of ANC visits might maximize the likelihood of items of the ANC. This is supported by studies conducted elsewhere. Moreover, the WHO came up with the new ANC model, which recommends eight contacts which might increase utilization of contents of antenatal care so that this finding implies the policy makers should strengthen the implementation of the new model of ANC. In addition, awareness creation sessions should be there to help mothers understand the effect of frequent visits as recommended by a health professional.

This study shows that having of history of prepregnancy contraceptive utilization before recent birth positively predicts receiving of both adequate ANC and content of the ANC. This finding is supported by studies from Nepal, Bangladesh, and Uganda. This might be due to family planning helping mothers to have children in the right spacing and hence allow them the resources and time to attend the next antenatal visits with ease. Researchers also reflect on the provision of education on family planning during antenatal visits.

In this study pregnancy desire is significantly associated with both the frequencies of the ANC and utilization of items of the ANC. The probability of receiving a higher number of items and attending more ANC visits was lower for mothers who had an unplanned pregnancy compared to planned pregnancy. This finding is in line with studies elsewhere. The finding indicates that mothers are usually less careful about receiving ANC services in the case of an unwanted pregnancy. In addition, this might be due to women who had an unplanned pregnancy, attended ANC care late, and accessed fewer full

| Variables                      | Mean of Number of ANC Items | p-value | AOR (95%CI) |
|--------------------------------|-----------------------------|---------|-------------|
| Birth order (n=432)            |                             |         |             |
| First                          | 5.16                        | 0.014   | 0.98 (0.82–1.18) |
| Second                         | 5.09                        |         | 0.97 (0.84–1.13) |
| Third                          | 5.64                        |         | 0.98 (0.87–1.11) |
| Four and above                 | 4.77                        |         | 1           |
| Desire on pregnancy (n=432)    |                             | <0.001  |             |
| Not planned                    | 3.1                         |         | 0.82 (0.71–0.94) |
| Planned                        | 5.7                         |         | 1           |
| ANC provider (n=432)           |                             | 0.007   |             |
| Skilled                        | 5.36                        |         | 1.04 (0.94–1.15) |
| Nonskilled                     | 4.76                        |         | 1           |
| Time for first ANC booking (n=432) |                     | <0.001  |             |
| At or above three months       | 4.88                        |         | 0.94 (0.84–1.04) |
| Before three months            | 6.14                        |         | 1           |
| Frequency of ANC               |                             | <0.001  |             |
| 1–3 ANC visits                 | 4.5                         |         | 0.84 (0.76–0.93) |
| ≥4 visits                      | 7.1                         |         | 1           |
| BPCR (n=432)                   |                             | <0.001  |             |
| Not well prepared              | 4.66                        |         | 0.90 (0.82–0.98) |
| Well prepared                  | 6.28                        |         | 1           |

Note: l reference.
Abbreviations: AOR, adjusted odds ratio; COR, crude odds ratio.
items of ANC. Thus, the policy makers should strengthen the implementation of strategies that decrease unplanned pregnancies. Moreover, early identification of women with unplanned pregnancy by health workers should be strengthened. This study indicate that mothers who were well prepared for birth and ready for its complications were more likely to receive items of ANC. This might be due to well-prepared mothers who were more aware about preventive measures of pregnancy-related complications, and who seek care for it from health professionals. Moreover, the WHO recommends birth preparedness and complication readiness in order to increase skilled birth and to reduce postpartum related complications. Researchers also believe that BPCR increases visits for subsequent maternal health care.

**Limitation of the Study**

This study had both strengths and limitations. There was limited evidence on the determinants of the contents of ANC in this study area. Thus, it adds inputs at local and policy level. It also improves ANC service implementation at health facilities. Since this study is cross sectional, no cause and effect relationship was reported. In addition, social desirability bias could be another limitation.

**Conclusion**

The findings of this study showed a low level of WHO minimum recommended ANC and core contents of the ANC. This finding implies that the government should focus on not only on the frequency of ANC visits, but also give attention to care contents. In this study preconception care like prepregnancy contraceptive utilization was identified as a determinant for both frequencies of the ANC and the contents of ANC care. This implies policy makers and concerned government bodies should give attention to strengthening the implementation of preconception care.

Since this study is cross sectional, it is difficult to conclude as frequency of ANC does indeed influence the content of the ANC. Therefore, further study with analytic and experimental design might support these findings.

In this study, time for the first ANC visit was significantly associated with ANC frequency while not with core contents of ANC even if a number of previous studies found its association. Consequently, further study focusing on time for ANC visits.

**Abbreviations**

AOR, adjusted odds ratio; ANC, antenatal care; BPCR, birth preparedness and complication readiness; HEWs, health extension workers; MMR, maternal mortality ratio; PCA, principal component analysis; WHO, World Health Organization.

**Data Sharing Statement**

The data used to support the findings of this study are available from the corresponding author upon request via email address of derehaile2010@gmail.com.

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**Author Contributions**

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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**References**

1. WHO UNICEF, UNFPA, the World Bank, the United Nations Population Division. Trends in maternal mortality: 1990 to 2015.
2. K S, Axelson H, Sheehan P, et al. Advancing social and economic development by investing in women’s and children’s health: a new global investment framework. *Lancet*. 2014;383:1333–1354. doi:10.1016/S0140-6736(13)62231-X
3. Central Statistical Agency (CSA) [Ethiopia] and ICF. *Ethiopia Demographic and Health Survey 2016*. Addis Ababa, Ethiopia, and Rockville, Maryland, USA: CSA and ICF; 2016.
4. Say L, Gemmill A, O T, et al. Global causes of maternal death: a WHO systematic analysis. *Lancet Global Health*. 2014;2(6):e323–e333. doi:10.1016/S2214-109X(14)70227-X
5. Oyerie K. Can antenatal care result in significant maternal mortality reduction in developing countries? *Community Med Health Educ.* 2013;3. doi:10.4172/2161-0711.1000116

6. Khatib N, Zahiruddin Q, Gaidhane A, et al. Predictors of antenatal services and pregnancy outcome in a rural area: a prospective study in Wardha district, India. *Indian J Med Sci.* 2009;63(10):436. doi:10.4103/0019-5359.57643

7. WHO. WHO recommendations on health promotion interventions for maternal and newborn health. 2015.

8. Gebremeskel F, Dibaba Y, Admassu B. Timing of first antenatal care attendance and associated factors among pregnant women in Arba Minch Town and Arba Minch District, Gamo Gofa Zone, South Ethiopia. *J Environ Public Health.* 2015;7:5.

9. Ewunetie AA, Munea AM, Meselu BT. DELAY on first antenatal care visit and its associated factors among pregnant women in public health facilities of Debre Markos town, North West Ethiopia. *BMC Pregnancy Childbirth.* 2018;18:173. doi:10.1186/s12884-018-1748-7

10. WHO. WHO recommendations on antenatal care for a positive pregnancy experience. Geneva, Switzerland: 2016.

11. Nwaru BI, Wu Z, Hemminki E. Determinants of the use of prenatal care in rural China: the role of care content. *Matern Child Health J.* 2012;16(1):235–241. doi:10.1007/s10819-010-0734-0

12. Keye N, Chansa C, Gabrysch S. Quality of antenatal care in Zambia: a national assessment. *BMC Pregnancy Childbirth.* 2012;12:151. doi:10.1186/1471-2393-12-151

13. World Health Organization (WHO). WHO Recommended Interventions for Improving Maternal and New-Born Health. Geneva: WHO Department of Making Pregnancy Safer; 2009.

14. USAID, CDC, Maternal and Child Survival. WHO antenatal care guidelines: malaria in pregnancy frequently asked questions (FAQ). Geneva. 2016.

15. Islam MM, Masud MS. Determinants of frequency and contents of antenatal care visits in Bangladesh: assessing the extent of compliance with the WHO recommendations. *PLoS One.* 2018;13(9): e0204752. doi:10.1371/journal.pone.0204752

16. Aga S, Tappis H. The timing of antenatal care initiation and the content of care in Sindh, Pakistan. *BMC Pregnancy Childbirth.* 2016;16:190.

17. Afulani PA, Buback L, Essandoh F, et al. Quality of antenatal care and associated factors in a rural county in Kenya: an assessment of service provision and experience dimensions. *BMC Health Serv Res.* 2019;19:684. doi:10.1186/s12913-019-4476-4

18. Kassaw A, Debie A, Geberu DM. Quality of prenatal care and associated factors among pregnant women at public health facilities of Wogera District, Northwest Ethiopia. *J Pregnancy.* 2020;2020:8.

19. Wang W, Hong R. Levels and determinants of continuum of care for maternal and newborn health in Cambodia evidence from a population-based survey. *BMC Pregnancy Childbirth.* 2015;15:62. doi:10.1186/s12884-015-0497-0

20. Igqal S, Maqsood S, Zakar R, et al. Continuum of care in maternal, newborn and child health in Pakistan: analysis of trends and determinants from 2006 to 2012. *BMC Health Serv Res.* 2017;17:189. doi:10.1186/s12913-017-2111-9

21. Hamed A, Mohamed E, Sabry M, et al. Egyptian status of continuum of care for maternal, newborn, and child health: Sohag Governorate as an example. *Int J Med Sci Public Health.* 2018;7(6):1. doi:10.5455/ijmsh.2018.01026007032018

22. Basha GW. Factors affecting the utilization of a minimum of four antenatal care services in Ethiopia. *Obstet Gynecol Int.* 2019;2019. doi:10.1155/2019/5036783

23. Tirsuneyt K, Muchie KF. Determinants of utilization of antenatal care services in Benishangul Gumuz Region, Western Ethiopia: a study based on demographic and health survey. *BMC Pregnancy Childbirth.* 2019;19:115. doi:10.1186/s12884-019-2259-x

24. Abuka T, Alemu A, Birhanu B. Assessment of timing of first antenatal care booking and associated factors among pregnant women who attend antenatal care at health facilities in Dilla town, Gedeo Zone, Southern Nations, Nationalities and Peoples Region, Ethiopia, 2014. *J Pregnancy and Child Health.* 2016;3:2. doi:10.4172/2376-127X.1000258

25. Anderson RM. Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav.* 2007;36(1):1–10. doi:10.1177/0022133506293728

26. McCullagh P, McCullagh P, Nelder JA. *Generalized Linear Models.* 2nd ed. London: Chapman and Hall; 1989.

27. Barber SL, Bertozzi SM, Gertler PJ. Variations in prenatal care quality for the rural poor in Mexico: indigenous women received fewer procedures than other women in private health facilities; disparities were much less prominent in public facilities. *Health Aff.* 2007;26(2):310–323. doi:10.1377/hlthaff.F2.63.w310

28. Joshi C, Torvaldsen S, Hodgson R, et al. Factors associated with the use and quality of antenatal care in Nepal: a population-based study using the demographic and health survey data. *BMC Pregnancy Childbirth.* 2014;14:94. doi:10.1186/1471-2393-14-94

29. Chukwuona A, Wusu AC, Mbachi C, et al. Quality of antenatal care predicts retention in skilled birth attendance: a multilevel analysis of 28 African countries. *BMC Pregnancy Childbirth.* 2017;17(1):152. doi:10.1186/s12884-017-1337-1

30. Yei J, Shibamuna A, Odoro A, et al. Continuum of care in a maternal, newborn and child health program in Ghana: low completion rate and multiple obstacle factors. *PLoS One.* 2015;10: e0142849. doi:10.1371/journal.pone.0142849

31. Mohan D, LeFevre AE, George A, et al. Analysis of dropout across the continuum of maternal health care in Tanzania: findings from a cross-sectional household survey. *Health Policy Plan.* 2017;32:791–799.

32. Belda SS, Gebremeriam MB. Birth preparedness, complication readiness and other determinants of place of delivery among mothers in Goba District, Bale Zone, South East Ethiopia. *BMC Pregnancy Childbirth.* 2016;16:73. doi:10.1186/s12884-016-0837-8

33. Nawal D, Goli S. Birth preparedness and its effect on place of delivery and post-natal check-ups in Nepal. *PLoS One.* 2013;8(5): e60957. doi:10.1371/journal.pone.0060957

34. Central Statistical Agency (CSA) [Ethiopia] and ICF. min-Ethiopia demographic and health survey 2019. Addis Ababa, Ethiopia, and Rockville, Maryland, USA: CSA and ICF; 2019.

35. Jacobs C, Moshabela M, Masweneyo S, et al. Predictors of antenatal care, skilled birth attendance, and postnatal care utilization among the remote and poorest rural communities of Zimbabwe: a multilevel analysis. *Front Public Health.* 2017;5:11. doi:10.3389/fpubh.2017.00011

36. Witunda C, Quaglio G, Putoto G, et al. Determinants of utilisation of antenatal care and skilled birth attendance at delivery in South West Shoa Zone, Ethiopia: a cross sectional study. *Reprod Health.* 2015;12:1–12. doi:10.1186/s12978-015-0067-y

37. UN-DESA. Sustainable development goal 3: ensure healthy lives and promote well-being for all at all ages, 2017. Sustainable Development Knowledge Platform; 2017.

38. Straneo M, Fogliati P, Pellis I, et al. On the way to universal coverage of maternal services in Iringa rural District in Tanzania. Who is yet to be reached? *Afr J Health Sci.* 2016;12(2):420–428. doi:10.4314/ahs.v12i2.10

39. Edward B. Factors influencing the utilisation of antenatal care content in Uganda. *AMJ.* 2011;49(5):516–526. doi:10.4066/AMJ.2011.849

40. WHO. 2016 WHO antenatal care guideline. 2016.

41. Hizaji HH, Alyahya MS, Sindiani AM, et al. Determinants of antenatal care attendance among women residing in highly disadvantaged communities in northern Jordan: a cross-sectional study. *BMC Reprod Health.* 2018;15:106.

42. Adeniyi OV, Ajayi AI, Moyaki MG, et al. High rate of unplanned pregnancy in the context of integrated family planning and HIV care services in South Africa. *BMC Health Serv Res.* 2018;18:140. doi:10.1186/s12913-018-2942-z
43. Gebre M, Gebremariam A, Abebe TA. Birth preparedness and complication readiness among pregnant women in Duguna Fango District, Wolayta Zone, Ethiopia. PLoS ONE. 2015;10(9):e0137570. doi:10.1371/journal.pone.0137570

44. Andarge E, Nigussie A, Wondafrash M, et al. Factors associated with birth preparedness and complication readiness in Southern Ethiopia: a community based cross-sectional study. BMC Pregnancy Childbirth. 2017;17:412. doi:10.1186/s12884-017-1582-3

45. Ijang YP, Cumber SN, Nkfusai CN, et al. Awareness and practice of birth preparedness and complication readiness among pregnant women in the Bamenda Health District, Cameroon. BMC Pregnancy Childbirth. 2019;19:371. doi:10.1186/s12884-019-2511-4