Completing the Continuum of Maternity Care and Associated Factors in Debre Berhan Town, Amhara, Ethiopia, 2020

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Background: The continuum of maternity care is the continuity of maternal health care services that a woman practices antenatal care, skilled birth attendant, and postnatal care. Even though there are positive inclinations towards the continuum of maternity care, the problem is still significant. So, the purpose of this study was to assess the utilization of continuum maternity care and associated factors among women who gave birth in the last 12 months before the data collection period in Debre Berhan town.

Methods: A community-based cross-sectional study was conducted from February 17 to March 15/2020. The respondents were selected by using the cluster sampling technique. Face-to-face interview was used for data collection. EpiData software version 3.1 was used for data entry and exported to SPSS version 21 for further analysis. In multivariable logistic regression, a statistically significant association has declared a p-value <0.05.

Results: In this study, the proportion of women who completed the continuum of maternity care was 37.2% (95% CI: 33.4–41.1). Completing primary education (AOR: 2.73, 95% CI: 1.17–6.38), secondary education (AOR: 3.11, 95% CI: 1.32–7.31), college and above educational level (AOR: 4.15, 95% CI: 1.79–9.57), initiation of first ANC visit ≤6wks (AOR: 2.57, 95% CI: 1.41–4.68), knowing key pregnancy danger signs (AOR: 1.91, 95% CI: 1.15–3.19), and well prepared on birth and complication readiness (AOR: 1.59, 95% CI: 1.10–2.32) were found to positively increase the chance of completing maternity care in our study area.

Conclusion: Even if a higher proportion of mothers completed the continuum of maternity care in the study area than the finding at national level of 9.1% basing EDHS 2016 data, further interventions are mandatory to reach the acceptable level. Therefore, health promotion programs targeting mothers with no education and lower educational level are important to increase their awareness about the importance of completing all levels of maternity care, health education, and counseling regarding early initiation of ANC, pregnancy danger signs, and birth preparedness and complication readiness plan.

Keywords: completion, continuum, maternity care, Ethiopia

Background

The continuum of maternity care is defined as the continuity of health care services that a woman practices Ante Natal Care (ANC), Skill Birth Attendant (SBA), and Post Natal Care (PNC).1 It is a critical strategy for reducing maternal mortality and morbidity.2 The continuum of maternity care is an integrated service of care explained by time and space dimensions that women are required to avail of uninterruptedly. Moreover, it should be provided as a continuum throughout the
lifecycle including adolescence, pregnancy, childbirth, and childhood; and also in seamless care that spans the home, community, and health facilities. Even though, there were great improvements over the last two decades, insufficient or non-existent care during pregnancy and delivery was fundamentally accountable for an estimated 295,000 maternal death in 2017. In addition to saving maternal lives with CoC; Up to 160,000 newborn lives can be saved with high ANC coverage including a focused package of interventions, 390,000 additional newborn lives can be saved through high coverage of skilled childbirth care, and 310,000 lives through postnatal care. 

Globally, 86% and 65% of pregnant women accessed once and four antenatal visits respectively and treated by skilled health personnel in 2018. In Sub-Saharan Africa (52%) and South Asia (49%), women attended at least four antenatal visits. In Sub-Saharan Africa, not more than 57% of mothers are delivered in a health facility. Each year about 18 million women in Africa gave birth at home and According to DHS data from 21 sub-Saharan African nations, only 13% of women who gave birth at home received PNC within three days. Different studies across the world showed a different level of continuum of care like; Nepal (41%) remote or isolated villages or Pakistan (6.4%) Ethiopia (9.1%) and northwest Ethiopia (47%).

Educational status, residence, distance from the health facility, woman’s decision making power, previous pregnancy-related complication, early initiation of ANC, wealth index, media access, Skills of health workers, health system supports, and presence of delivery fee was some of the identified determinant factors affecting CoC by different studies.

Evidence from EDHS showed that there are improvements in the proportion of individual MCH care package utilizations from 2016 to 2019 in Ethiopia; where ANC increased from 62% to 74%, SBA from 28% to 50%, and PNC from 17% to 34%. This showed that there are large discrepancies between the utilization of ANC, SBA, and PNC services continuously. An effective continuum of care strengthens the links between the home and the first level facility and the hospital, assuring the appropriate care is available in each place. The maternal continuum of care can be achieved using a combination of well-defined policies and strategies to improve home care practices and health care services throughout the lifecycle, building on existing programs and packages.

Unlike other parts of the world and including Ethiopia, there is no available data or evidence regarding the proportion of mothers who completed the continuum of maternity care and factors that enhance the completion of maternity care in our study area. So this study aimed to assess the utilization of continuous maternity care and associated factors in Debre Birhan town, Ethiopia 2020.

Methods
Study Design and Setting
A cross-sectional (community-based) study was conducted from February 17 to March 15/2020 among mothers who gave birth in the last year preceding the data collection period in Debre Berhan town. Debre Berhan Town, located in the North Shewa Zone of the Amhara region, 130 kilometers far from the capital city, Addis Ababa. According to the 2019 report of Debre Berhan Town administration’s mayor’s office, the Town consists of nine kebeles (the smallest administrative unit) with an estimated total population of 114,652 (Male=51,843 and Female=62,809). Of the 62,809 female population, 39,066 were within the age group of 15–49 years. The town has four public (one referral hospital and three health centers) and three private health institutions. All the above health institutions had maternal health services.

Sample Size and Sampling Technique
The sample size was calculated using the single population proportion formula. The estimated proportion of completing the continuum of maternity care was taken from a related study (48.7%), the confidence level of 95%, 5% degree of precision, design effect of 1.5, and non-response rate of 10%, was assumed. The final sample size was estimated to be 634 mothers.

Study participants were selected using a cluster sampling technique. From the total of 9 kebeles in the town, 5 kebeles were selected by the lottery method, and all mothers in the selected kebeles who fulfill the eligibility criteria were incorporated in the study. We found a total of 659 women who full fill the inclusion criteria from the selected clusters using data from health extension workers (registration log book) and all of them were included in to our study.

Population
Mothers who gave their most recent birth in the last 12 months, who had booked for ANC, and those who were at six weeks or more after birth at the time of data collection were included. Women who lived in the study area for less
than six months at the period of data collection were excluded from the study.

Data Collection Tools and Procedures
Data were collected through face to face interviews using pre-tested structured questionnaires by trained data collectors. The data collection tool was adapted from the Ethiopian Demographic and Health Survey (EDHS) and other literature.\textsuperscript{7,10,12-17} The tool incorporates socio-demographic, reproductive and obstetrics, and maternal health service-related variables.

Measurement
- Completing the continuum of maternity care: was considered if the women had four or more ANC visits and childbirth and at least one PNC after discharge from the health facilities within six weeks by skilled health personnel (medical doctors, midwives, nurses, health officers, or community health extension workers) or with in the first week by community health extension workers during their home visit. If they missed any one of the above visits, it is considered an incomplete continuum of maternity care.\textsuperscript{14}
- Knowledgable about pregnancy danger signs: women were categorized as knowledgeable if they stated at least two of the four key pregnancy danger signs (vaginal bleeding, severe headache, blurring of vision, and swelling of the face); if not they were categorized as not knowledgeable.\textsuperscript{14}
- Not Knowledgable about pregnancy danger signs: women were categorized as not knowing if they stated at less than two of the four key pregnancy danger signs (vaginal bleeding, severe headache, blurring of vision, and swelling of the face); if not they were categorized as not knowledgeable.\textsuperscript{14}
- Well prepared for birth preparedness and complication readiness were considered when women reported that they have applied five or more of (BPCR) otherwise considered as “not well prepared”. The elements of BPCR considered in this study were identified birthplace, recognized sign of labor, identify supplies needed during labor/delivery, saving money for an emergency, identified emergency transportation, people to support during/after birth, and identified potential blood donors as needed.\textsuperscript{18,19}
- Planned pregnancy: A woman who plans to become pregnant by making lifestyle choices for optimal health in advance of the planned conception.
- Unplanned pregnancy: happened mainly due to the results of not using contraception or inconsistent or incorrect use of effective methods.
- Health extension workers: Health Extension Workers are short term trained health workers assigned to local health posts and provide a package of essential interventions to meet population health needs at this level.

Data Quality Assurance
Five data collectors (two Midwives and three Nurses) and two supervisions were recruited to collect the data of the study. One-day training on the objective of the study, sampling technique, and data collection tool was provided. Back and forth questionnaire translation was done to check its consistency with the original meaning. Before commencing data collection, a pre-test was conducted among 5% of the study sample and, the required adjustments were made on unclear questions.

Data Processing and Analysis
Data were coded and entered after checking the completeness of the data. EpiData software version 3.1 was used for data entry and SPSS version 21 was used for analysis. Descriptive statistics were used to measure the proportion of women who complete the continuum of maternity care and other variables of the study participants. Variables with a P value of less than 0.25 on bivariate logistic regression were selected as a candidate for multivariate logistic regression. Finally, multivariable Logistic regressions were used to assess the relative impact of explanatory variables on dependent variables and to select important predictors of the continuum of maternity care. Hosmer and Lemeshow goodness of test was used to check Model fitness and variance inflation factor was applied to diagnosed multicollinearity between the explanatory variables with cut-off point VIF > 10 as problematic.\textsuperscript{20} In multivariable logistic regression, a statistically significant association was declared a p-value less than 0.05 to determine factors associated with the completion of the continuum of maternity care and reported by using adjusted odds ratio with 95% CI.

Ethical Consideration
A letter of Ethical clearance was secured from the Institutional Review Board (IRB) of health Science College, Debre Berhan University. A formal letter of permission was obtained from the Debre Berhan town health
office. Informed written consent was obtained from study subjects. Additionally, after doing the witness attests that the consent information was accurately explained for those who cannot read and write, that the subject apparently understood the information, and informed consent was given freely. Participants had the right to self-determination regarding participation in research, both initially and during the research. For confidentiality purposes, the names of the participant were not included in the questionnaire. The collected data were kept confidential and used only for the study. This study was conducted following the Declaration of Helsinki.

Results

Socio-Demographic Characteristics
A total of 647 women were interviewed, giving a response rate of 98.2%. The majority 442 (68.3%) of respondents were aged 25–34 years and the mean age was 28.5±4.48 years. Most women 605 (93.5%), were married and 28 (4.3%) were divorced. While 67 (10.4%) did not attend modern education, 259 (40.0%) had college and above education. Nearly 96% were Amhara in ethnicity. Five hundred seventy-one (88.2%) were Orthodox Christians. Most 591 (91.3%) had information about maternal health services. Almost half 339 (52.4%) of participant’s partners achieved tertiary education, and 260 (40.2%) of them were government employees (see Table 1).

Reproductive Health and Maternal Health Service-Related Characteristics
Among study participants, 247 (38.2%) of women were in the first pregnancy, whereas 64 (9.9%) had four and more pregnancies. Six hundred twenty-six (96.8%) of the participant’s recent pregnancy was planned. Five hundred twenty-nine (81.8%) of women had initiated their first antenatal visit at ≤16 weeks of gestation and 482 (74.5%) had four or more antenatal care visits throughout their pregnancy (see Table 2).

Out of all respondents, 412 (63.7%) of women received their antenatal care at public health centers. Five hundred twenty-two (80.7%) got husband’s support during maternal health visit. Regarding the services taken during the pregnancy period; 635 (98.1%) measured their blood pressure, and 609 (94.1%) received nutritional counseling (see Figure 1).

Almost all respondents, 641 (99.1%) had skilled birth attendant/health facility delivery, of which 210 (32.8%) had stayed in the health facility for 24hrs or more after delivery and 324 (50.5%) had informed on when to return for PNC (see Table 3).

The Proportion of Women Completing the Continuum of Maternity Care
The overall proportion of women completing the continuum of maternity care was 37.2% (95%, CI: 33.4–41.1). Additionally, 482 (74.5%) mothers had at least four ANC visits, and 480 (74.2%) of them delivered at a health facility by skilled birth attendants. Correspondingly, from those who had ANC4+ and SBA, 241 (37.2%) got at least one PNC within six weeks of discharge (see Figure 2).

Factors Associated with Completing the Continuum of Maternity Care
The current study has identified some important factors that are associated with the completion of the continuum of maternity care in Debre Berhan town. Maternal educational status, initiation of ANC visit ≤16wks of gestation, knowing pregnancy key danger signs, and well prepared on birth and complication readiness plan become a statistically significant association with the outcome variable.

The odds of completing the continuum of maternity care was higher among educated women; women who attend primary education (AOR: 2.73, 95% CI: 1.17–6.38), secondary education (AOR: 3.11, 95% CI: 1.32–7.31), and college and above (AOR: 4.15, 95% CI: 1.79–9.57) contribute for completing the continuum of maternity care than those who had no education. The odds of completing the continuum of maternity care was almost three times higher for those who had their first ANC visit at ≤16weeks of gestation than their counterparts (AOR: 2.57, 95% CI: 1.41–4.68). Similarly, the odds of completing the continuum of maternity care were 91% higher among women knowledgeable on the key danger signs of pregnancy than those who were not knowledgeable (AOR: 1.91, 95% CI: 1.15–3.19). Women who were well prepared on birth preparedness and complication readiness plan had higher odds to accomplish continuum of maternity care than those who had not (AOR: 1.59, 95% CI: 1.10–2.32) (see Table 4).

Discussion
The finding of this study showed that about one-third (37.2%, 95% CI: 33.4–41.1) of women in the study area received all elements of the continuum of maternity care.
<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age of women in years</strong></td>
<td></td>
<td></td>
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<tr>
<td>19–24</td>
<td>124</td>
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<tr>
<td>25–34</td>
<td>442</td>
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<tr>
<td>≥35</td>
<td>81</td>
<td>12.5</td>
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<td><strong>Religion</strong></td>
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<tr>
<td>Muslim</td>
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</tr>
<tr>
<td>Protestant</td>
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<td>5.4</td>
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<tr>
<td>Others</td>
<td>5</td>
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<tr>
<td><strong>Ethnicity</strong></td>
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<tr>
<td>Amhara</td>
<td>620</td>
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</tr>
<tr>
<td>Others (Oromo, Tigre …)</td>
<td>27</td>
<td>4.2</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
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<tr>
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<td>Divorced/separated</td>
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</tr>
<tr>
<td>Widowed</td>
<td>5</td>
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<tr>
<td>Single</td>
<td>9</td>
<td>1.4</td>
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<tr>
<td><strong>Educational status</strong></td>
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<td>67</td>
<td>10.4</td>
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<td>Primary education(1–8)</td>
<td>183</td>
<td>28.3</td>
</tr>
<tr>
<td>Secondary education(9–12)</td>
<td>138</td>
<td>21.3</td>
</tr>
<tr>
<td>College and above</td>
<td>259</td>
<td>40.0</td>
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<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmer</td>
<td>15</td>
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</tr>
<tr>
<td>Housewife</td>
<td>312</td>
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<tr>
<td>Private employed</td>
<td>73</td>
<td>11.3</td>
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<tr>
<td>Gov’t employed</td>
<td>170</td>
<td>26.3</td>
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<tr>
<td>Merchant</td>
<td>48</td>
<td>7.4</td>
</tr>
<tr>
<td>Others</td>
<td>29</td>
<td>4.5</td>
</tr>
<tr>
<td><strong>Family monthly income(ETB)</strong></td>
<td></td>
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<tr>
<td>≤500</td>
<td>8</td>
<td>1.2</td>
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<tr>
<td>501–1500</td>
<td>52</td>
<td>8.1</td>
</tr>
<tr>
<td>1501–2500</td>
<td>94</td>
<td>14.5</td>
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<tr>
<td>≥2501</td>
<td>493</td>
<td>76.2</td>
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<td><strong>Educational status of partner</strong></td>
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<tr>
<td>No education</td>
<td>51</td>
<td>7.9</td>
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<tr>
<td>Primary education(1–8)</td>
<td>101</td>
<td>15.6</td>
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<tr>
<td>Secondary education(9–12)</td>
<td>156</td>
<td>24.1</td>
</tr>
<tr>
<td>College and above</td>
<td>339</td>
<td>52.4</td>
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<tr>
<td><strong>Occupation of partner</strong></td>
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<td></td>
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<tr>
<td>Farmer</td>
<td>36</td>
<td>5.6</td>
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<tr>
<td>Private employed</td>
<td>145</td>
<td>22.4</td>
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<tr>
<td>Gov’t employed</td>
<td>260</td>
<td>40.2</td>
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<tr>
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<tr>
<td>Daily laborer</td>
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<td>Others</td>
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<tr>
<td><strong>Ever Heard maternal health services</strong></td>
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<td>591</td>
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<tr>
<td>No</td>
<td>56</td>
<td>8.7</td>
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<tr>
<td><strong>Source of maternal health information(n=591)</strong></td>
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<td>Mass-media(tv/radio)</td>
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<td>35.0</td>
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<tr>
<td>Health care provider</td>
<td>362</td>
<td>61.3</td>
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<tr>
<td>Others</td>
<td>22</td>
<td>3.7</td>
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</table>
This finding was consistent with the study done in Nepal where 41% of the women received Antenatal Care (ANC), delivery from Skilled Birth Attendant (SBA) as well as the Postnatal Care (PNC) during their most recent birth.\(^5\)

This finding was higher than the study conducted in two studies from Ethiopia (9.1%),\(^7\) Arbaminch Zuria woreda 9.7%\(^21\) Ghana (8%),\(^17\) Tanzania (10%),\(^14\) remote or isolated villages of Pakistan (6.4%)\(^6\) and trend study in Pakistan (27%).\(^13\) This difference might be due to, our study was conducted only in urban areas while the compared studies were done at a general level and specifically at rural areas which had relatively creates a better chance of accessing maternal health services. This was supported by studies showing that being rural resident negatively affect the chance of receiving full continuum of maternal care than urbans.\(^8,9,22\)

On the other hand; the finding of this study was found to be lower than the evidence from study done northwest Ethiopia 47% (CI (43.2%–50.2%)),\(^8\) Debre Markos town (67.8%),\(^23\) Nepal (45.7%),\(^24\) Cambodia (60%),\(^16\) and Egypt (50.4%).\(^12\) This variation could be explained by the

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency</th>
<th>Percentage (%)</th>
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<tbody>
<tr>
<td>Number of pregnancy</td>
<td>247</td>
<td>38.2</td>
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<td></td>
<td>336</td>
<td>51.9</td>
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<td></td>
<td>64</td>
<td>9.9</td>
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<tr>
<td>Pregnancy planned</td>
<td>626</td>
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<tr>
<td></td>
<td>21</td>
<td>3.2</td>
</tr>
<tr>
<td>Number of children</td>
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<td>39.1</td>
</tr>
<tr>
<td></td>
<td>339</td>
<td>52.4</td>
</tr>
<tr>
<td></td>
<td>55</td>
<td>8.5</td>
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<tr>
<td>Number of ANC visit for the last pregnancy</td>
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<td>25.5</td>
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<td>482</td>
<td>74.5</td>
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<td>Timing of first ANC visit for the last pregnancy</td>
<td>529</td>
<td>81.8</td>
</tr>
<tr>
<td></td>
<td>118</td>
<td>18.2</td>
</tr>
</tbody>
</table>

This difference might be due to, our study was conducted only in urban areas while the compared studies were done at a general level and specifically at rural areas which had relatively creates a better chance of accessing maternal health services. This was supported by studies showing that being rural resident negatively affect the chance of receiving full continuum of maternal care than urbans.\(^8,9,22\)

On the other hand; the finding of this study was found to be lower than the evidence from study done northwest Ethiopia 47% (CI (43.2%–50.2%)),\(^8\) Debre Markos town (67.8%),\(^23\) Nepal (45.7%),\(^24\) Cambodia (60%),\(^16\) and Egypt (50.4%).\(^12\) This variation could be explained by the

![Figure 1 Types of health services received during antenatal care visits in Debre Berhan Town, Ethiopia 2020.](image-url)
Table 3 Maternal Health Service-Related Characteristics of Study Participants in Debre Berhan Town, North Shewa, Amhara, Ethiopia, 2020 (n=647)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
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<tbody>
<tr>
<td><strong>Place of ANC visit</strong></td>
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<tr>
<td>Gov't hospital</td>
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<td>Gov't health center</td>
<td>412</td>
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<td>Private clinic</td>
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<td><strong>Partner support</strong></td>
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<td>No</td>
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<td><strong>Informed pregnancy danger sign</strong></td>
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<td>598</td>
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<td>7.6</td>
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<td><strong>Knowledge on danger sign(n=598)</strong></td>
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<tr>
<td>Knowledgeable</td>
<td>502</td>
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<tr>
<td>Not knowledgeable</td>
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<td><strong>Blood pressure measured at ANC</strong></td>
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<td>635</td>
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</tr>
<tr>
<td>No</td>
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<td><strong>Urine sample taken</strong></td>
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<tr>
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<tr>
<td><strong>Blood sample taken</strong></td>
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<td><strong>Nutritional counseling</strong></td>
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<td>94.1</td>
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<td>No</td>
<td>38</td>
<td>5.9</td>
</tr>
<tr>
<td><strong>TT vaccine at ANC</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>462</td>
<td>71.4</td>
</tr>
<tr>
<td>No</td>
<td>185</td>
<td>28.6</td>
</tr>
<tr>
<td><strong>Number of TT vaccine(n=462)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One</td>
<td>129</td>
<td>27.9</td>
</tr>
<tr>
<td>Two or more</td>
<td>333</td>
<td>72.1</td>
</tr>
<tr>
<td><strong>Iron tablet taken</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>591</td>
<td>91.3</td>
</tr>
<tr>
<td>No</td>
<td>56</td>
<td>8.7</td>
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<td><strong>Deworming during ANC</strong></td>
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<td>250</td>
<td>38.6</td>
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<tr>
<td>No</td>
<td>397</td>
<td>61.4</td>
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<td><strong>Informed about Birth preparedness plan</strong></td>
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<td>560</td>
<td>86.6</td>
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<tr>
<td>No</td>
<td>87</td>
<td>13.4</td>
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<td><strong>Status of Birth preparedness(n=560)</strong></td>
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<td></td>
</tr>
<tr>
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<td>297</td>
<td>53.0</td>
</tr>
<tr>
<td>Not well prepared</td>
<td>263</td>
<td>47.0</td>
</tr>
<tr>
<td><strong>Place of birth</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>6</td>
<td>0.9</td>
</tr>
<tr>
<td>Health facility</td>
<td>641</td>
<td>99.1</td>
</tr>
<tr>
<td><strong>Type of facility(n=641)</strong></td>
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<td></td>
</tr>
<tr>
<td>Gov’t hospital</td>
<td>340</td>
<td>53.0</td>
</tr>
<tr>
<td>Gov’t health center</td>
<td>275</td>
<td>42.9</td>
</tr>
<tr>
<td>Private hospital</td>
<td>24</td>
<td>3.7</td>
</tr>
<tr>
<td>Private clinic</td>
<td>2</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>Duration of stay after birth(n=641)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;24 hours</td>
<td>431</td>
<td>67.2</td>
</tr>
<tr>
<td>≥24 hours</td>
<td>210</td>
<td>32.8</td>
</tr>
<tr>
<td><strong>Informed danger sign at PNC(n=641)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>547</td>
<td>85.3</td>
</tr>
<tr>
<td>No</td>
<td>94</td>
<td>14.7</td>
</tr>
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</table>

(Continued)
Table 3 (Continued).

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
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<tbody>
<tr>
<td>Knowledge on PNC (n=547)</td>
<td>Knowledgeable</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>Not knowledgeable</td>
<td>47</td>
</tr>
<tr>
<td>Informed when to return for PNC (n=641)</td>
<td>Yes</td>
<td>324</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>317</td>
</tr>
<tr>
<td>Post natal visit after discharge (n=641)</td>
<td>Yes</td>
<td>323</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>318</td>
</tr>
<tr>
<td>Timing of first PNC after delivery (n=327)</td>
<td>First day (24hrs)</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Day 3 (48–72hrs)</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>Between days 7–14</td>
<td>142</td>
</tr>
<tr>
<td></td>
<td>Six weeks</td>
<td>94</td>
</tr>
<tr>
<td>Number of PNC (n=327)</td>
<td>One</td>
<td>169</td>
</tr>
<tr>
<td></td>
<td>Two</td>
<td>121</td>
</tr>
<tr>
<td></td>
<td>Three or more</td>
<td>37</td>
</tr>
<tr>
<td>Place of PNC received (n=327)</td>
<td>Gov't hospital</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>Gov't health center</td>
<td>223</td>
</tr>
<tr>
<td></td>
<td>Private hospital</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Private clinic</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>2</td>
</tr>
</tbody>
</table>

difference in study settings like study period, sample size, and study area in addition to the possible difference in socio-demographic characteristics.

Women’s educational status was positively associated with completing the continuum of maternity care. Women with primary education, secondary education, and college or above education had nearly three and higher odds of completing the continuum of maternity care compared to non-educated women. This is consistent with studies in Northwest Ethiopia, Nepal, and Pakistan. The above finding is also maintained by other studies in which, maternal educational status of secondary school and above were positively associated with maternal health service utilization. Increasing women’s education alters the traditional balance of power within the family, leading to changes in decision making and allocation of resources within the households, modifies women’s beliefs about disease causation and cure, influencing domestic child care practices, use of modern health care services, improving their ability to communicate with health care providers, increase antenatal healthcare use, potentially owing to changes in women’s cognitive skills, economic resources, and autonomy.

Early initiation of antenatal care increases the odds of completing the continuum of maternity care. The odds of completing the continuum of maternity care was almost 3 times higher for those who had their first ANC visit at ≤16 weeks of gestation than their counterparts. This finding was supported by a study done in northwest Ethiopia where early initiation of ANC visits was significantly associated with the completion of maternity care. This could be explained by, women who are late for booking of ANC will have a poor birth preparedness plan, lower

![Figure 2](attachment:image.png) Proportion of women completing the maternity continuum of care along the continuum care path way in Debre Berhan Town, Ethiopia 2020.
knowledge of the expected date of delivery, lower likelihood of having a birth plan in terms of the desired place of delivery, preferred birth attendant, birth companion, means of transport and blood donor. Additionally early booking of ANC was found to increase emergency preparedness with better knowledge of danger signs during pregnancy and postpartum periods.28 Additionally, this might be early ANC booking creates great opportunity to familiarize themselves with the health facility environment and this, in turn, would have helped them to avoid needless fear and stress related to maternal health service use. It also helps women to set birth plans by discussing with the ANC provider and hence increase women’s occurrence to complete the continuum of maternity care.29,30

The odds of completing the continuum of maternity care were almost 2 times higher among those women who were knowledgeable about the danger signs of pregnancy than their counterparts. This finding is in agreement with the prior studies conducted in Ethiopia.7,22 Another study

<table>
<thead>
<tr>
<th>Variables</th>
<th>Completion of Maternity Continuum of Care</th>
<th>COR(95% CI)</th>
<th>AOR(95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Age of the mother</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19–24</td>
<td>50</td>
<td>74</td>
<td>1.93(1.05–3.56)</td>
</tr>
<tr>
<td>25–34</td>
<td>170</td>
<td>272</td>
<td>1.79(1.05–3.04)</td>
</tr>
<tr>
<td>≥35</td>
<td>21</td>
<td>60</td>
<td>1</td>
</tr>
<tr>
<td>Educational status of the mother</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary education</td>
<td>60</td>
<td>123</td>
<td>3.59(1.62–8.01)</td>
</tr>
<tr>
<td>Secondary education</td>
<td>48</td>
<td>90</td>
<td>3.93(1.74–8.91)</td>
</tr>
<tr>
<td>College and above</td>
<td>125</td>
<td>134</td>
<td>6.88(3.16–14.97)</td>
</tr>
<tr>
<td>No education</td>
<td>8</td>
<td>59</td>
<td>1</td>
</tr>
<tr>
<td>Ever heard about maternal health services</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>229</td>
<td>362</td>
<td>2.32(1.20–4.49)</td>
</tr>
<tr>
<td>No</td>
<td>12</td>
<td>44</td>
<td>1</td>
</tr>
<tr>
<td>Timing of first ANC visit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤16 weeks</td>
<td>223</td>
<td>306</td>
<td>4.05(2.38–6.88)</td>
</tr>
<tr>
<td>&gt;16 weeks</td>
<td>18</td>
<td>100</td>
<td>1</td>
</tr>
<tr>
<td>Husband support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>211</td>
<td>311</td>
<td>2.15(1.38–3.36)</td>
</tr>
<tr>
<td>No</td>
<td>30</td>
<td>95</td>
<td>1</td>
</tr>
<tr>
<td>Knowledge of danger sign of pregnancy</td>
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<td></td>
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<tr>
<td>Knowledgeable</td>
<td>214</td>
<td>288</td>
<td>3.25(2.06–5.11)</td>
</tr>
<tr>
<td>Not knowledgeable</td>
<td>27</td>
<td>118</td>
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</tr>
<tr>
<td>Iron and folate taken</td>
<td></td>
<td></td>
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<tr>
<td>Yes</td>
<td>229</td>
<td>362</td>
<td>2.32(1.20–4.49)</td>
</tr>
<tr>
<td>No</td>
<td>12</td>
<td>44</td>
<td>1</td>
</tr>
<tr>
<td>Informed about BPCR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>218</td>
<td>342</td>
<td>1.77(1.07–2.94)</td>
</tr>
<tr>
<td>No</td>
<td>23</td>
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<tr>
<td>Status of BPCR</td>
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<td></td>
<td></td>
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<tr>
<td>Well-prepared</td>
<td>140</td>
<td>157</td>
<td>2.19(1.59–3.04)</td>
</tr>
<tr>
<td>Not well-prepared</td>
<td>101</td>
<td>249</td>
<td>1</td>
</tr>
</tbody>
</table>

Notes: *p<0.05, **p<0.01.
Abbreviations: 1, reference; BPCR, birth preparedness and complication readiness; COR, crude odds ratio; AOR, adjusted odds ratio.
done in rural Haramaya District, Eastern Ethiopia revealed that women with knowledge of pregnancy complications were more likely to seek maternal health service utilization as compared with their counterparts.\textsuperscript{31} The reason might be knowledgeable women have understandings of the consequences of pregnancy danger signs and its complications. This increases their curiosity and accountability for their own and their child’s health.

This study also revealed that the BPCR status of women ahead of childbirth is an important predictor of completing the continuum of maternity care. Those women who were well prepared on birth preparedness and complication readiness plan had 60% more likely to complete the continuum of maternity care than those who were not well prepared. This finding is supported by studies conducted in Goba district and Nepal respectively.-\textsuperscript{18,19} This might be due to well-prepared women have recognized the value of birth preparedness and complication readiness plan, and better social support to get maternal health services. This helped women to increase the use of skilled care at birth and to increase the timely use of facility care for obstetric and newborn complications.\textsuperscript{32}

**Limitation of the Study**
The finding of this study might not be representative of the zonal population since it was done in an urban area. Additionally, there might be recall bias during our data collection, but we tried to manage it by including data regarding their recent births.

**Conclusion and Recommendations**
The proportion of women completing the continuum of maternity care was low in Debre Berhan town according to the expected proportion according to the world health organization and ministry of health recommendations. So Health promotion programs targeting mothers with no education and lower educational level are important to increase their awareness about the importance of completing all levels of maternity care. Additionally, health facilities should intensively work on increasing the early initiation of ANC using different methods of information dissemination, counseling, and health education. Finally, increasing women’s knowledge about pregnancy danger signs through counseling and health education, as well as encouraging them to be well prepared for birth and ready for possible complications are important to improve maternal use of a continuum of care. Finally, we recommend further researches to be done addressing both urban and rural areas supplemented with qualitative data.

**Abbreviations**
ANC, antenatal care; AOR, adjusted odds ratio; BPCR, birth preparedness and complication readiness; CI, confidence interval; CoC, continuum of care; COR, crude odds ratio; EDHS, Ethiopian Demographic and Health Survey; EMDHS, Ethiopian Mini Demographic and Health Survey; HSTP, Health Sector Transformation Plan; MMR, maternal mortality ratio; PNC, postnatal care; SBA, skill birth attendant; WHO, World Health Organization.

**Data Sharing Statement**
The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

**Acknowledgment**
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**Author Contributions**
All authors contributed to data analysis, drafting or revising the article, have agreed on the journal to which the article will be submitted, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

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**Disclosure**
The authors declare that they have no conflicts of interest for this work.

**References**
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