Prevalence of completion of maternity continuum of care and its associated factors in Ethiopia: a systematic review and meta-analysis

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ABSTRACT

Objective The present study aimed to estimate the pooled prevalence of completion of the maternity continuum of care (CoC) and its associated factors in Ethiopia.

Study design Systematic review and meta-analysis.

Study setting Ethiopia.

Study participants A total of 6245 reproductive-age women were included.

Primary outcome The pooled prevalence of completion of the maternity CoC.

Secondary outcome Factors associated with completion of the maternity CoC.

Methods We systematically searched international databases such as PubMed, Scopus, African Journals Online, Google Scholar and Web of Sciences to retrieve related articles. The Preferred Reporting Items for Systematic Review and Meta-Analysis guidelines were used for this study. Publication bias was assessed using the funnel plot and Egger’s test. Evidence of heterogeneity was checked using Cochrane Q test and I² statistics. Subgroup analysis was computed based on the study regions. Data were analysed using STATA V.14 statistical software. Weighted inverse variance random effect models were used to estimate the pooled prevalence of completion of the maternity CoC.

Results The pooled prevalence of completion of maternity continuum care in Ethiopia was 25.82% (95% CI: 16.69% to 34.94%). Urban residence (adjusted odds ratio [AOR]=2.77, 95% CI: 1.99 to 3.86), having secondary and above educational status (AOR=3.50, 95% CI: 2.50 to 50), prepregnancy contraceptive utilisation (AOR=3.25, 95% CI: 2.02 to 5.22), women’s autonomy (AOR=3.81, 95% CI: 2.74 to 5.31), following mass media (AOR=2.51, 95% CI: 1.79 to 3.50), early initiation of antenatal care (ANC) (AOR=4.98, 95% CI: 3.28 to 7.57), planned pregnancy (AOR=2.93, 95% CI: 1.99 to 4.32), birth preparedness and complication readiness (AOR=1.80, 95% CI: 1.29 to 2.51) and distance from a health facility <30 min (AOR=3.29, 95% CI: 2.45 to 4.42) were factors associated with completion of maternity continuum care in Ethiopia.

Conclusion The pooled prevalence of completion of maternity continuum care in Ethiopia was low. Therefore, policymakers and stakeholders should improve the completion of ANC, the rate of skilled birth attendants and postnatal follow-up. Enhancing the accessibility of health facilities, women’s awareness and empowering women’s decision-making are recommended.

STRENGTH AND LIMITATION OF THIS STUDY

⇒ To our knowledge, this is the first study conducted in Ethiopia to estimate the pooled prevalence of completion of the maternity continuum of care (CoC) and its associated factors.

⇒ This study gives recent information on the factors associated with the completion of the maternity CoC.

⇒ We strictly followed Preferred Reporting Items for Systematic Review and Meta-Analysis guidelines and assessed the quality of each study using the modified Newcastle Ottawa Scale.

⇒ The absence of study in some regions of Ethiopia might make it unable to generalise the finding of this study.

⇒ Variations between studies in assessing the completion of antenatal care and postnatal follow-up (ie, within 2 days or 6 weeks) might affect the outcome variables of this study. However, each included study assessed all components of the maternity CoC.

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BACKGROUND

Globally, maternal and neonatal mortality is overwhelming. Approximately, 295 000 women died due to preventable pregnancy and childbirth-related complications in 2017. Of these, 94% of death occurred in low-resource seating. Sub-Saharan Africa and Southern Asia accounted for the highest maternal mortality. In Ethiopia, maternal mortality is 412 per 100 000 live births, and neonatal mortality is 30 per 100 000 live births. Ethiopia has planned to reduce maternal mortality below or fewer than 70 per 100 000 live births by the end of the 2030 Sustainable Development Goals.

Continuum of care (CoC) is a crucial strategy in reducing maternal and neonatal mortality in low-income and middle-income countries. CoC has two components. First, the sequential time component includes...
antenatal care (ANC), skilled birth attendants (SBAs) and postnatal follow-up. Second, the space component includes the provision of care at the community–family level and health facility. Evidence shows that CoC could avert half a million maternal deaths, four million neonatal deaths and six million child death. However, completion of the maternity CoC was a challenge in low-income countries. Studies conducted in Tanzania, Ghana and Nepal showed that only 8%-41% of women receive complete maternity CoC.

Completion of the maternity continuum care and its associated factors were studied in Ethiopia. For instance, studies conducted in the southern region reported that only 9.7% of mothers complete the maternity CoC, while in the Amhara region 12.1%-45% of mothers completed the maternity CoC. Evidence revealed that timely initiation of ANC before 16 weeks, birth preparedness and complication readiness, educational status, discussion with husband and being satisfied with the service delivery were some of the factors associated with completion of the maternity CoC.

Inconsistent findings were reported regarding the completion of the maternity CoC and its associated factors across different regions of Ethiopia. For instance, a study conducted by Shitie et al in the Amhara region reported that 42% of women had a complete maternity CoC. However, a study conducted by Haile et al in the southern region reported that only 9.7% of women had a complete maternity CoC. Additionally, there are no nationally representative pooled data on the prevalence of completion of the maternity CoC in Ethiopia.

Accordingly, understanding the overall prevalence of completion of the maternity CoC (ie, ANC 4+, SBA and at least one postnatal care (PNC) following delivery) and identifying its associated factors is crucial for policymakers, governments and stakeholders. Therefore, the main objective of this study was to estimate the pooled prevalence and to identify factors associated with the completion of the maternity CoC in Ethiopia.

METHODS

Study design and setting
According to the World Bank, Ethiopia is one of the low-income countries located in the horn of Africa with a total population of 115 million, and by the end of 2060, it is projected to be 210 million. A systematic review and meta-analysis was conducted to estimate the pooled prevalence of completion of the maternity CoC and its associated factors in Ethiopia. Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines were used for this review (online supplemental file 1).

Information sources
We have checked the PROSPERO database (http://www.library.ucsf.edu/) to rule out whether published or ongoing projects exist related to the completion of the maternity CoC to avoid further duplication. Thus, the finding revealed that there were no ongoing or published articles in the area of this topic. International databases such as PubMed, Google Scholar, Scopus, African Journals Online and Web of Sciences were searched to retrieve related articles. Grey literature was searched using Google. Search terms were formulated using population, intervention, comparison, outcomes (PICO) guidelines through online databases. Medical Subject Headings and key terms had been developed using different boolean operators ‘AND’ and ‘OR’ (online supplemental file 2).

Eligibility criteria
The inclusion criteria were studies which report the overall prevalence of completion of the maternity CoC and its associated factors. Both published and unpublished including preprint studies at any time in the English language only were considered. Lastly, all community-based cross-sectional study designs conducted in Ethiopia till the last search day, that is, 18 February 2022, were included. Regarding the study period, there was no restriction. The exclusion criteria were those articles without full abstracts or texts and articles reported out of the outcome interest. Moreover, citations without abstracts and/or full-text, anonymous reports, commentaries, letters, editorials, reviews, systematic reviews and meta-analysis were excluded after reviewing the full texts.

Outcome measurements
The outcome variables of interest of the study were the uptake of the CoC at antepartum, intrapartum and postpartum stages: (1) CoC at the antepartum stage is women who received ANC 4+ visits, (2) CoC at the intrapartum stage is those women who continued use of skilled birth attendance after receiving ANC 4+ visits and (3) CoC at the postpartum stage or complete continuum is those women who received PNC for the mothers and their newborns, within 6 weeks of their delivery after receiving both ANC 4+ visits and delivered by skilled assistance. The secondary aim was to identify factors associated with the completion of the maternity CoC.

Data extraction
All relevant studies were exported to Endnote VX8 software. Duplicated studies were removed and exported to a Microsoft Excel spreadsheet. Two authors (AM and KH) independently extracted all the important data using a standardised data extraction form which was adapted from Joanna Briggs Institute. For the primary outcome (prevalence), the data extraction format included (the primary author, publication year, study period, study setting, objective of the study, sampling procedure, mode of interview, region, sample size, prevalence and study design). Similarly, two authors (AM and AT) extracted data for the secondary outcome (factors associated with completion of the maternity CoC) using a Microsoft Excel spreadsheet (ie, adjusted OR, lower CI and upper CI). Finally, each factor was exported into STATA V.14.
software to identify factors associated with completion of the maternity CoC.

Quality and risk of bias assessment
Three authors (AM, KH and AT) assessed the quality of each study using the modified Newcastle Ottawa Quality Assessment Scale (NOS) for cross-sectional studies. The NOS had a maximum of nine points. The NOS contains sample selection, comparability and outcome measurement; accordingly, four points, two points and three points, respectively, were given. The study which scored more than seven points was included (online supplemental file 3).

Data processing and analysis
First, selected articles were entered into Microsoft Excel spreadsheet format and imported to STATA V.14.0 statistical software for analysis. A narrative synthesis was used to analyse and interpret the findings. A random effects meta-analysis model was used to pool the estimates of the magnitude of CoC and its associated factors accounting for the variability among studies. Cochrane Q test and I² statistics were computed to assess heterogeneity among all studies. Accordingly, if the result of I² is 0%–40%, it is mild heterogeneity, 30%–60% would be moderate heterogeneity, 50%–90% would be substantial heterogeneity and 75%–100% would be considerable heterogeneity. Funnel plot and Egger’s test were done to assess publication bias. The p value>0.05 indicated that there was no publication bias. Subgroup analysis was done based on the study region. Forest plot format was used to present the pooled prevalence completion of the maternity CoC with 95% CI. To identify factors associated with completion of the maternity CoC, STATA V.14.0 software was used.

Public and patient involvement
Neither patients nor public were involved in this study.

RESULTS
Characteristics of included studies
Overall, the search strategy yielded 233 articles. After removing duplicated files, there were 102 articles remaining. After reviewing, n=63 articles were excluded by title and n=21 articles were excluded by reading abstracts. Therefore, 18 full-text articles were accessed and assessed for inclusion criteria, resulting in the further exclusion of 9 articles primarily due to reasons (figure 1). As a result, nine studies were fulfilled the inclusion criteria and undergo the final meta-analysis (table 1).

Completion of the maternity continuum care in Ethiopia
The pooled prevalence of completion of the maternity CoC in Ethiopia was 25.82% (95% CI: 16.69% to 34.94%). The result of Cochrane heterogeneity index is I²=98.9%, p=0.000, which indicated that there is substantial heterogeneity of different studies (I²>50%). The finding was presented using a forest plot (figure 2).

Publication bias
A funnel plot was done to check the presence of publication bias at a significance level of less than 0.05. The Egger’s regression test was not statistically significant (p>0.05) confirming no evidence of publication bias, as presented by the funnel plot (figure 3).

Subgroup analysis of completion of the maternity continuum care
The finding of subgroup analysis by region showed that the pooled prevalence of completion of the maternity CoC was highest in the Amhara region 21.53% (95% CI: 20.52 to 22.53, I²=98.9%, p<0.001) and lowest in the SNNP region 9.72% (95% CI: 6.93 to 12.52, I²=98.9%, p<0.001) (figure 4).

Sensitivity analysis
A random effect model result showed that no single study has influenced the pooled prevalence of completion of the maternity continuum care (table 2).

Factors associated with completion of the maternity CoC
In this systematic review and meta-analysis, urban residence, secondary and above educational status, prepregnancy contraceptive utilisation, autonomy, following mass media, early initiation of ANC, planned pregnancy, birth preparedness and complication readiness and distance
**Table 1** Study characteristics included in the systematic review and meta-analysis on the prevalence of completion of maternity continuum of care (CoC) and its associated factors in Ethiopia

| Study Id | Authors | Publication year | Study period | Study setting | Objective of the study | Sampling procedure | Mode of interview | Region | Sample size | Prevalence | Study design | NOS |
|----------|---------|------------------|--------------|---------------|------------------------|--------------------|-------------------|--------|-------------|------------|--------------|-----|
| 1        | Shitie et al<sup>14</sup> | 2020 | 25 February to 10 March 2019 | Enemay district | Assess completion maternity CoC, Identify factors associated with | Simple random sampling technique | Face-to-face interview | Amhara | 651 | 45% | CS | 7 |
| 2        | Tizazu et al<sup>13</sup> | 2020 | 17 February to 15 March 2020 | Debre Berhan town | Utilisation of continuum maternity care, Identify associated factors | Cluster sampling technique | Amhara | 647 | 37.2% | CS | 7 |
| 3        | Cherie et al<sup>17</sup> | 2021 | February to March 2020 | Legambo district | Maternity CoC, Determinant factors | Multistage sampling technique | Face-to-face interviews | Amhara | 732 | 11.2% | CS | 8 |
| 4        | Asratie et al<sup>19</sup> | 2020 | 12 March to 1 April 2019 | Motta town and Hulet Eji Enese district | Assess completion of maternity CoC, Identify associated factors | Stratified cluster sampling technique | Face-to-face interviews | Amhara | 819 | 47% | CS | 8 |
| 5        | Haile et al<sup>16</sup> | 2020 | 15 February to 15 March 2019 | Arba Minch Health and Demographic Surveillance System site | Level of completion along CoC, Identifying associated factors | Simple random sampling technique | Face-to-face interviews | SNNP | 432 | 9.7% | CS | 7 |
| 6        | Atnafu et al<sup>18</sup> | 2020 | 1 May to 29 June 2019 | Dabat and Gondar Zuria rural districts | Completion of the continuum of maternal healthcare services, Identify associated factors | Simple random sampling technique | Face-to-face interviews | Amhara | 565 | 21.6% | CS | 7 |
| 7        | Emiru et al<sup>10</sup> | 2020 | June 2018 | West Gojam Zone | Completed the continuum of maternal care services, Factors affecting retention on the CoC | Two-stage cluster sampling | Face-to-face interviews | Amhara | 1281 | 12.1% | CS | 8 |
The odds of being residing in an urban area were 2.77 times more likely to complete the maternity CoC than those residing in a rural area (AOR=2.77, 95% CI: 1.99 to 3.86). Those women who had secondary and above educational status were 3.5 times more likely to complete the maternity CoC than those who had no formal education (AOR=3.5, 95% CI: 2.5 to 5). The odds of using prepregnancy contraceptives were 3.25 times more likely to complete the maternity CoC than those who had not used contraceptive methods (AOR=3.25, 95% CI: 2.02 to 5.29). The odds of being autonomous in healthcare decisions were 3.81 times more likely to complete the maternity CoC than those who did not follow mass media (AOR=3.81, 95% CI: 2.74 to 5.31). The odds of following mass media were 2.51 times more likely to complete the maternity CoC than those women who had early initiation of ANC (AOR=2.51, 95% CI: 1.79 to 3.40). Those women who had early initiation of ANC were 4.98 times more likely to complete the maternity CoC than those who did not follow mass media (AOR=4.98, 95% CI: 3.07 to 8.01). The odds of following mass media were 2.51 times more likely to complete the maternity CoC than those who did not follow mass media (AOR=2.51, 95% CI: 1.79 to 3.40). Those women who had early initiation of ANC were 4.98 times more likely to complete the maternity CoC than those who did not follow mass media (AOR=4.98, 95% CI: 3.07 to 8.01).
maternity CoC than those women who had late initiation of ANC (AOR=4.98, 95% CI: 3.28 to 7.57). Those women who had planned pregnancy were 2.93 times more likely to complete the maternity CoC than those who had unplanned pregnancy (AOR=2.93, 95% CI: 1.29 to 2.51). The odds of having birth preparedness and complication readiness were 1.8 times more likely to complete the maternity CoC than those who had late initiation of ANC (AOR=1.8, 95% CI: 1.29 to 2.51). Furthermore, women who found less than 30 min distance from a health facility were 3.29 times more likely to complete the maternity CoC than their counterparts (AOR=3.29, 95% CI: 2.45 to 4.42) (table 3).

### DISCUSSION

The current study revealed that the estimated prevalence of completion of the maternity CoC was 25.82%. Urban residence, secondary and above educational status, prepregnancy contraceptive utilisation, autonomy, following mass media, early initiation of ANC, planned pregnancy, birth preparedness and complication readiness and distance from health facility<30 min were factors associated with completion of the maternity CoC in Ethiopia.

The prevalence of completion of the maternity CoC was low in Ethiopia. The finding is higher than a study conducted in Ghana (8%). The possible explanation might be due to the study period difference. For instance, this study included recent studies as compared with a study done in Ghana which was conducted from 2011 to 2013. However, the finding is lower than studies conducted in Zambia (38%), Cambodia (60%) and Egypt (50.4%).

The possible explanation for varieties of findings might be due to differences in accessing healthcare facilities. For example, a study conducted in Cambodia might have better access to quality maternity care and can easily access healthcare services.

Women who resided in urban areas were 2.77 times more likely to complete the maternity CoC than those who resided in rural areas. The possible explanation could be those women who resided in rural areas might not easily access transportation services, particularly during night time, and there might be a lack of access to a health facility in their nearby residence. Thus, the probability of discontinuing the maternity CoC is more likely than those women who resided in urban areas. The finding is in line with a study conducted in Ghana.

Those women who had completed secondary and above educational status were 3.5 times more likely to complete the maternity CoC than those who did not have formal education. The finding is consistent with studies conducted in Pakistan, Uganda and Kenya.27 28 The possible explanation might be those women who are able to read and write have awareness regarding the benefit of antenatal follow-up, giving birth at a health facility and postnatal follow-up such as early detection and management of diseases, prevention of infection and bleeding after delivery.

Those women who had used prepregnancy contraceptive methods were 3.25 times more likely to complete the maternity CoC than their counterparts. The possible explanation might be the integration of the family planning service with other maternal and child healthcare services in the health facility. Therefore, women who had used contraceptive methods have an awareness concerning the maternity continuity of care and that might enable them to continue ANC, childbirth and postnatal follow-up at a health facility.

Women who had autonomy in healthcare decision-making were 3.8 times more likely to complete the maternity CoC than those who did not have autonomy. The finding is in line with a study conducted in Gambia.29

### Table 2

| Study omitted | Estimate (95% CI) |
|---------------|------------------|
| Shitie et al24 | 16.07 (6.07 to 42.55) |
| Tizazu et al23 | 16.18 (6.10 to 42.90) |
| Cherie et al26 | 18.61 (6.61 to 52.43) |
| Asratie et al29 | 15.69 (5.88 to 41.86) |
| Haile et al25 | 18.35 (6.74 to 49.99) |
| Atnafu et al28 | 18.77 (6.28 to 44.79) |
| Emiru et al9 | 19.5 (6.42 to 59.22) |
| Sertsewold et al27 | 17.18 (6.34 to 46.59) |
| Tsega et al30 | 16.42 (6.24 to 43.24) |
| Combined | 17.07 (6.65 to 43.84) |
women’s autonomy is crucial to continue reproductive and child healthcare services.31

The odds of following mass media were 2.5 times more likely to complete the maternity CoC than those who did not follow mass media. The finding is similar to previous studies conducted in Zambia and sub-Saharan Africa.25 32 The possible explanation might be media have a significant role in creating awareness on the maternity CoC.

Those women who had initiated early ANC before 16 weeks were 4.98 times more likely to complete the maternity CoC than their counterparts. The possible explanation might be ANC is the entry into the maternity CoC. Therefore, women who had started early ANC visits receive counselling on the CoC that might enable them to complete the maternity continuity care. The finding is supported by studies conducted in India, Tanzania and Ethiopia indicating that early ANC visit could enhance the maternity CoC.12 33 34 On the other hand, a study conducted in India and sub-Saharan Africa shows that low utilisation of ANC service was a major obstacle to the maternity CoC.35 36

Those women who had planned pregnancies were 2.93 times more likely to complete the maternity CoC than those who had unplanned pregnancies. This could be explained that women who had unplanned pregnancies might have fear of visiting healthcare facilities. The finding

### Table 3
Factors associated with completion of maternity continuum of care in Ethiopia: a systematic review and meta-analysis, 2022

| Variables                                   | Included studies                  | OR (95% CI)               | Pooled OR (95% CI) | Heterogeneity (I², p value) |
|---------------------------------------------|-----------------------------------|---------------------------|--------------------|-----------------------------|
| Urban residence                             | Sertsewold et al15                | 3.91 (1.06 to 14.39)      | 2.77 (1.99 to 3.86) | 39.7%, 0.173                |
|                                             | Tsega et al38                     | 2.45 (1.35 to 4.45)       |                    |                             |
|                                             | Cherie et al17                    | 1.84 (1.03 to 3.29)       |                    |                             |
|                                             | Asratie et al19                   | 4.60 (2.50 to 8.50)       |                    |                             |
| Secondary and above educational status      | Shitie et al14                    | 6.00 (2.26 to 16.60)      | 3.50 (2.45 to 5.00) | 0.0%, 0.735                 |
|                                             | Sertsewold et al15                | 5.36 (1.15 to 25.06)      |                    |                             |
|                                             | Tsega et al38                     | 2.75 (1.42 to 5.32)       |                    |                             |
|                                             | Tizazu et al13                    | 3.11 (1.32 to 7.31)       |                    |                             |
|                                             | Asratie et al19                   | 3.50 (1.90 to 6.30)       |                    |                             |
| Prepregnancy contraceptive utilisation     | Haile et al16                     | 3.90 (1.40 to 11.00)      | 3.25 (2.02 to 5.22) | 0.0%, 0.601                 |
|                                             | Cherie et al17                    | 2.70 (1.50 to 5.04)       |                    |                             |
|                                             | Sertsewold et al15                | 4.95 (1.61 to 15.20)      |                    |                             |
| Women autonomy                              | Shitie et al14                    | 4.00 (2.26 to 7.20)       | 3.81 (2.74 to 5.31) | 0.0%, 0.976                 |
|                                             | Sertsewold et al15                | 4.45 (1.69 to 11.60)      |                    |                             |
|                                             | Cherie et al17                    | 3.70 (1.90 to 7.20)       |                    |                             |
|                                             | Asratie et al19                   | 3.50 (1.90 to 6.30)       |                    |                             |
| Following mass media                        | Shitie et al14                    | 1.97 (1.20 to 3.27)       | 2.50 (1.79 to 3.50) | 19.0%, 0.291                |
|                                             | Tsega et al38                     | 3.64 (2.02 to 6.56)       |                    |                             |
|                                             | Cherie et al17                    | 2.33 (1.15 to 4.74)       |                    |                             |
| Early initiation of ANC                     | Tizazu et al13                    | 2.57 (1.41 to 4.68)       | 4.98 (3.28 to 7.57) | 78.8%, 0.009                |
|                                             | Haile et al16                     | 10.70 (5.10 to 22.70)     |                    |                             |
|                                             | Emiru et al9                      | 7.53 (2.94 to 19.29)      |                    |                             |
| Planned pregnancy                           | Shitie et al14                    | 3.33 (1.87 to 5.90)       | 2.93 (1.99 to 4.32) | 0.0%, 0.728                 |
|                                             | Cherie et al17                    | 2.45 (1.36 to 4.40)       |                    |                             |
|                                             | Haile et al16                     | 3.50 (1.10 to 11.40)      |                    |                             |
| Birth preparedness and complication readiness| Haile et al16                    | 2.90 (1.40 to 6.10)       | 1.80 (1.29 to 2.51) | 50.9%, 0.153                |
|                                             | Tizazu et al13                    | 1.59 (1.10 to 2.32)       |                    |                             |
| Distance from health facility (<30 min)     | Sertsewold et al15                | 3.17 (1.38 to 7.25)       | 3.29 (2.45 to 4.42) | 38.9%, 0.178                |
|                                             | Tsega et al38                     | 3.22 (1.84 to 5.63)       |                    |                             |
|                                             | Atnafu et al18                    | 4.98 (2.97 to 8.38)       |                    |                             |
|                                             | Asratie et al19                   | 2.10 (1.20 to 3.70)       |                    |                             |

ANC, antenatal care.
is consistent with a study conducted in Ghana. Similarly, those women who had birth preparedness and complication readiness were 1.8 times more likely to complete the maternity CoC than their counterparts. This could be explained that those women who had birth preparedness and complication readiness have awareness about the maternity CoC. Moreover, women who found <30 min distance from the health facility were 3.29 times more likely to complete the maternity CoC than their counterparts. The finding is in line with a study conducted in Lao PDR and Nigeria. The possible explanation might be as the health facility is far away from their home; there might be a lack of transportation services.

This study has several strengths. To our knowledge, this systematic review and meta-analysis is the first study conducted in Ethiopia to estimate the pooled prevalence of completion of the maternity CoC and its associated factors. Additionally, this study gives recent information on the factors associated with the completion of the maternity CoC. Moreover, we strictly followed PRISMA guidelines and assessed the quality of each study using the modified Newcastle Ottawa Scale. However, this study is not void of limitations. Variations between studies in assessing the completion of ANC and postnatal follow-up (ie, within 2 days or 6 weeks) might affect the outcome variables of this study. Moreover, the absence of study in some regions of Ethiopia (ie, Afar, Gambella, Somalia and Tigray region) might make it unable to generalise the finding of this study. Thus, we recommend that future studies should be conducted in the above respective regions.

CONCLUSION

The pooled prevalence of completion of the maternity CoC was low in Ethiopia. Urban residence, secondary and above educational status, prepregnancy contraceptive utilisation, women’s autonomy, following mass media, early initiation of ANC, planned pregnancy, birth preparedness and complication readiness and distance from health facility<30min were factors associated with completion of the maternity CoC in Ethiopia. Therefore, policymakers and stakeholders should improve the completion of ANC, the rate of SBAs and postnatal follow-up. Enhancing the accessibility of health facilities, women’s awareness and empowering women’s decision-making are recommended.

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REFERENCES

1 World Health Organization. Maternal mortality. Available: https://www.who.int/news-room/fact-sheets/detail/maternal-mortality#:~:text=Maternal mortality is unacceptably high. About 295 000 low-,resource settings%2C and most could have been prevented
2 WHO. Trends in maternal mortality 2000 to 2017 estimates by, WHO, UNICEF, UNFPA, world bank group and the United nations population division
3 CSA. Ethiopia mini demographic and health survey, 2019.
4 World Health Organization. W. Ending preventable maternal mortality online consultation for coverage targets for ending preventable maternal mortality. Available: https://www.who.int/news/item/03-09-2020-ending-preventable-maternal-mortality-online-consultation-for-coverage-targets-for-ending-preventable-maternal-mortality
5 Srivastav MUABS. Association between maternal health continuum of care and child survival: evidence from a population based survey. Lancet 2021;128.
6 Kikuchi K, Ansaah EK, Okawa S, et al. Effective linkages of continuum of care for improving neonatal, perinatal, and maternal mortality: a systematic review and meta-analysis. PLoS One 2015;10:1–27.
7 Kerber KJ, de Graft-Johnson JE, Bhutta ZA, et al. Continuum of care for maternal, newborn, and child health: from slogan to service delivery. Lancet 2007;370:1558–69.
8 Black RE, Levin C, Walker N, et al. Reproductive, maternal, newborn, and child health: key messages from disease control priorities 3rd edition. Lancet 2016;388:2811–4.
9 Emeru AA, Alene GD, Debelev GT. Women’s retention on the continuum of care pathway in the west Gojjam zone, Ethiopia: multilevel analysis. BMC Pregnancy Childbirth 2020;20:1–14.
10 Silwali RC, Shibanuma A, Poudyal AK, et al. Difference in factors associated with continuum of care completion rate from pregnancy to postpartum period in rural Nepal: a community-based, cross-sectional study. BMJ Open 2021;11:1–10.
11 Yeji F, Shibanuma A, Oduro 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;10:1–23.
12 Mohan D, LeFevre AE, 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;32:791–9.
13 Tizzazu MA, Sharew NT, Mamo T, et al. Completing the continuum of maternity care and associated factors in Debre berhan town, Amhara, Ethiopia, 2020. J Multiscip Healthc 2021;14:21–32.
14 Shitie A, Assefa N, Dhressa M, et al. Completion and factors associated with maternity continuum of care among mothers who gave birth in the last one year in Enemay district, Northwest Ethiopia. J Pregnancy 2020;2020:7019676.
15 Sertsewold SG, Debbie A, Geberu DM. Continuum of maternal health services utilisation and associated factors among women
who gave birth in Siyadebirena Wayu district, Ethiopia: community-based cross-sectional study. \textit{BMJ Open} 2021;11:1–15.

16 Haile D, Kondale M, Andarge E, et al. Level of completion along continuum of care for maternal and newborn health services and factors associated with it among women in Arba Minch Zuria woreda, Gamo zone, southern Ethiopia: a community based cross-sectional study. \textit{PloS One} 2020;15:1–18.

17 Cherue N, Abdulkader M, Abegaz Z, et al. Maternity continuum of care and its determinants among mothers who gave birth in Legambo district, South Wollo, northeast Ethiopia. \textit{Health Sci Rep} 2021;4:e409.

18 Atrafu A, Kebede A, Mshganaw B, et al. Determinants of the continuum of maternal healthcare services in Northwest Ethiopia: findings from the primary health care project. \textit{J Pregnancy} 2020;2020:4318197.

19 Asratie MH, Muche AA, Geremew AB. Completion of maternity continuum of care among women in the post-partum period: magnitude and associated factors in the northwest, Ethiopia. \textit{PLoS One} 2020;15:1–14.

20 Sakuma S, Yasueka J, Phonglukx S, et al. Determinants of continuum of care for maternal, newborn, and child health services in rural Khammouane, Lao PDR. \textit{PloS One} 2019;14:1–12.

21 PRISMA transparent reporting of systematic reviews and meta-analyses. Available: http://www.prisma-statement.org/PRISMAStatement/Checklist.aspx [Accessed 8 Feb].

22 The Joanna Briggs Institute. \textit{JBI data extraction form for review for systematic reviews and research syntheses}, 2014.

23 McPheeters ML, Kripalani S, Peterson NB. Closing the quality gap: revisiting the state of the science (vol. 3: quality improvement interventions to address health disparities). \textit{Evid Rep Technol Assess} 2012.

24 Hamed A, Mohamed E, Sabry M. Egyptian status of continuum of care for maternal, newborn, and child health: Sohag Governorate as an example. \textit{Int J Med Sci Public Health} 2018;7:1.

25 Ssenwanja Q, Musaba MW, Mutsya LM, et al. Continuum of maternity care in Zambia: a national representative survey. \textit{BMC Pregnancy Childbirth} 2021;21:1–10.

26 Wang W, Hong R. Levels and determinants of continuum of care for maternal and newborn health in Cambodia-evidence from a population-based survey. \textit{BMC Pregnancy Childbirth} 2015;15:1–9.

27 Iqbal 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. \textit{BMC Health Serv Res} 2017;17:1–15.

28 Arunda MO, Agardh A, Asamoah BO. Determinants of continued maternal care seeking during pregnancy, birth and postnatal and associated neonatal survival outcomes in Kenya and Uganda: analysis of cross-sectional, demographic and health surveys data. \textit{BMJ Open} 2021;11:1–16.

29 Yaya S, Uthman OA, Ehoveluentale M, et al. Women empowerment as an enabling factor of contraceptive use in sub-Saharan Africa: a multilevel analysis of cross-sectional surveys of 32 countries. \textit{Reprod Health} 2018;15:1–12.

30 Ohi J, Moon J, Choi JW, et al. Factors associated with the continuum of care for maternal, newborn and child health in the Gambia: a cross-sectional study using demographic and health survey 2013. \textit{BMJ Open} 2020;10:e036516.

31 Osamor PE, Grady C. Women’s autonomy in health care decision-making in developing countries: a synthesis of the literature. \textit{Int J Womens Health} 2016;8:191–202.

32 Tessema ZT, Teshaale AB, Tesema GA, et al. Determinants of completing recommended antenatal care utilization in sub-Saharan from 2006 to 2018: evidence from 36 countries using demographic and health surveys. \textit{BMC Pregnancy Childbirth} 2021;21:1–12.

33 Berhan Y, Berhan A. Antenatal care as a means of increasing birth in the health facility and reducing maternal mortality: a systematic review. \textit{Ethiop J Health Sci} 2014;24 Suppl:93–104.

34 Muluneh AG, Kassa GM, Alemayehu GA, et al. High dropout rate from maternity continuum of care after antenatal care booking and its associated factors among reproductive age women in Ethiopia. Evidence from Demographic and Health Survey 2016. \textit{PloS One} 2020;15:1–11.

35 Kothavale A, Meher T. Level of completion along continuum of care for maternal, newborn and child health services and factors associated with it among women in India: a population-based cross-sectional study. \textit{BMC Pregnancy Childbirth} 2021;21:1–12.

36 Owili PO, Muga MA, Chou YJ. Associations in the continuum of care for maternal, newborn and child health surveys. \textit{Evidence from Demographic and Health Survey} Evidence from Demographic and Health Survey 2016. \textit{PloS One} 2020;15:1–11.

37 Berhan Y, Linchayou S, Berhan A. Maternal care seeking during pregnancy, birth and postnatal and its associated factors among reproductive age women in Ethiopia. Evidence from Demographic and Health Survey 2016. \textit{PloS One} 2020;15:1–11.

38 Oh J, Moon J, Choi JW, et al. Factors associated with the continuum of care for maternal, newborn and child health in the Gambia: a cross-sectional study using demographic and health survey 2013. \textit{BMJ Open} 2020;10:e036516.

39 Muluneh AG, Kassa GM, Alemayehu GA, et al. High dropout rate from maternity continuum of care after antenatal care booking and its associated factors among reproductive age women in Ethiopia. Evidence from Demographic and Health Survey 2016. \textit{PloS One} 2020;15:1–11.

40 Ohi J, Moon J, Choi JW, et al. Factors associated with the continuum of care for maternal, newborn and child health in the Gambia: a cross-sectional study using demographic and health survey 2013. \textit{BMJ Open} 2020;10:e036516.

41 Osamor PE, Grady C. Women’s autonomy in health care decision-making in developing countries: a synthesis of the literature. \textit{Int J Womens Health} 2016;8:191–202.

42 Tessema ZT, Teshaale AB, Tesema GA, et al. Determinants of completing recommended antenatal care utilization in sub-Saharan from 2006 to 2018: evidence from 36 countries using demographic and health surveys. \textit{BMC Pregnancy Childbirth} 2021;21:1–12.

43 Berhan Y, Berhan A. Antenatal care as a means of increasing birth in the health facility and reducing maternal mortality: a systematic review. \textit{Ethiop J Health Sci} 2014;24 Suppl:93–104.

44 Muluneh AG, Kassa GM, Alemayehu GA, et al. High dropout rate from maternity continuum of care after antenatal care booking and its associated factors among reproductive age women in Ethiopia. Evidence from Demographic and Health Survey 2016. \textit{PloS One} 2020;15:1–11.

45 Kothavale A, Meher T. Level of completion along continuum of care for maternal, newborn and child health services and factors associated with it among women in India: a population-based cross-sectional study. \textit{BMC Pregnancy Childbirth} 2021;21:1–12.

46 Owili PO, Muga MA, Chou YJ. Associations in the continuum of care for maternal, newborn and child health surveys. \textit{Evidence from Demographic and Health Survey} Evidence from Demographic and Health Survey 2016. \textit{PloS One} 2020;15:1–11.

47 Berhan Y, Berhan A. Maternal care seeking during pregnancy, birth and postnatal and its associated factors among reproductive age women in Ethiopia. Evidence from Demographic and Health Survey 2016. \textit{PloS One} 2020;15:1–11.

48 Oh J, Moon J, Choi JW, et al. Factors associated with the continuum of care for maternal, newborn and child health in the Gambia: a cross-sectional study using demographic and health survey 2013. \textit{BMJ Open} 2020;10:e036516.

49 Muluneh AG, Kassa GM, Alemayehu GA, et al. High dropout rate from maternity continuum of care after antenatal care booking and its associated factors among reproductive age women in Ethiopia. Evidence from Demographic and Health Survey 2016. \textit{PloS One} 2020;15:1–11.

50 Ohi J, Moon J, Choi JW, et al. Factors associated with the continuum of care for maternal, newborn and child health in the Gambia: a cross-sectional study using demographic and health survey 2013. \textit{BMJ Open} 2020;10:e036516.