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Completion of Continuum Antenatal Care Utilization among Pregnant Mothers in Ethiopia: A Systematic Review and Meta-Analysis

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Abstract

Introduction: Pregnancy and childbirth are significant events for women and their families. Every day preventable causes related to pregnancy and child birth lead to the deaths of over 800 women with 99% of these maternal deaths occurring in low and middle-income countries. Although there are some fragmented primary studies on the coverage of completion of continuum antenatal care services utilization in Ethiopia, the national level of complete continuity of antenatal care services utilization was unknown. Therefore, this is the first meta-analysis aimed to estimate the pooled prevalence of complete continuum of antenatal care services utilization in Ethiopia.

Methods: A thorough search approach employing PubMed/MEDLINE, EMBASE, HINARI, Cochrane Library, and Google search was used to find the articles. Each author individually extracted the data. The original data was represented using tables and forest plots. 12 statistics were used to assess the statistical heterogeneity. The featured papers varied in their subject matter. Therefore, in order to calculate the total pooled prevalence of complete continuum of antenatal care service in Ethiopia, authors utilized a meta-analysis of random effects. Methods like the funnel plot and Egger regression test were used to evaluate potential publication bias. Meta-regression model was done based on sample size and year of publication to identify the sources of random variations among included studies. This finding should be published in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Results: We discovered 572 articles after a thorough search and discovery process. After that, we decide to only include twelve full-text abstract studies in this meta-analysis. According to the analysis of the available studies, 45% (95% CI: 34%-56%) of complete continuum of antenatal care service in Ethiopia overall. According to the subgroup analysis by study region and year the prevalence estimates were a little bit higher in Amhara region 55% (95% CI: 39-70) and in the year 2020 58% (95% CI: 34%-80%).

Conclusion: This study implies that Ethiopia has low pooled prevalence of complete continuum antenatal care service. To improve the utilization of complete continuum of antenatal care services, it is crucial to work on the community mobilization to increase awareness of the community on the health benefit of complete continuum of antenatal care service utilization.

Keywords: Antenatal care; Completion; Ethiopia; Mothers; Utilization

Abbreviations: ANC: Antenatal Care; EDHS: Ethiopian Demographic Health Survey; LMICs: Low and Middle-Income Countries; PRISMA-P: Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols; SSA: Sub-Saharan Africa

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Introduction

Globally, pregnancy and childbirth are significant events for women and their families. Every day preventable causes related to pregnancy and child birth lead to the deaths of over 800 women with 99% of these maternal deaths occurring in low and middle income countries [1]. In addition, an estimated 2.6 million babies were stillbirth in 2015. Of thus ninety eight percent occurred in Low and Middle-Income Countries (LMICs) and 77% of these occurred in the south Asia and Sub-Saharan Africa (SSA), thus showing little progress in SSA [2]. Ethiopia is one of the countries in Sub-Saharan Africa with 19,000 maternal deaths per year [3].

Studies shows that women that receive quality services during ANC develop confidence in the maternal care services are more likely to deliver under the care of a skilled birth attendant, and also seek early postnatal care [4]. Although a minimum of four ANC visits are recommended only around 50% of women in developing countries received adequate ANC. In Ethiopia, only about 32% of the women had four or more ANC and 64% of the women had at least one ANC visits while about 36% women did not receive any ANC. Hence, the problem still remains a challenge in Ethiopia [5]. Having the recommended maternal health care during ANC promotes the completion of the continuum of care [6].

The magnitude of a completion of continuum antenatal care service utilization was variable across different countries. It was 54% in Nigeria [7], 59% Colombia [8], and 14.99% in Rwanda [9]. The Ethiopian Demographic Health Survey (EDHS) 2019 report showed that 58.1% of women received four or more ANC visits [10].

Evidence indicated that different factors affect the continuum of antenatal care services utilization. Some of these factors were negatively associated with ANC four or more visit belonging to ethnic minority groups, having lower education, lower husband's education, no exposure to media communication, doing informal works, having lower income, having lower knowledge on ANC services, receiving no financial support from the husband and unwanted pregnancy [11-13].

Although there are some fragmented primary studies on the coverage and determinants of completion of continuum antenatal care services utilization in Ethiopia, the national level of complete continuity of antenatal care services utilization was unknown. Besides, the prevalence of complete continuum of antenatal care services utilization was significantly different across the studies. Furthermore, determinants of complete continuum antenatal care services utilization were varying among those studies. Therefore, this is the first meta-analysis aimed to estimate the pooled prevalence of complete continuum of antenatal care services utilization in Ethiopia. The result of this study will provide important input for policymakers and clinicians about continuum of maternal healthcare services utilization and this finding will enforce them to design evidence based strategies for improvement of complete continuum of antenatal care services utilization in Ethiopia.

Literature Review

Protocol and registration

This systematic review and meta-analysis were designed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols (PRISMA-P 2015) Guidelines [14].

Data source and searching strategy

Five authors (THW, TGH, GGG, YMM, and NA) search all relevant studies systematically from different international data base (Pub Med/MEDLINE databases, and Cochrane Library on continuum antenatal care. Furthermore, Google Scholar and web of Science were used to retrieve articles. The searching data base was until June 25/2023. Single or combination of search items were used: Antenatal care, pregnancy care, completion of continuum, antenatal care utilization, associated factors, pregnant mothers, continuum care, pregnancy, maternity care, Ethiopia. Search detailed for PubMed ((("completion"(MeSH Terms) OR ("continuum care"(All Fields) AND "pregnancy" (All Fields)) OR "maternity" (All Fields) OR "mothers" (All Fields)) AND (antenatal care (All Fields) AND associated factors (All Fields)) AND ("predictors"(MeSH Terms) OR "Ethiopia"(All Fields)).

Data extraction and quality assessment

The five reviewers (THW, TGH, GGA, WA, and TG) extracted all necessary data separately from twelve primary study by using a predesigned data abstraction form. First author's name, publication year, study region, study period, sample size, and completion of continuum antenatal care service utilization were extracted. A standard quality assessment tool (Newcastle-Ottawa quality assessment Scale adapted for cross-sectional studies) were used to assess the quality of the studies [15]. Qualities of studies were assessed by three reviewers (NA, THA, and YMM) individually using the following components: The first component was selection, which was graded by five stars, the second comparability and graded by two stars, and the third was outcome and assessed by three stars. The collective quality score established that 0–3, 4–6 and 7–10 stars which was considered as high, moderate, and low risk of bias, respectively. Differences among the three reviewers at the time of quality assessment were resolute through discussion and consensus by involving the fourth reviewer (GGA). Articles that had > 7 points out of 9 were considered to be high quality and included in this study.

Inclusion criteria

Design: All published observational studies.

Publication type: Both published and unpublished articles.

Setting: Studies conducted in Ethiopia.

Language: Published studies only written in English language were included.

Publication year: All published articles up to June 25, 2023.

Outcome: The main outcome of this study is complete continuum of antenatal care service utilization. Complete continuum of antenatal care service utilization was considered when the mother received at least four antenatal visits in health facility by skilled health care provider.

Exclusion criteria

Studies with different outcome of interest and different definition and measurement of completion of continuum antenatal care services utilization.

Publication bias and heterogeneity

Publication bias was checked by funnel plot. The distribution of studies and a P-value <0.05 were used to declare publication bias. The heterogeneity of studies were checked using Q test and I^2 test statistics and a value of 25%, 50% and 75% was used to state the heterogeneity test as low, medium and high respectively. Random effect model analysis was used with evidence of heterogeneity. Funnel plot and Egger regression asymmetry test was used to check the existence of publication bias.

Statistical analysis/data synthesis and presentation of results

To estimate national pooled completion of continuum antenatal care service utilization necessary data were extracted in Microsoft Excel and then exported to STATA version 14 for further analysis. Egger's test was used to assess publication bias and I^2 test statistics were used to investigate the presence of heterogeneity across the included studies. Meta-regression model was done based on sample size and year of publication to identify the sources of random variations among included studies. The findings of the meta-analysis were presented using forest plot and figures with its 95% Confidence Interval (CI). The findings of this analysis were published based on the guideline for Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).

Data management

Following the development of framework tool was created to guide screening and processing based on inclusion and exclusion criteria. Data extraction was begun after the tool was piloted and revised. The search results were uploaded to Endnote 8x software to delete duplications.

Data items

Data extraction was including the first author's name, publication year, study region, study period, sample size, adjusted odds ratio.

Outcomes and prioritization

Primary outcome is completion of continuum antenatal care service utilization in Ethiopia.

Results

Screening flow

We discovered 572 articles using a thorough search and discovery process, and we then eliminated 263 duplicates. After reviewing 309 publications based on their titles and abstracts, we found that 250 articles were disqualified because the studies in those articles didn't match the criteria for inclusion or exclusion. Following a second review of 59 papers, 47 were disregarded, because didn't reveal the prevalence of complete continuum of antenatal care services utilization. Finally, twelve full-text abstract publications with a total of 6,260 samples size were included in this systematic review and meta-analysis based on the pre-defined criteria and quality assessment. A PRISMA flow illustrates the precise screening process phases (Figure 1).

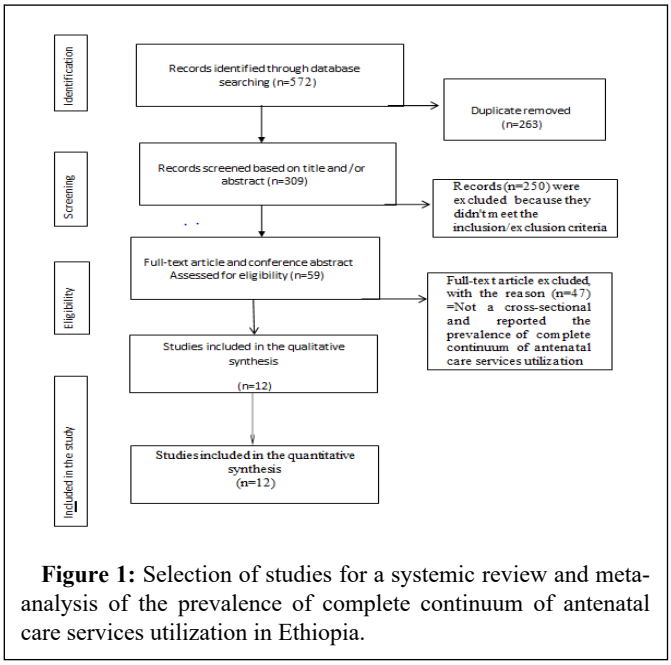

Figure 1: Selection of studies for a systemic review and meta-analysis of the prevalence of complete continuum of antenatal care services utilization in Ethiopia.

Study characteristics

A total of 12 studies with a 6,260 person sample size was included in this meta-analysis study. The study was conducted in Amhara for about 50% of the time. All of the research were cross sectional studies. A study conducted in Hawassa (18.8%) had the lowest rate of complete continuum of antenatal care services utilization, whereas Amhara (78.5%) had the greatest. The Newcastle Ottawa Scale quality assessment criteria for each primary study's quality score indicated no appreciable risk, hence all the studies were taken into account in this systematic review and meta-analysis. In Table 1, the specific traits of the articles that were included were displayed.

Authors	Study year	Study area	Study design	Type of study	Sample size	Case	Prevalence (%)	Quality score based on NOS
Mulat, et al.	2015	Amhara	CS	CB	930	420	45.2	8
Lire et al.	2017	Hawassa	CS	IB	414	78	18.8	8

Gurmesa T.	2007	Benishangul Gumuz	CS	CB	517	248	48	9
Alebachew Taye Belay, et al.	2021	Amhara	CS	CB	434	256	59	9
Birhanu Darega Gela, et al.	2013	Oromia	CS	CB	703	177	30.6	7
Woyessa AH, et al.	2017	Oromia	CS	IB	420	135	32.1	8
Tizazu, et al.	2020	Amhara	CS	CB	647	482	74.5	7
Buli, et al.	2021	Oromia	CS	CB	428	183	42.8	7
Asmamaw Atnafu, et al.	2019	Amhara	CS	CB	565	231	40.9	8
Daniel Tsega, et al.	2020	Amhara	CS	CB	443	129	29.07	8
Tizazu, et al.	2020	Amhara	CS	CB	390	306	78.5	8
Kare, et al.	2020	Sidama	CS	IB	369	174	47.2	7

Table 1: Characteristics of studies considered in this systematic review and meta-analysis of the prevalence of complete continuum of antenatal care utilization in Ethiopia.

The pooled prevalence of complete continuum of antenatal care services utilization

We have incorporated 12 studies for this meta-analysis, and the estimated pooled prevalence of complete continuum of antenatal care services utilization was 45% (95% CI: 34%-56%) but with a significant high level of heterogeneity among the studies in the random-effects model analysis (I^2=98.65%, p ≤ 0.000) (Figure 2).

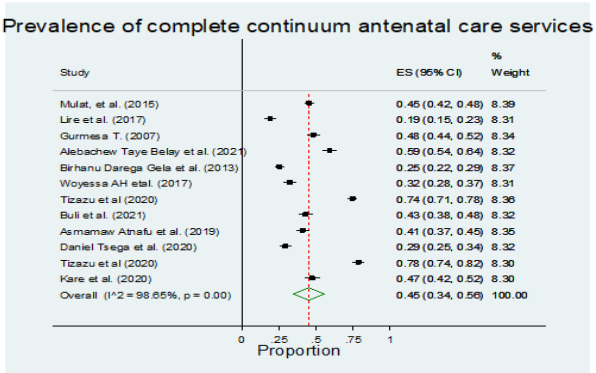

Figure 2: Forest plot for the prevalence of complete continuum antenatal care services utilization in Ethiopia.

Publication bias

In case there is no publication bias, the effect sizes of all the studies are normally distributed around the center of a funnel plot. Therefore, the result given in Figure 3 seems symmetrical distribution in the funnel plot. Additionally, the Egger's test for the small study effect were highly non-significant for the presence of publication bias (p=0.971). This indicates there was no small study effect or no publication bias among the included studies in estimating the pooled prevalence of complete continuum of antenatal care services utilization. Furthermore, Trim-and-fill analysis for the prevalence of complete continuum of antenatal care services utilization was done to reduce and correct if there is publication bias in the studies. The result showed no study was imputed for missing studies and the estimated pooled prevalence also approximately similar with the unadjusted prevalence.

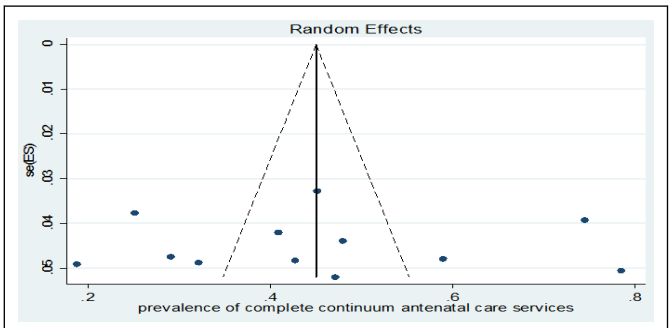

Figure 3: Distribution of the studies included in prevalence of complete continuum of antenatal care services utilization.

Subgroup analysis

We have done subgroup meta-analysis, based on study region and year. The intent was to compare the pooled estimates across the groups and find out whether the considered grouping helps us to explain some of the observed between study heterogeneity. As a result, the pooled prevalence estimates were a little bit higher in Amhara region 55% (95% CI: 39-70) (Figure 4) and in the year 2020 58% (95% CI: 34%-80%) (Figure 5). Meta regression was run taking into account the sample size and study year as covariates to check if they are the sources of heterogeneity for the pooled prevalence but none of them were also significant.

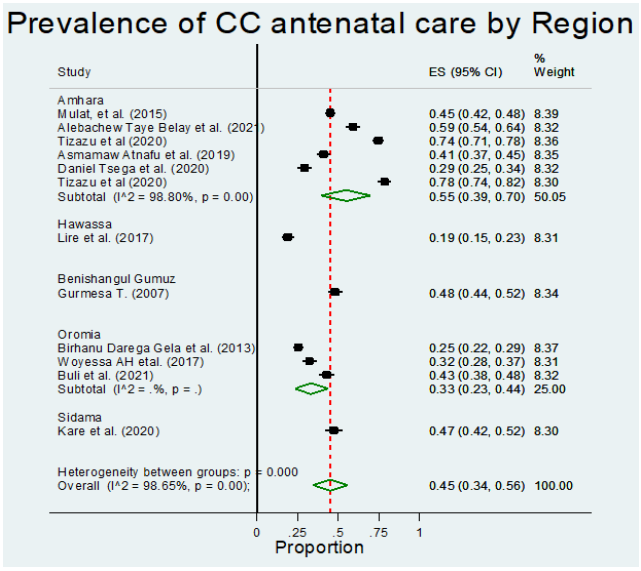

Figure 4: Forest plot for the prevalence of complete continuum antenatal care services utilization by region in Ethiopia.

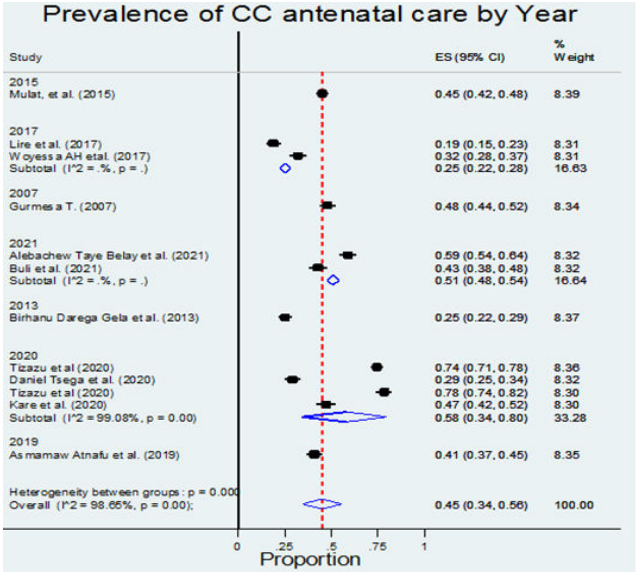

Figure 5: Forest plot for the prevalence of complete continuum antenatal care services utilization by year in Ethiopia.

Sensitivity analysis

Sensitivity analysis was done by omitting one study at a time to assess if there is some influence on the result of overall pooled prevalence of complete continuum of antenatal care services utilization and result showed that there was no influential study on the overall pooled estimated prevalence. Therefore, when excluding the named particular study, the 95% CI fluctuated from (0.35, 0.55) to the (0.33, 0.58) as indicated in the Figure 6.

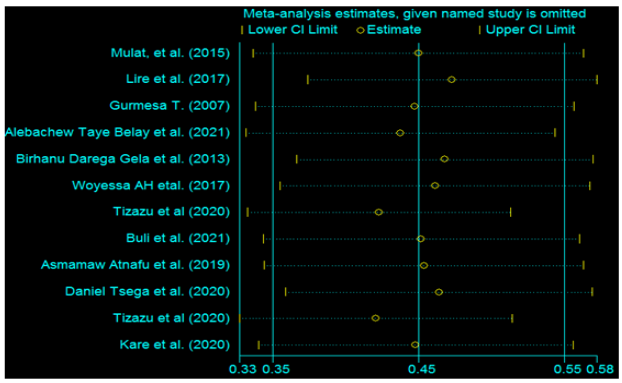

Figure 6: Meta-analysis result when omitting the named particular study.

Discussion

To ascertain the total pooled prevalence of the complete continuum of antenatal care services utilization in Ethiopia, a systematic review and meta-analysis were conducted. Based on the results of this meta-analysis, it was determined that Ethiopia had a pooled prevalence of 45% (95% CI: 34%-56%) for the complete continuum of antenatal care service utilization. The prevalence of complete continuum antenatal care services uses in the publications we included in our work varied, with reports ranging from 18.8% by Lire et al., to 78.5%by Tizazu et al. Such disparities may be explained by the lack of awareness of antenatal care services, the accessibility of health facilities, and the quality of the antenatal care provided.

We compared the present pooled prevalence with a variety of primary studies conducted in Ethiopia and elsewhere in the lack of systematic reviews and meta-analyses. The overall coverage of the complete continuum of antenatal care services utilization was 45%. This result was consistent with local analyses of the 2019 Ethiopian mini demographic health survey, which found that 3910 (44%) [10]. Similarly, this finding was also higher than local studies done among pregnant women attending ANC services at public hospitals in Northeast Ethiopia, 7 (1.8%). The reason for this discrepancy might be antenatal care service utilization was found to be low during the pandemic period. This may be due to movement restrictions, fear of infection, and economic pressure. Additionally, there may have been more disruptions to the health systems due to workforce and supply chain issues and the repurposing of health workers.

Our results, however, are less significant than those of research carried out in Vietnam and Nigeria, which found that 38,945 (54%), and 489 (53.9%), respectively. This variation's cause could be attributed to varying ease of access to medical services. For instance, a study carried out in Vietnam may have improved community health seeking behavior, easier access to health care resources, and better maternity care.

We conducted subgroup meta-analysis based on study region and year after examining the heterogeneity of studies included in this systematic review and meta-analysis. As a result, we discovered that the pooled prevalence estimates were slightly higher in the Amhara region 55% and in the year 2020 was 58%. The variation in research

periods and the possibility of greater antenatal care service awareness in Amhara than in other regions might be potential explanations for the discrepancy.

Individually, the prevalence of complete continuum antenatal care in publications included in our work was varied in which they disclosed from (18.8% to 78.5%), suggests the creation of uniform standards to boost the use of the entire spectrum of antenatal care services. Additionally, and to the best of our knowledge, this systematic review and meta-analysis is the first of its kind in Ethiopia in estimating the national level and determining the national coverage of the complete continuum of antenatal care services utilization. This enables policymakers and clinicians at various levels to design evidence-based strategies for improving antenatal care services utilization.

Conclusion

Our work systematically summarizes the pooled prevalence of complete continuum of antenatal care services utilization that revealed 45%. Thus, this finding suggests that the pooled prevalence of complete continuum of antenatal care services in Ethiopia was still lower than other previous studies reported from some countries. To improve the utilization of complete continuum of antenatal care services, it is crucial to work on the community mobilization by working with women developmental army, religious leaders, community leaders and health extension workers on how to educate and aware the community on the health benefit of complete continuum of antenatal care follow up for the mother and their babies. Furthermore, great attention should be given to early initiation of antenatal care visit and promoting adherence of women to the ministry of health antenatal care visit recommendations. For the researchers, it is better to assess the effect of preconception care as well as the quality of completion of continuum antenatal care service utilization.

Ethics Approval and Consent to Participate

Not applicable.

Consent for Publication

Not applicable.

Competing Interests

The authors declare no competing interests.

Availability of Data and Materials

This study has not been submitted and considered for publication in any journal. All raw data generated or analyzed during the current study are available from the corresponding author on request.

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Authors' Contributions

THW: Was the principal author who contributed to designing the study, analyzing, interpreting the data, and preparing the manuscript. TGH, THA, GGG, and WA: Involved in the design, selection of study, data extraction, and statistical analysis and drafts of the manuscript. GGA, NA, YMM, TG, and THW: involved in the interpreting of the data, data extraction, and statistical analysis. All authors read and approved the final manuscript.

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