Evidence on the effect of gender of newborn, antenatal care and postnatal care on breastfeeding practices in Ethiopia
Habtewold, Tesfa Dejenie; Sharew, Nigussie Tadesse; Alemu, Sisay Mulugeta

Published in:
BMJ Open

DOI:
10.1136/bmjopen-2018-023956

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2019

Link to publication in University of Groningen/UMCG research database

Citation for published version (APA):

Copyright
Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

Take-down policy
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): http://www.rug.nl/research/portal. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.
Evidence on the effect of gender of newborn, antenatal care and postnatal care on breastfeeding practices in Ethiopia: a meta-analysis and meta-regression analysis of observational studies

Tesfa Dejenie Habtewold,1,2 Nigussie Tadesse Sharew,1 Sisay Mulugeta Alemu3


ABSTRACT

Objectives The aim of this systematic review and meta-analysis was to investigate the association of gender of newborn, antenatal care (ANC) and postnatal care (PNC) with timely initiation of breast feeding (TIBF) and exclusive breastfeeding (EBF) practices in Ethiopia.

Design Systematic review and meta-analysis.

Data sources To retrieve all available literature, PubMed, EMBASE, CINAHL, WHO Global Health Library, Web of Science and SCOPUS databases were systematically searched and complemented by manual searches. The search was done from August 2017 to September 2018.

Eligibility criteria All observational studies including cross-sectional, case-control, cohort studies conducted in Ethiopia from 2000 to 2018 were included. Newcastle-Ottawa Scale was used for quality assessment of included studies.

Data extraction and synthesis Study area, design, population, number of mothers (calculated sample size and participated in the study) and observed frequency data were extracted using Joanna Briggs Institute tool.

Results Of 523 articles retrieved, 17 studies (n=26 146 mothers) on TIBF and 24 studies (n=81 919 mothers) on EBF were included in the final analysis. ANC (OR=2.24, 95% CI 1.65 to 3.04, p<0.001, I²=90.9%), PNC (OR=1.86, 95% CI 1.41 to 2.47, p<0.001, I²=63.4%) and gender of newborn (OR=1.31, 95% CI 1.01 to 1.68, p=0.04, I²=81.7%) significantly associated with EBF. ANC (OR=1.70, 95% CI 1.10 to 2.65, p=0.02, I²=93.1%) was also significantly associated with TIBF but not with gender of newborn (OR=1.02, 95% CI 0.86 to 1.21, p=0.82, I²=66.2%).

Conclusions In line with our hypothesis, gender of newborn, ANC and PNC were significantly associated with EBF. Likewise, ANC was significantly associated with TIBF. Optimal care during pregnancy and after birth is important to ensure adequate breast feeding. This meta-analysis study provided up-to-date evidence on breastfeeding practices and its associated factors, which could be useful for breastfeeding improvement initiative in Ethiopia and cross-country and cross-cultural comparison.

Strengths and limitations of this study

- This systematic review and meta-analysis was conducted based on the registered and published protocol.
- Since this is the first study in Ethiopia, the evidence could be helpful for future researchers, public health practitioners and healthcare policy-makers.
- Almost all included studies were observational which might weaken the strength of evidence and hinder causality inference.
- Perhaps, the results may not be nationally representative given that studies from some regions are lacking.
- Based on the conventional method of heterogeneity test, a few analyses suffer from high between-study variation.

INTRODUCTION

WHO and Unicef recommend timely initiation of breast feeding (TIBF) (ie, initiating breast feeding within 1 hour of birth) and exclusive breast feeding (EBF) (ie, feeding only human milk during the first 6 months) for maintaining maternal and newborn health. Breastfeeding provides optimal nutrition, increase cognitive development, reduce morbidity and mortality for the newborn; for
example, TIBF prevents 22% of neonatal deaths. Inappropriate breastfeeding practice, on the other hand, causes more than two-thirds of under-five child mortality, of which 41% of these deaths occur in Sub-Saharan Africa. Breast feeding also prevents maternal long-term chronic diseases, such as diabetes mellitus.

According to a new 2017 global Unicef and WHO report, only 42% start breast feeding within an hour of birth, leaving an estimated 78 million newborns to wait over 1 hour to be put to the breast, the majority born in low-income and middle-income countries. The prevalence rate of TIBF varies widely across regions from 35% in the Middle East and North Africa to 65% in Eastern and Southern Africa. Another report also shows that only two in five infants <6 months of age are exclusively breast fed. The prevalence rate of EBF ranges from 22% in East Asia and Pacific to 56% in Eastern and Southern Africa. Based on our meta-analysis in 2018, the prevalence of TIBF and EBF in Ethiopia is 66.5% and 60.1% respectively. To date, globally, only 22 nations have achieved the WHO goal of 70% coverage in TIBF and 23 countries have achieved at least 60% coverage in EBF.

To promote optimal breast feeding, WHO, Unicef and other (inter)national organisations have been working in developing countries, and several studies have been conducted on the advantages of breast feeding. However, it is still challenging to achieve the expected coverage and attributed to several factors including antenatal (ANC), postnatal care (PNC) and gender of newborn and breastfeeding care unit. In Ethiopia, several meta-analyses studies were done on infant and young child feeding. In our previous meta-analysis, we explored the association between maternal employment, lactation counselling, mode of delivery, place of delivery, maternal age, newborn age and discarding colostrum breastfeeding practices (ie, TIBF and EBF). We also separately studied the association between TIBF and EBF. However, none of these meta-analyses did study the pooled effect of gender of newborn, ANC and PNC on TIBF and EBF. Given the absence of pooled estimates, up-to-date evidence is required to design intervention-based studies targeting these factors. Therefore, we aimed to investigate whether TIBF and EBF in Ethiopia are influenced by gender of newborn, ANC and PNC. We hypothesised at least one ANC or PNC visit significantly improves TIBF and EBF practices. Additionally, mothers with male newborn have higher odds of TIBF and EBF compared with mothers with female newborn.

METHODS
Protocol registration and publication

The study protocol was registered with the University of York, Centre for Reviews and Dissemination, International prospective register of systematic reviews (PROSPERO) and published.

Search strategy and databases

PubMed, EMBASE, CINAHL, WHO Global Health Library, Web of Science and SCOPUS electronic databases were searched to extract all available literature. The search strategy was developed using Population Exposure Controls and Outcome (PECO) searching guide in consultation with a medical information specialist (online supplementary file 1). The search was done from August 2017 to September 2018. Grey literature and cross-references of included articles and previous meta-analysis were also hand searched.

PECO guide

Population

All mothers with newborn up to 23 months of age.

Exposure

Gender of the newborn, ANC and PNC visit (at least one visit).

Comparison

Female newborn, no ANC visit and no PNC visit.

Outcome

TIBF and EBF practices.

Inclusion and exclusion criteria

Studies were included if they met the following criteria: (1) observational studies including cross-sectional, case-control, cohort studies; (2) conducted in Ethiopia; (3) published in English language and (4) published between 2000 and 2018. Studies were excluded on any one of the following conditions: (1) conducted in women with HIV/AIDS, preterm newborn and newborn in intensive care unit; (2) published in language other than English; (3) abstracts without full text and (4) qualitative studies, symposium/conference proceedings, essays, commentaries and case reports.

Selection and quality assessment

Initially, all identified articles were exported to Refwork citation manager (RefWorks 2.0; ProQuest LLC, Bethesda, Maryland, USA, http://www.refworks.com), and duplicate studies were cancelled. Next, a pair of independent reviewers identified articles by analysing the title and abstract for relevance and its compliance with the proposed review topic. Agreement between the two reviewers, as measured by Cohen’s Kappa, was 0.76. After removing irrelevant studies through a respective decision after discussion, full texts were systematically reviewed for further eligibility analysis. Newcastle-Ottawa Scale (NOS) was used to examine the quality of studies and for potential risk of bias. In line with the WHO standard definition, outcome measurements were TIBF (the percentage of newborn who breast feed within the first hour of birth) and EBF (the percentage of infants who exclusively breast fed up to 6 months since birth). Finally, Joanna Briggs Institute (JBI) tool was used to extract the following data: study area (region and place), method (design), population, number of mothers (calculated sample size and participated in
the study) and observed data (ie, 2×2 table). Geographic regions were categorised based on the current Federal Democratic Republic of Ethiopia administrative structure.19 Disagreement between reviewers was solved through discussion and consensus.

**Statistical analysis**
A meta-analysis using a weighted inverse variance random-effects model was performed to obtain a pooled OR. In addition, a cumulative meta-analysis was done to illustrate the trend of evidence regarding the effect of gender of newborn, ANC and PNC on breastfeeding practices. Publication bias was assessed by visual inspection of a funnel plot and Egger’s regression test for funnel plot asymmetry using SE as a predictor in mixed-effects meta-regression model at a p value threshold ≤0.010.20 Duval and Tweedie trim-and-fill method was used to manage publication bias. Cochran’s Q X2 test, τ2 and I2 statistics were used to test heterogeneity, estimate amount of total/residual heterogeneity and measure variability attributed to heterogeneity, respectively.22 Mixed-effects meta-regression analysis was done to examine the effect of variation in study area (region), residence of women, sample size and publication year on between-study heterogeneity.23 The total amount of heterogeneity (R2) accounted for these factors was calculated by subtracting the residual amount of heterogeneity from the total amount of heterogeneity and dividing by the total amount of heterogeneity. Moreover, to assess the moderation effect of these factors, Omnibus test of moderators was applied. The data were analysed using ‘metafor’ packages in R software V.3.2.1 for Windows.23

**Data synthesis and reporting**
We analysed the data in two groups based on outcome measurements (ie, TIBF and EBF). Results are presented using forest plots. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline was strictly followed to report our results.24

**Minor post hoc protocol changes**
Based on the authors’ decision and reviewers’ recommendation, the following changes were made to our published protocol methods.15 We added the JBI tool to extract the data. In addition, we used the Duval and Tweedie trim-and-fill method to manage publication bias. Furthermore, cumulative meta-analysis and mixed-effects meta-regression analysis were done to reveal the trends of evidence and identify possible sources of between-study heterogeneity, respectively.

**Patient and public involvement**
The research questions and outcome measures were developed by the authors (TDH and NTS) in consultation with public health professionals and previous studies. Given this is a systematic review and meta-analysis based on published data, patients/study participants were not directly involved in the design and analysis of this study. The results of this study will be disseminated to patients/study participants through health education on factors affecting breast feeding and disseminating the key findings using brochure in the local language.

**RESULTS**

**Search results**
In total, we obtained 533 articles from PubMed (n=169), EMBASE (n=24), Web of Science (n=200), SCOPUS (n=85) and CINHAL and WHO Global Health Library (n=5). Fifty additional articles were found through manual search. After removing duplicates and screening of titles and abstracts, 84 studies were selected for full-text review. Of these, 43 articles were excluded due to several reasons: 19 studies on complementary feeding, 3 studies on prelacteal feeding, 3 studies on malnutrition, 17 studies with different variables of interest and 1 project review report. As a result, 41 articles fulfilled the inclusion criteria and used in this meta-analysis: 17 studies investigated the association between TIBF and gender of newborn and ANC whereas 24 studies between EBF and gender of newborn, ANC and PNC. The PRISMA flow diagram of literature screening and selection process is shown in figure 1. One study could report more than one outcome measures or associated factors.

**Study characteristics**
As presented in table 1, 17 studies reported the association of TIBF and gender of newborn and ANC in 26146 mothers. Among these studies, 13 of them were conducted in Amhara (n=5), Oromia (n=4) and Southern Nations, Nationalities and Peoples’ (SNNP) (n=4) region. Regarding the residence status, eight studies were conducted in both urban and rural whereas six studies in urban women. All studies passed the NOS quality assessment criteria at a cut-off value ≥7.

Twenty-four studies reported the association between EBF and gender of newborn, ANC and PNC in 17819 mothers. Of these studies, 11 were conducted in Amhara and seven in SNNP region. Based on the residence status, 10 studies were conducted in urban, 8 in urban and rural, and 6 in rural women. Even though almost all studies were cross-sectional, five studies have used nationally representative data of the Ethiopian Demographic Health Survey.19-22 Detailed characteristics of the included studies are shown in table 2.

**Meta-analysis**

**Timely initiation of breast feeding**
Among the 17 selected studies, 10 studies reported the association between TIBF and gender of newborn in 16411 mothers (table 1A). The pooled OR of gender of newborn was 1.02 (95% CI 0.86 to 1.21, p=0.82, I2=66.2%) (figure 2). Mothers with male newborn had 2% higher chance of initiating breast feeding within 1 hour of birth compared with female newborn although not statistically significant. There was no significant publication bias (z=0.41, p=0.68) (online supplementary figure 1).
Likewise, 13 studies reported the association between TIBF and ANC in 12,535 mothers (table 1B). The pooled OR of ANC was 1.70 (95% CI 1.10 to 2.65, p=0.02, I²=93.1%) (figure 3). Mothers who had at least one ANC visit had 70% significantly higher chance of initiating breast feeding within 1 hour of birth compared with mothers who had no ANC visit. There was no significant publication bias (z=0.96, p=0.34) (online supplementary figure 2).

Exclusive breast feeding
Out of the 24 studies included, 11 studies reported the association between EBF and gender of newborn in 6527 mothers (table 2A). The pooled OR of newborn gender was 1.08 (95% CI 0.86 to 1.36, p=0.49, I²=71.7%) (figure 4). Since significant publication bias detected (z=-3.64, p<0.001), we did Duval and Tweedie trim-and-fill analysis and calculated a new effect size for gender of newborn (OR=1.31, 95% CI 1.01 to 1.68, p=0.04, I²=81.7%) after including imputed studies (ie, estimated number of missing studies=4) (online supplementary figure 3). Therefore, mothers with male newborn had 31% significantly higher chance of exclusive breast feeding during the first 6 months compared with mothers with female newborn.

Twenty-one studies reported the association between EBF and ANC in 16,052 mothers (table 2B). The pooled OR of ANC was 2.24 (95% CI 1.65 to 3.04, p<0.0001, I²=90.9%) (figure 5). Mothers who had at least one ANC visit had 2.24 times significantly higher chance of exclusively breast feed compared with mothers who had no ANC visit. There was no significant publication bias (z=1.69, p=0.09) (online supplementary figure 4).

Figure 1 PRISMA flow diagram of literature screening and selection process; 'n' in each stage represents the total number of studies that fulfilled particular criteria. EBF, exclusive breast feeding; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; TIBF, timely initiation of breast feeding.
<table>
<thead>
<tr>
<th>Author/publication year</th>
<th>Study area</th>
<th>Study design</th>
<th>Study population</th>
<th>Sample size/Participated</th>
<th>Factors</th>
<th>TIBF Within 1 hour</th>
<th>TIBF After 1 hour</th>
<th>TIBF Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regassa 2014</td>
<td>SNNPR, Sidama zone</td>
<td>Cross-sectional study</td>
<td>Mothers with infants aged between 0 and 6 months old</td>
<td>1100/1094</td>
<td>Male 488</td>
<td>107</td>
<td>595</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female 389</td>
<td>110</td>
<td>499</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 877</td>
<td>217</td>
<td>1094</td>
<td></td>
</tr>
<tr>
<td>Alemayehu 2014</td>
<td>Tigray, Axum town</td>
<td>Cross-sectional study</td>
<td>Mothers who had children aged 6–12 months</td>
<td>418/418</td>
<td>Male 75</td>
<td>141</td>
<td>216</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female 99</td>
<td>103</td>
<td>202</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 174</td>
<td>244</td>
<td>418</td>
<td></td>
</tr>
<tr>
<td>Berhe et al 2013</td>
<td>Tigray, Mekelle town</td>
<td>Cross-sectional study</td>
<td>Mothers of children aged 0–24 months</td>
<td>361/361</td>
<td>Male 166</td>
<td>42</td>
<td>208</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female 112</td>
<td>37</td>
<td>149</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 278</td>
<td>79</td>
<td>357</td>
<td></td>
</tr>
<tr>
<td>Beyene et al 2016</td>
<td>SNNPR, Dale Woreda</td>
<td>Cross-sectional study</td>
<td>Mothers of children &lt;24 months</td>
<td>634/634</td>
<td>Male 262</td>
<td>51</td>
<td>313</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female 255</td>
<td>50</td>
<td>305</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 517</td>
<td>101</td>
<td>618</td>
<td></td>
</tr>
<tr>
<td>Lakew et al 2015</td>
<td>National **</td>
<td>Cross-sectional study*</td>
<td>Mothers who had children &lt;5 years</td>
<td>11 654/11 553</td>
<td>Male 3124</td>
<td>2860</td>
<td>5984</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female 3057</td>
<td>2511</td>
<td>5568</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 6181</td>
<td>5371</td>
<td>11 552</td>
<td></td>
</tr>
<tr>
<td>Liben and Yesuf 2016</td>
<td>Afar, Dubti town</td>
<td>Cross-sectional study</td>
<td>Mothers of infants aged &lt;6 months</td>
<td>346/333</td>
<td>Male 81</td>
<td>122</td>
<td>203</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female 70</td>
<td>130</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 151</td>
<td>252</td>
<td>403</td>
<td></td>
</tr>
<tr>
<td>Setegn et al 2011</td>
<td>Oromia, Goba district</td>
<td>Cross-sectional study</td>
<td>Mothers with children (&lt;12 months)</td>
<td>668/608</td>
<td>Male 164</td>
<td>152</td>
<td>316</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female 150</td>
<td>133</td>
<td>283</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 314</td>
<td>285</td>
<td>599</td>
<td></td>
</tr>
<tr>
<td>Wolde et al 2014</td>
<td>Oromia, Nekemte town</td>
<td>Cross-sectional study</td>
<td>Mothers who had a child less &lt;24 months</td>
<td>182/174</td>
<td>Male 70</td>
<td>10</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female 84</td>
<td>10</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 154</td>
<td>20</td>
<td>174</td>
<td></td>
</tr>
<tr>
<td>Woldemichael 2016</td>
<td>Oromia, Tiyo Woreda</td>
<td>Cross-sectional study</td>
<td>Mothers who have children &lt;1 year age</td>
<td>386/373</td>
<td>Male 153</td>
<td>60</td>
<td>213</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female 98</td>
<td>62</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total 251</td>
<td>122</td>
<td>373</td>
<td></td>
</tr>
</tbody>
</table>

Continued
<table>
<thead>
<tr>
<th>Author/publication year</th>
<th>Study area</th>
<th>Study design</th>
<th>Study population</th>
<th>Sample size/Participated Factors</th>
<th>TIBF</th>
<th>Within 1 hour</th>
<th>After 1 hour</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mekonen et al 2018</td>
<td>Amhara, South Gondar</td>
<td>Cross-sectional study</td>
<td>Mothers of infants &lt;12 months</td>
<td>845/823</td>
<td>Male</td>
<td>214</td>
<td>229</td>
<td>443</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female</td>
<td>187</td>
<td>193</td>
<td>380</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>401</td>
<td>422</td>
<td>823</td>
</tr>
<tr>
<td>B. Antenatal care versus TIBF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gulifie and Sebsibie 2016</td>
<td>Amhara, Debre Berhan town</td>
<td>Cross-sectional study</td>
<td>Mothers having children aged &lt;23 months old</td>
<td>548/548</td>
<td>ANC</td>
<td>482</td>
<td>88</td>
<td>570</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No ANC</td>
<td>16</td>
<td>15</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>498</td>
<td>103</td>
<td>601</td>
</tr>
<tr>
<td>Tamiru et al 2012</td>
<td>Oromia, Jimma Arjo Woreda</td>
<td>Cross-sectional study</td>
<td>Mothers of index children aged 0–6 months</td>
<td>384/382</td>
<td>ANC</td>
<td>115</td>
<td>69</td>
<td>184</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No ANC</td>
<td>120</td>
<td>71</td>
<td>191</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>235</td>
<td>140</td>
<td>375</td>
</tr>
<tr>
<td>Tamiru and Tamrat 2015</td>
<td>SNNPR, Arba Minch Zuria Woreda</td>
<td>Cross-sectional study</td>
<td>Mothers of infants aged ≤2 years</td>
<td>384/384</td>
<td>ANC</td>
<td>179</td>
<td>140</td>
<td>319</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No ANC</td>
<td>40</td>
<td>24</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>219</td>
<td>164</td>
<td>383</td>
</tr>
<tr>
<td>Berhe et al 2013</td>
<td>Tigray, Mekelle town</td>
<td>Cross-sectional study</td>
<td>Mothers of children aged 0–24 months</td>
<td>361/361</td>
<td>ANC</td>
<td>263</td>
<td>66</td>
<td>329</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No ANC</td>
<td>15</td>
<td>13</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>278</td>
<td>79</td>
<td>357</td>
</tr>
<tr>
<td>Adugna 2014</td>
<td>SNNPR, Arba Minch Zuria</td>
<td>Cross-sectional study</td>
<td>Women who had children &lt;2 years</td>
<td>384/383</td>
<td>ANC</td>
<td>179</td>
<td>140</td>
<td>319</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No ANC</td>
<td>40</td>
<td>24</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>219</td>
<td>164</td>
<td>383</td>
</tr>
<tr>
<td>Beyene et al 2016</td>
<td>SNNPR, Dale Woreda</td>
<td>Cross-sectional study</td>
<td>Mothers of children &lt;24 months</td>
<td>634/634</td>
<td>ANC</td>
<td>206</td>
<td>58</td>
<td>264</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No ANC</td>
<td>311</td>
<td>43</td>
<td>354</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>517</td>
<td>101</td>
<td>618</td>
</tr>
<tr>
<td>Deso et al 2017</td>
<td>Amhara, Dabat district</td>
<td>Cross-sectional study</td>
<td>Mothers with children &lt;5 years of age</td>
<td>6761/6761</td>
<td>ANC</td>
<td>2135</td>
<td>2220</td>
<td>4355</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No ANC</td>
<td>670</td>
<td>1364</td>
<td>2034</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>2805</td>
<td>3584</td>
<td>6389</td>
</tr>
<tr>
<td>Liben and Yesuf 2015</td>
<td>Afar, Dubti town</td>
<td>Cross-sectional study</td>
<td>Mothers of infants aged &lt;6 months</td>
<td>346/333</td>
<td>ANC</td>
<td>110</td>
<td>196</td>
<td>306</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No ANC</td>
<td>41</td>
<td>56</td>
<td>97</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>151</td>
<td>252</td>
<td>403</td>
</tr>
</tbody>
</table>

Continued
<table>
<thead>
<tr>
<th>Author/publication year</th>
<th>Study area</th>
<th>Study design</th>
<th>Study population</th>
<th>Sample size/Participated</th>
<th>Factors</th>
<th>TIBF Within 1 hour</th>
<th>TIBF After 1 hour</th>
<th>TIBF Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seid et al 2013(^{31})</td>
<td>Amhara, Bahir Dar city</td>
<td>Cross-sectional</td>
<td>Mothers who delivered in the last 12 months</td>
<td>819/819</td>
<td>ANC</td>
<td>680</td>
<td>94</td>
<td>774</td>
</tr>
<tr>
<td></td>
<td></td>
<td>study</td>
<td></td>
<td></td>
<td>No ANC</td>
<td>29</td>
<td>12</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>709</td>
<td>106</td>
<td>815</td>
</tr>
<tr>
<td>Setegn et al 2011(^{31})</td>
<td>Oromia, Goba district</td>
<td>Cross-sectional</td>
<td>Mothers with children (&lt;12 months)</td>
<td>668/608</td>
<td>ANC</td>
<td>270</td>
<td>238</td>
<td>508</td>
</tr>
<tr>
<td></td>
<td></td>
<td>study</td>
<td></td>
<td></td>
<td>No ANC</td>
<td>37</td>
<td>19</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>307</td>
<td>257</td>
<td>564</td>
</tr>
<tr>
<td>Tewabe 2016(^{40})</td>
<td>Amhara, Motta town</td>
<td>Cross-sectional</td>
<td>Mothers with infant &lt;6 months-old</td>
<td>423/405</td>
<td>ANC</td>
<td>282</td>
<td>41</td>
<td>323</td>
</tr>
<tr>
<td></td>
<td></td>
<td>study</td>
<td></td>
<td></td>
<td>No ANC</td>
<td>37</td>
<td>45</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>319</td>
<td>86</td>
<td>405</td>
</tr>
<tr>
<td>Woldemichael 2016(^{31})</td>
<td>Oromia, Tiyo Woreda</td>
<td>Cross-sectional</td>
<td>Mothers who have children &lt;1 year age</td>
<td>386/373</td>
<td>ANC</td>
<td>194</td>
<td>41</td>
<td>235</td>
</tr>
<tr>
<td></td>
<td></td>
<td>study</td>
<td></td>
<td></td>
<td>No ANC</td>
<td>57</td>
<td>81</td>
<td>138</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>251</td>
<td>122</td>
<td>373</td>
</tr>
<tr>
<td>Mekonen et al 2018(^{34})</td>
<td>Amhara, South Gondar</td>
<td>Cross-sectional</td>
<td>Mothers of infants &lt;12 months</td>
<td>845/823</td>
<td>ANC</td>
<td>370</td>
<td>332</td>
<td>702</td>
</tr>
<tr>
<td></td>
<td></td>
<td>study</td>
<td></td>
<td></td>
<td>No ANC</td>
<td>31</td>
<td>90</td>
<td>121</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>401</td>
<td>422</td>
<td>823</td>
</tr>
</tbody>
</table>

*Used nationally representative EDHS data.

ANC, antenatal care; EDHS, Ethiopian Demographic Health Survey; SNNPR, Southern Nations, Nationalities and Peoples’ Region; TIBF, timely initiation of breast feeding.
Table 2  Characteristics of included studies on EBF

<table>
<thead>
<tr>
<th>Author/publication year</th>
<th>Study area</th>
<th>Study design</th>
<th>Study population</th>
<th>Sample size/ Participated</th>
<th>Factors</th>
<th>EBF</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Gender of newborn versus EBF</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asemahagn 2016</td>
<td>Amhara, Azezo district</td>
<td>Cross-sectional study</td>
<td>Women having children aged from 0 to 6 months</td>
<td>346/332</td>
<td>Male</td>
<td>95</td>
<td>38</td>
<td>133</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female</td>
<td>167</td>
<td>32</td>
<td>199</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>262</td>
<td>70</td>
<td>332</td>
<td></td>
</tr>
<tr>
<td>Setegn et al 2012</td>
<td>Oromia, Bale Zone, Goba district</td>
<td>Cross-sectional study</td>
<td>Mothers–infant pairs</td>
<td>668/608</td>
<td>Male</td>
<td>107</td>
<td>43</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female</td>
<td>92</td>
<td>37</td>
<td>129</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>199</td>
<td>80</td>
<td>279</td>
<td></td>
</tr>
<tr>
<td>Sonko and Worku 2015</td>
<td>SNNPR, Halaba special woreda</td>
<td>Cross-sectional study</td>
<td>Mothers with children &lt;6 months of age</td>
<td>422/420</td>
<td>Male</td>
<td>145</td>
<td>60</td>
<td>205</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female</td>
<td>151</td>
<td>64</td>
<td>215</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>296</td>
<td>124</td>
<td>420</td>
<td></td>
</tr>
<tr>
<td>Regassa 2014</td>
<td>SNNPR, Sidama zone</td>
<td>Cross-sectional study</td>
<td>With infants aged between 0 and 6 months old</td>
<td>1100/1094</td>
<td>Male</td>
<td>109</td>
<td>19</td>
<td>128</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female</td>
<td>89</td>
<td>17</td>
<td>106</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>198</td>
<td>36</td>
<td>234</td>
<td></td>
</tr>
<tr>
<td>Alemayehu 2014</td>
<td>Tigray, Axum town</td>
<td>Cross-sectional study</td>
<td>Mothers who had children aged 6–12 months</td>
<td>418/418</td>
<td>Male</td>
<td>97</td>
<td>119</td>
<td>216</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female</td>
<td>77</td>
<td>128</td>
<td>205</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>174</td>
<td>247</td>
<td>421</td>
<td></td>
</tr>
<tr>
<td>Bikis et al 2015</td>
<td>Amhara, Dabat district</td>
<td>Nested case–control study*</td>
<td>All pregnant women in the second/third trimester</td>
<td>1769/1769</td>
<td>Male</td>
<td>271</td>
<td>619</td>
<td>890</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female</td>
<td>727</td>
<td>1148</td>
<td>1875</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>998</td>
<td>1767</td>
<td>2765</td>
<td></td>
</tr>
<tr>
<td>Arage and Gedamu 2016</td>
<td>Amhara, Debre Tabor Town</td>
<td>Cross-sectional study</td>
<td>Mothers of infants &lt;6 months of age</td>
<td>470/453</td>
<td>Male</td>
<td>119</td>
<td>40</td>
<td>159</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female</td>
<td>227</td>
<td>67</td>
<td>294</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>346</td>
<td>107</td>
<td>453</td>
<td></td>
</tr>
<tr>
<td>Adugna et al 2017</td>
<td>SNNPR, Hawassa city</td>
<td>Cross-sectional study</td>
<td>Mothers with infants aged 0–6 months</td>
<td>541/529</td>
<td>Male</td>
<td>169</td>
<td>88</td>
<td>257</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female</td>
<td>153</td>
<td>119</td>
<td>272</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>322</td>
<td>207</td>
<td>529</td>
<td></td>
</tr>
<tr>
<td>Egata et al 2013</td>
<td>Oromia, Kersa district</td>
<td>Cross-sectional study*</td>
<td>Mothers of children &lt;2 years of age</td>
<td>881/860</td>
<td>Male</td>
<td>323</td>
<td>124</td>
<td>447</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female</td>
<td>294</td>
<td>119</td>
<td>413</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>617</td>
<td>243</td>
<td>860</td>
<td></td>
</tr>
<tr>
<td>Teka et al 2015</td>
<td>Tigray, Enderta Woreda</td>
<td>Cross-sectional study</td>
<td>Mothers having children aged &lt;24 months</td>
<td>541/530</td>
<td>Male</td>
<td>158</td>
<td>60</td>
<td>218</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female</td>
<td>214</td>
<td>98</td>
<td>312</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>372</td>
<td>158</td>
<td>530</td>
<td></td>
</tr>
</tbody>
</table>

Continued
<table>
<thead>
<tr>
<th>Author/publication year</th>
<th>Study area</th>
<th>Study design</th>
<th>Study population</th>
<th>Sample size/ Participated</th>
<th>Factors</th>
<th>EBF</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sefene 2013&lt;sup&gt;50&lt;/sup&gt;</td>
<td>Amhara, Bahir Dar city</td>
<td>Cross-sectional study</td>
<td>Mothers who had a child aged &lt;6 months</td>
<td>170/159</td>
<td>Male</td>
<td>36</td>
<td>47</td>
<td>83</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Female</td>
<td>42</td>
<td>34</td>
<td>76</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>78</td>
<td>81</td>
<td>159</td>
<td></td>
</tr>
<tr>
<td>B. Antenatal care versus EBF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asemahagn 2016&lt;sup&gt;42&lt;/sup&gt;</td>
<td>Amhara, Azezo district</td>
<td>Cross-sectional study</td>
<td>Women having children aged from 0 to 6 months</td>
<td>346/332</td>
<td>ANC</td>
<td>243</td>
<td>57</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No ANC</td>
<td>19</td>
<td>13</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>262</td>
<td>70</td>
<td>332</td>
<td></td>
</tr>
<tr>
<td>Gultie and Sebsibie 2016&lt;sup&gt;35&lt;/sup&gt;</td>
<td>Amhara, Debre Berhan town</td>
<td>Cross-sectional study</td>
<td>Mothers having children aged &lt;23 months old</td>
<td>548/548</td>
<td>ANC</td>
<td>263</td>
<td>253</td>
<td>516</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No ANC</td>
<td>10</td>
<td>21</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>273</td>
<td>274</td>
<td>547</td>
<td></td>
</tr>
<tr>
<td>Hunegnaw et al 2017&lt;sup&gt;50&lt;/sup&gt;</td>
<td>Amhara, Gozamin district</td>
<td>Cross-sectional study</td>
<td>Mothers who had infants aged between 6 and 12 months</td>
<td>506/478</td>
<td>ANC</td>
<td>341</td>
<td>109</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No ANC</td>
<td>17</td>
<td>11</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>358</td>
<td>120</td>
<td>478</td>
<td></td>
</tr>
<tr>
<td>Lenja et al 2016&lt;sup&gt;53&lt;/sup&gt;</td>
<td>SNNPR, Offa district</td>
<td>Cross-sectional study</td>
<td>Mothers of infants &lt;6 months</td>
<td>403/396</td>
<td>ANC</td>
<td>233</td>
<td>43</td>
<td>276</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No ANC</td>
<td>44</td>
<td>88</td>
<td>132</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>277</td>
<td>131</td>
<td>408</td>
<td></td>
</tr>
<tr>
<td>Seid et al 2013&lt;sup&gt;51&lt;/sup&gt;</td>
<td>Amhara, Bahir Dar city</td>
<td>Cross-sectional study</td>
<td>Mothers who delivered in the last 12 months</td>
<td>819/819</td>
<td>ANC</td>
<td>405</td>
<td>372</td>
<td>777</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No ANC</td>
<td>7</td>
<td>35</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>412</td>
<td>407</td>
<td>819</td>
<td></td>
</tr>
<tr>
<td>Setegn et al 2011&lt;sup&gt;31&lt;/sup&gt;</td>
<td>Oromia, Goba district</td>
<td>Cross-sectional study</td>
<td>Mothers with children (&lt;12 months)</td>
<td>668/608</td>
<td>ANC</td>
<td>166</td>
<td>65</td>
<td>231</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No ANC</td>
<td>27</td>
<td>10</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>193</td>
<td>75</td>
<td>268</td>
<td></td>
</tr>
<tr>
<td>Sonko and Worku 2015&lt;sup&gt;44&lt;/sup&gt;</td>
<td>SNNPR, Halaba special woreda</td>
<td>Cross-sectional study</td>
<td>Mothers with children &lt;6 months of age</td>
<td>422/420</td>
<td>ANC</td>
<td>258</td>
<td>88</td>
<td>346</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No ANC</td>
<td>38</td>
<td>36</td>
<td>74</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>296</td>
<td>124</td>
<td>420</td>
<td></td>
</tr>
<tr>
<td>Tadesse et al 2016&lt;sup&gt;54&lt;/sup&gt;</td>
<td>SNNPR, Sorro District</td>
<td>Cross-sectional Study</td>
<td>Mothers with infants aged 0–5 months</td>
<td>602/579</td>
<td>ANC</td>
<td>211</td>
<td>121</td>
<td>332</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No ANC</td>
<td>59</td>
<td>123</td>
<td>182</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>270</td>
<td>244</td>
<td>514</td>
<td></td>
</tr>
<tr>
<td>Tariku et al 2017&lt;sup&gt;55&lt;/sup&gt;</td>
<td>Amhara, Dabat District</td>
<td>Cross-sectional study *</td>
<td>Mothers with children aged &lt;59 months</td>
<td>5227/5227</td>
<td>ANC</td>
<td>1979</td>
<td>1353</td>
<td>3332</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No ANC</td>
<td>713</td>
<td>876</td>
<td>1589</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>2692</td>
<td>2229</td>
<td>4921</td>
<td></td>
</tr>
</tbody>
</table>

Table 2 Continued
<table>
<thead>
<tr>
<th>Author/publication year</th>
<th>Study area</th>
<th>Study design</th>
<th>Study population</th>
<th>Sample size/Participated</th>
<th>Factors</th>
<th>EBF Yes</th>
<th>EBF No</th>
<th>EBF Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tewabe 2016</td>
<td>Amhara, Motta town, East Gojjam zone</td>
<td>Cross-sectional study</td>
<td>Mothers with an infant &lt;6 months old</td>
<td>423/405</td>
<td>ANC 185 No ANC 18</td>
<td>164 56</td>
<td>349</td>
<td></td>
</tr>
<tr>
<td>Tamiru et al 2012</td>
<td>Oromia, Jimma Arjo Woreda</td>
<td>Cross-sectional study</td>
<td>Mothers of index children aged 0–6 months</td>
<td>384/382</td>
<td>ANC 87 No ANC 96</td>
<td>103 192</td>
<td>405</td>
<td></td>
</tr>
<tr>
<td>Tamiru and Tamrat 2015</td>
<td>SNNPR, Arba Minch Zuria Woreda</td>
<td>Cross-sectional study</td>
<td>Mothers of infants aged ≤2 years</td>
<td>384/384</td>
<td>ANC 228 No ANC 27</td>
<td>92 64</td>
<td>320</td>
<td></td>
</tr>
<tr>
<td>Biks et al 2015</td>
<td>Amhara, Dabat district</td>
<td>Nested case-control study*</td>
<td>All pregnant women in the second/third trimester</td>
<td>1769/1769</td>
<td>ANC 180 No ANC 363</td>
<td>277 1312</td>
<td>1495</td>
<td></td>
</tr>
<tr>
<td>Abera 2012</td>
<td>Harari, Harar town</td>
<td>Cross-sectional study</td>
<td>Mothers of children aged ≤2 years</td>
<td>604/583</td>
<td>ANC 194 No ANC 13</td>
<td>163 42</td>
<td>357</td>
<td></td>
</tr>
<tr>
<td>Arage and Gedamu 2016</td>
<td>Amhara, Debre Tabor Town</td>
<td>Cross-sectional study</td>
<td>Mothers of infants &lt;6 months of age</td>
<td>470/453</td>
<td>ANC 384 No ANC 18</td>
<td>39 30</td>
<td>423</td>
<td></td>
</tr>
<tr>
<td>Adugna et al 2017</td>
<td>SNNPR, Hawassa city</td>
<td>Cross-sectional study</td>
<td>Mothers with infants aged 0–6 months</td>
<td>541/529</td>
<td>ANC 221 No ANC 101</td>
<td>111 197</td>
<td>322</td>
<td></td>
</tr>
<tr>
<td>Egata et al 2013</td>
<td>Oromia, Kersa district</td>
<td>Cross-sectional study*</td>
<td>Mothers of children &lt;2 years of age</td>
<td>881/860</td>
<td>ANC 233 No ANC 384</td>
<td>135 492</td>
<td>668</td>
<td></td>
</tr>
<tr>
<td>Taddele 2014</td>
<td>Amhara, Injibara Town</td>
<td>Comparative cross-sectional study</td>
<td>Employed and unemployed mothers of children aged ≤1 year</td>
<td>524/473</td>
<td>ANC 90 No ANC 6</td>
<td>98 29</td>
<td>187</td>
<td></td>
</tr>
<tr>
<td>Echamo 2012</td>
<td>SNNPR, Arbaminch town</td>
<td>Cross-sectional study</td>
<td>Mothers of infants within the age of 6–12 months</td>
<td>768/768</td>
<td>ANC 332 No ANC 25</td>
<td>360 76</td>
<td>692</td>
<td></td>
</tr>
</tbody>
</table>

Continued
<table>
<thead>
<tr>
<th>Author/publication year</th>
<th>Study area</th>
<th>Study design</th>
<th>Study population</th>
<th>Sample size/ Participated</th>
<th>Factors</th>
<th>EBF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teka et al 2015</td>
<td>Tigray, Enderta Woreda</td>
<td>Cross-sectional study</td>
<td>Mothers having children aged &lt;24 months</td>
<td>541/530</td>
<td>ANC</td>
<td>325</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No ANC</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>372</td>
</tr>
<tr>
<td>Chekol et al 2017</td>
<td>Amhara, Gonder town</td>
<td>Cross-sectional study</td>
<td>Mothers with children aged 7–12 months</td>
<td>333/333</td>
<td>ANC</td>
<td>131</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No ANC</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>160</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### C. Postnatal care versus EBF

<table>
<thead>
<tr>
<th>Author/publication year</th>
<th>Study area</th>
<th>Study design</th>
<th>Study population</th>
<th>Sample size/ Participated</th>
<th>Factors</th>
<th>EBF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asemahagn 2016</td>
<td>Amhara, Azezo district</td>
<td>Cross-sectional study</td>
<td>Women having children aged from 0 to 6 months</td>
<td>346/332</td>
<td>PNC</td>
<td>137</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No PNC</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>262</td>
</tr>
<tr>
<td>Lenja et al 2016</td>
<td>SNNPR, Offa district</td>
<td>Cross-sectional study</td>
<td>Mothers of infants &lt;6 months</td>
<td>403/396</td>
<td>PNC</td>
<td>188</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No PNC</td>
<td>121</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>309</td>
</tr>
<tr>
<td>Sonko and Worku 2015</td>
<td>SNNPR, Halaba special woreda</td>
<td>Cross-sectional study</td>
<td>Mothers with children &lt;6 months of age</td>
<td>422/420</td>
<td>PNC</td>
<td>98</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No PNC</td>
<td>197</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>295</td>
</tr>
<tr>
<td>Tadesse et al 2016</td>
<td>SNNPR, Sorro District</td>
<td>Cross-sectional Study</td>
<td>Mothers with infants aged 0–5 months</td>
<td>602/579</td>
<td>PNC</td>
<td>204</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No PNC</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>270</td>
</tr>
<tr>
<td>Tewabe et al 2016</td>
<td>Amhara, Motta town, East Gojjam zone</td>
<td>Cross-sectional Study</td>
<td>Mothers with an infant &lt;6 months old</td>
<td>423/405</td>
<td>PNC</td>
<td>116</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No PNC</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>203</td>
</tr>
<tr>
<td>Abera 2012</td>
<td>Harari, Harar town</td>
<td>Cross-sectional study</td>
<td>Mothers of children aged &lt;2 years</td>
<td>604/583</td>
<td>PNC</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No PNC</td>
<td>178</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>207</td>
</tr>
<tr>
<td>Teka et al 2015</td>
<td>Tigray, Enderta woreda</td>
<td>Cross-sectional study</td>
<td>Mothers having children aged &lt;24 months</td>
<td>541/530</td>
<td>PNC</td>
<td>167</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No PNC</td>
<td>205</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>372</td>
</tr>
</tbody>
</table>

*Used nationally representative EDHS data.
ANC, antenatal care; EBF, exclusive breast feeding; EDHS, Ethiopian Demographic Health Survey; PNC, postnatal care; SNNPR, Southern Nations, Nationalities and Peoples’ Region.
Furthermore, seven studies reported the association between EBF and PNC in 2995 mothers (table 2C). The pooled OR of PNC was 1.86 (95% CI 1.41 to 2.47, p<0.0001, I²=63.4%) (figure 6). Mothers who had at least one PNC visit had 86% significantly higher chance of exclusively breast feed during the first 6 months compared with mothers who had no PNC.

### Table 2C

<table>
<thead>
<tr>
<th>Studies and Publication Year</th>
<th>Male</th>
<th>Male</th>
<th>Female</th>
<th>Female</th>
<th>Odds Ratio [95% CI]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regassa, 2014</td>
<td>488</td>
<td>107</td>
<td>389</td>
<td>110</td>
<td>1.29 [0.96, 1.74]</td>
</tr>
<tr>
<td>Alemayehu et al., 2014</td>
<td>75</td>
<td>141</td>
<td>99</td>
<td>103</td>
<td>0.55 [0.37, 0.82]</td>
</tr>
<tr>
<td>Berhe et al., 2013</td>
<td>166</td>
<td>42</td>
<td>112</td>
<td>37</td>
<td>1.31 [0.79, 2.16]</td>
</tr>
<tr>
<td>Beyene et al., 2017</td>
<td>262</td>
<td>51</td>
<td>255</td>
<td>50</td>
<td>1.01 [0.66, 1.54]</td>
</tr>
<tr>
<td>Lakev et al., 2015</td>
<td>3124</td>
<td>2865</td>
<td>3057</td>
<td>2511</td>
<td>0.90 [0.83, 0.97]</td>
</tr>
<tr>
<td>Liben et al., 2015</td>
<td>81</td>
<td>122</td>
<td>70</td>
<td>130</td>
<td>1.23 [0.82, 1.85]</td>
</tr>
<tr>
<td>Setegn et al., 2011</td>
<td>164</td>
<td>152</td>
<td>150</td>
<td>133</td>
<td>0.96 [0.69, 1.32]</td>
</tr>
<tr>
<td>Woldu et al., 2014</td>
<td>70</td>
<td>10</td>
<td>84</td>
<td>10</td>
<td>0.83 [0.33, 2.12]</td>
</tr>
<tr>
<td>Woldeamlashew et al., 2016</td>
<td>153</td>
<td>60</td>
<td>98</td>
<td>62</td>
<td>1.61 [1.04, 2.50]</td>
</tr>
<tr>
<td>Melkonen et al., 2018</td>
<td>214</td>
<td>229</td>
<td>187</td>
<td>193</td>
<td>0.98 [0.73, 1.32]</td>
</tr>
</tbody>
</table>

Summary

REM test for heterogeneity (Q = 22.28, df = 9, p = 0.01, I² = 66.2%).

**Figure 2** Forest plot of the unadjusted odds ratios with corresponding 95% CIs of 10 studies on the association of gender of newborn and TIBF. The horizontal line represents the CI, the box and its size in the middle of the horizontal line represents the weight of sample size. The polygon represents the pooled OR. The reference category is ‘Female’. LIBF, late initiation of breast feeding; REM, random-effects model; TIBF, timely initiation of breast feeding.

**Figure 3** Forest plot of the unadjusted odds ratios with corresponding 95% CIs of 13 studies on the association of ANC and TIBF. The horizontal line represents the CI, the box and its size in the middle of the horizontal line represents the weight of sample size. The polygon represents the pooled OR. The reference category is ‘No ANC follow-up’. ANC, antenatal care; LIBF, late initiation of breast feeding; REM, random-effects model; TIBF, timely initiation of breast feeding.

**Figure 4** Forest plot of the unadjusted odds ratios with corresponding 95% CIs of 11 studies on the association of newborn gender and EBF. The horizontal line represents the CI, the box and its size in the middle of the horizontal line represents the weight of sample size. The polygon represents the pooled OR. The reference category is ‘Female’. EBF, exclusive breast feeding; NEBF, non-exclusive of breast feeding; REM, random-effects model.

**Figure 5** Forest plot of the unadjusted odds ratios with corresponding 95% CIs of 21 studies on the association of ANC and EBF. The horizontal line represents the CI, the box and its size in the middle of the horizontal line represents the weight of sample size. The polygon represents the pooled OR. The reference category is ‘No ANC follow-up’. ANC, antenatal care; EBF, exclusive breast feeding; NEBF, non-exclusive of breast feeding; REM, random-effects model.
follow-up. There was no significant publication bias (z=−0.91, p=0.36) (online supplementary figure 5).

**Cumulative meta-analysis**

As illustrated in figure 7, the effect of gender of newborn (figure 7) has not been changed whereas the effect of ANC on TIBF (figure 8) has been increasing over time.

Similarly, the effect of gender of newborn on EBF (figure 9) has not been changed over time. The effect of ANC (figure 10) and PNC (figure 11) have been increasing.

**Meta-regression analysis**

In studies reporting the association between TIBF and ANC, 26.29% of the heterogeneity was accounted for the variation in study area (region), residence of mothers, sample size and publication year. Based on the omnibus test of moderators, however, none of these factors influenced association between TIBF and ANC (Q_M=11.57, df=8, p=0.17). In studies reporting the association between TIBF and gender of newborn, the estimated amount of total heterogeneity was substantially low (τ²=4.28%).
as a result, it is not relevant to investigate the possible reasons for heterogeneity.

Among studies reporting the association between EBF and gender of newborn, ANC and PNC, 77.66%, 60.29% and 100% of the heterogeneity were accounted for the variation in study area (region), residence of mothers, sample size and publication year, respectively. Based on the omnibus test of moderators, study area (region) and publication year negatively influenced the association between gender of newborn and EBF practice (Q\text{het}=18.46, df=7, p=0.01). Study area (region) negatively influenced the association between ANC and EBF practice (Q\text{het}=27.55, df=8, p=0.001) (table 3).

**DISCUSSION**

This meta-analysis assessed the association between breastfeeding practices (ie, TIBF and EBF) and gender of newborn, ANC and PNC. The key findings were EBF was significantly associated with ANC, PNC and gender of newborn whereas TIBF was significantly associated with ANC but not with gender of newborn.

In congruent with our hypothesis and the large body of global evidence, our finding indicated that mothers who had at least one antenatal visit had a significantly higher chance of initiating breast feeding within 1 hour of birth and exclusively breast feed for the first 6 months compared with mothers who had no ANC visit. This may be because health professionals provide breastfeeding guidance and counselling during ANC visit. The Ethiopian Ministry of Health has also adopted Baby-Friendly Hospital Initiative programme as part of the national nutrition programme and is now actively working to integrate to all public and private health facilities and improving breastfeeding practice as a result.

We also showed that mothers who had at least one PNC visit had nearly twice higher chance of exclusively breast feeding during the first 6 months compared with mothers who had no PNC follow-up. This result supported our hypothesis, and various studies have similarly reported a significantly high rate of EBF in mothers who had a postnatal visit at health institution or postnatal home visit. The possible justification could be that postnatal visit health education may positively influence the belief and decision of the mothers to exclusively breast feed. Previous studies have also shown that postnatal education and counselling are important to increase EBF practice. In addition, in our previous meta-analyses, we showed that guidance and counselling during PNC was significantly associated with high-rate EBF. Furthermore, PNC may ease breastfeeding difficulty, increase maternal confidence and encourage social/family support which lead the mother to continue EBF for 6 months.

Finally, in agreement with our hypothesis and previous studies, we uncovered gender of newborn was significantly associated with EBF practice. Mothers with male newborn had a 31% significantly higher chance of exclusively breast feeding during the first 6 months compared with mothers of female newborn. This finding disproved the traditional perception and belief in Ethiopia that male newborn has prelacteal feeding to be strong and healthy compared with female newborn. On the other hand, several studies depicted that gender of newborn is not significantly associated with breastfeeding practice, such as TIBF as we showed in our meta-analysis. This discrepancy might be due to the sociocultural difference and lack of adequate power given that we only found 10 studies to estimate the pooled effect size.

This systematic review and meta-analysis was conducted based on published protocol, and PRISMA guideline for literature reviews. In addition, publication bias was quantified using Egger’s regression statistical test and NOS was used to assess the quality of included studies. Since it is

**Figure 10** Forest plot showing the results from a cumulative meta-analysis of studies examining the effect of ANC on EBF. ANC, antenatal care; EBF, exclusive breast feeding.

**Figure 11** Forest plot showing the results from a cumulative meta-analysis of studies examining the effect of PNC on EBF. EBF, exclusive breast feeding; PNC, postnatal care.
the first study in Ethiopia, the evidence could be helpful for future researchers, public health practitioners and healthcare policy-makers. The inclusion of all previously published studies is a further strength of this meta-analysis. This study has limitations as well. Almost all included studies were observational, which weakens the strength of evidence and hinders causality inference. Even though we have used broad search strategies, the possibility of missing relevant studies cannot be fully exempted and the finding may not be nationally representative. Based on the conventional method of heterogeneity test, a few analyses suffer from high between-study variation. The course of heterogeneity was carefully explored using meta-regression analysis, and this variation may be due to the difference in study area (region), residence of mothers, sample size, publication year or other residual factors.

### Table 3  Meta-regression analysis to identify possible factors of heterogeneity among the included studies

<table>
<thead>
<tr>
<th>Variables (reference category)*</th>
<th>Estimate</th>
<th>SE</th>
<th>Z value</th>
<th>P value</th>
<th>CI lb</th>
<th>CI ub</th>
</tr>
</thead>
<tbody>
<tr>
<td>TIBF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amhara region (Afar)</td>
<td>1.71</td>
<td>1.17</td>
<td>1.46</td>
<td>0.15</td>
<td>−0.59</td>
<td>4.01</td>
</tr>
<tr>
<td>Oromia region (Afar)</td>
<td>1.48</td>
<td>0.91</td>
<td>1.62</td>
<td>0.10</td>
<td>−0.31</td>
<td>3.28</td>
</tr>
<tr>
<td>SNNPR region (Afar)</td>
<td>0.54</td>
<td>1.09</td>
<td>0.50</td>
<td>0.62</td>
<td>−1.58</td>
<td>2.67</td>
</tr>
<tr>
<td>Tigray region (Afar)</td>
<td>1.58</td>
<td>1.30</td>
<td>1.21</td>
<td>0.23</td>
<td>−0.97</td>
<td>4.12</td>
</tr>
<tr>
<td>Urban residence (Rural)</td>
<td>0.71</td>
<td>1.07</td>
<td>0.67</td>
<td>0.51</td>
<td>−1.38</td>
<td>2.80</td>
</tr>
<tr>
<td>Urban and rural residence (Rural)</td>
<td>0.65</td>
<td>1.25</td>
<td>0.52</td>
<td>0.61</td>
<td>−1.81</td>
<td>3.10</td>
</tr>
<tr>
<td>≥500 mothers (≤500 mothers)</td>
<td>−0.54</td>
<td>0.81</td>
<td>−0.66</td>
<td>0.51</td>
<td>−2.13</td>
<td>1.06</td>
</tr>
<tr>
<td>Published 2016–2018 (2011–2015)</td>
<td>0.14</td>
<td>0.82</td>
<td>0.17</td>
<td>0.87</td>
<td>−1.47</td>
<td>1.74</td>
</tr>
<tr>
<td>EBF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender of newborn</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oromia region (Amhara)</td>
<td>−0.54</td>
<td>0.24</td>
<td>−2.22</td>
<td>0.03</td>
<td>−1.02</td>
<td>−0.06</td>
</tr>
<tr>
<td>SNNPR region (Amhara)</td>
<td>0.12</td>
<td>0.26</td>
<td>0.46</td>
<td>0.64</td>
<td>−0.39</td>
<td>0.63</td>
</tr>
<tr>
<td>Tigray region (Amhara)</td>
<td>−0.39</td>
<td>0.30</td>
<td>−1.31</td>
<td>0.19</td>
<td>−0.98</td>
<td>0.19</td>
</tr>
<tr>
<td>Urban residence (Rural)</td>
<td>0.79</td>
<td>0.51</td>
<td>1.57</td>
<td>0.12</td>
<td>−0.20</td>
<td>1.78</td>
</tr>
<tr>
<td>Urban and rural residence (Rural)</td>
<td>−0.10</td>
<td>0.44</td>
<td>−0.24</td>
<td>0.81</td>
<td>−0.96</td>
<td>0.75</td>
</tr>
<tr>
<td>≥500 mothers (≤500 mothers)</td>
<td>0.78</td>
<td>0.23</td>
<td>3.34</td>
<td>&lt;0.001</td>
<td>0.32</td>
<td>1.24</td>
</tr>
<tr>
<td>Published 2016–2018 (2011–2015)</td>
<td>−1.14</td>
<td>0.44</td>
<td>−2.59</td>
<td>0.01</td>
<td>−1.99</td>
<td>−0.28</td>
</tr>
<tr>
<td>ANC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harari region (Amhara)</td>
<td>−0.11</td>
<td>0.64</td>
<td>−0.17</td>
<td>0.87</td>
<td>−1.37</td>
<td>1.16</td>
</tr>
<tr>
<td>Oromia region (Amhara)</td>
<td>−1.27</td>
<td>0.39</td>
<td>−3.28</td>
<td>0.001</td>
<td>−2.03</td>
<td>−0.51</td>
</tr>
<tr>
<td>SNNPR region (Amhara)</td>
<td>0.09</td>
<td>0.35</td>
<td>0.27</td>
<td>0.78</td>
<td>−0.59</td>
<td>0.78</td>
</tr>
<tr>
<td>Tigray region (Amhara)</td>
<td>−0.49</td>
<td>0.57</td>
<td>−0.87</td>
<td>0.38</td>
<td>−1.60</td>
<td>0.62</td>
</tr>
<tr>
<td>Urban residence (Rural)</td>
<td>−0.18</td>
<td>0.38</td>
<td>−0.47</td>
<td>0.63</td>
<td>−0.92</td>
<td>0.56</td>
</tr>
<tr>
<td>Urban and rural residence (Rural)</td>
<td>−0.26</td>
<td>0.52</td>
<td>−0.49</td>
<td>0.62</td>
<td>−1.28</td>
<td>0.76</td>
</tr>
<tr>
<td>≥500 mothers (≤500 mothers)</td>
<td>−0.30</td>
<td>0.34</td>
<td>−0.87</td>
<td>0.38</td>
<td>−0.96</td>
<td>0.37</td>
</tr>
<tr>
<td>Published 2016–2018 (2011–2015)</td>
<td>0.08</td>
<td>0.28</td>
<td>0.29</td>
<td>0.77</td>
<td>−0.46</td>
<td>0.62</td>
</tr>
<tr>
<td>PNC†</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harari region (Amhara)</td>
<td>−0.60</td>
<td>0.48</td>
<td>−1.24</td>
<td>0.22</td>
<td>−1.54</td>
<td>0.35</td>
</tr>
<tr>
<td>SNNPR region (Amhara)</td>
<td>0.25</td>
<td>0.30</td>
<td>0.82</td>
<td>0.41</td>
<td>−0.34</td>
<td>0.83</td>
</tr>
<tr>
<td>Tigray region (Amhara)</td>
<td>−0.16</td>
<td>0.64</td>
<td>−0.25</td>
<td>0.80</td>
<td>−1.42</td>
<td>1.10</td>
</tr>
<tr>
<td>≥500 mothers (≤500 mothers)</td>
<td>0.11</td>
<td>0.31</td>
<td>0.36</td>
<td>0.72</td>
<td>−0.50</td>
<td>0.73</td>
</tr>
<tr>
<td>Published 2016–2018 (2011–2015)</td>
<td>0.26</td>
<td>0.36</td>
<td>0.71</td>
<td>0.47</td>
<td>−0.45</td>
<td>0.96</td>
</tr>
</tbody>
</table>

*Since we do not have a specific hypothesis, the reference category is selected arbitrarily; †Residence is dropped from the model due to small sample size of included studies. Cut-off value for sample size and publication year was arbitrarily chosen.

ANC, antenatal care; CI lb, CI interval, lower bound; CI ub, CI interval, upper bound; EBF, exclusive breast feeding; PNC, postnatal care; SNNPR, Southern Nations, Nationalities and Peoples’ Region; TIBF, timely initiation of breast feeding.
factors; therefore, the result should be interpreted with caution. Moreover, the dose–response relationship between the number of ANC or PNC visits and breastfeeding practices was not examined. Lastly, significant publication bias was detected in studies that reported the association between EBF and gender of newborn. We did Duval and Tweedie trim-and-fill analysis to adjust publication bias and to provide an unbiased estimate; however, the result should be cautiously interpreted.

CONCLUSIONS

In line with our hypothesis, we found that increasing the use of antenatal and PNC has a positive effect on breastfeeding practices (ie, TIBF and EBF), which signifies stakeholders would provide emphasis on ANC and PNC service to optimise breast feeding. This meta-analysis study provided an overview of up-to-date evidence for public nutrition professionals and policy-makers in Ethiopia. It could also be useful for breastfeeding improvement initiative in Ethiopia and cross-country and cross-cultural comparison. From the research point of view, in general, intervention and outcome based studies on breast feeding in Ethiopia are required.

Author affiliations
1Department of Nursing, Debre Berhan University, Debre Berhan, Ethiopia
2Department of Epidemiology, University Medical Center Groningen, University of Groningen, Groningen, The Netherlands
3Department of Public Health, University Medical Center Groningen, University of Groningen, Groningen, The Netherlands

Acknowledgements
Our special gratitude forwarded to Sjojke van der Werf (University of Groningen, the Netherlands) for her support to develop the search strings and Balewgizie Sileshi (University of Groningen, the Netherlands) for his support during the title and abstract screening.

Contributors
NTS and TDH conceived and designed the study. TDH developed a systematic review and synthesis of studies in the past 10 years. NTS and Balewgizie Sileshi (University of Groningen, the Netherlands) for his attitude forwarded to Sjoukje van der Werf (University of Groningen, the Netherlands) for her support to develop the search strings and Balewgizie Sileshi (University of Groningen, the Netherlands) for his support during the title and abstract screening.

Funding
The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests
None declared.

Patient consent for publication
Not required.

Provenance and peer review
Not commissioned; externally peer reviewed.

Data sharing statement
All data generated or analysed in this study are included in the article and its supplementary files.

Open access
This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/.

REFERENCES


42. Asemahang MA. Determinants of exclusive breastfeeding practices among mothers in aazzo district, northwest Ethiopia. Int Breastfeed J 2016;11.


