

Colostrum avoidance and associated factors in Ethiopia: A systematic review and meta-analysis

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Abstract

Background: Colostrum is the first milk produced by the mammary glands during the second half of pregnancy for a few days (3-4) after birth. However, colostrum is a normative standard for infants' complete form of nutrition, most mothers' giving prelacteal food such as honey, butter, sugar water, and plain water instead of colostrum to their newborn. In Ethiopia, colostrum was seen as abnormal milk causing abdominal problems, and to mitigate this problem most mothers were discarding the portion of the colostrum. Although studies have been conducted on colostrum avoidance and associated factors in Ethiopia, their report was inconsistent regarding the prevalence and associated factors. The main aim of this systematic review and meta-analysis was to estimate the pooled prevalence of colostrum avoidance and associated factors in Ethiopia.

Methods: In this systematic review and meta-analysis databases such as Google, Google Scholar, PubMed/Medline, Science Direct, and Hinari were searched. We found a total of 327 records, of which 292 records were excluded due to duplication and unrelated to our objective. Finally, 35 studies were included in this systematic review and meta-analysis. The data were extracted in Microsoft Excel format and exported to STATA Version 14.0 statistical software for analysis. Heterogeneity was checked by the I^2 test. A random-effect meta-analysis model was used to estimate the pooled prevalence of colostrum avoidance and associated factors. Egger's weighted regression and Begg's rank correlation test were used to assess publication bias.

Result: This review revealed that the pooled prevalence of colostrum avoidance in Ethiopia was 20.5% (95% CI; 16.46, 24.45). Ante-natal care (ANC) visits [OR= 0.274 (95% CI; 0.175, 0.428)], place of delivery [OR= 3.8 (95% CI; 2.9, 4.9)], breastfed counselling [OR= 0.261(95% CI; 0.147 - 0.462), timely initiation of breast feeding [OR = 3.8 (95% CI; 1.9, 7.4)] and prelacteal feeding [OR= 5.77 (95% CI; 4.03- 8.22)] were significant factors for colostrum avoidance.

Conclusion: This meta-analysis showed that one of five mothers discarded colostrum in Ethiopia. Colostrum avoidance was higher in rural mothers than in urban mothers. Strengthening ANC visits, institutional delivery, breastfed counseling, early initiation of breastfeeding, and avoidance of prelacteal feeding are recommended interventions to reduce colostrum avoidance in Ethiopia. Furthermore, promoting the health benefit of colostrum and its nutritional value also emphasizes to improving colostrum feeding in the community.

Introduction

Breast milk is a natural and renewable food that serves as a complete source of infant nutrition for the first six months of life [1]. It contains suitable nutrients provided as an easily digestible form and protects both children and mothers against a variety of diseases [1]. The most effective intervention to improve child health is optimal breastfeeding [2]. The practice of optimal breastfeeding starts by feeding colostrum within 1 hour after birth [3]. WHO and UNICEF recommend colostrum as a newborn perfect food that should be initiated within the first hour of birth [4].

Colostrum is the first milk produced by the mammary glands during the second half of pregnancy for a few days [5]. It is a concentrated form of 'immature milk contains a higher amount of calories, proteins, vitamin A and sodium chloride, but holds lower amounts of lipids, fat, and potassium compared to normal milk[6, 7]. It is also

called 'golden milk' [8] which is a normative standard for infants' complete form of nutrition [9]. Colostrum contains bioactive immune factors and immunoglobulin (A, G & M), which protect a neonate against a variety of infections and allergic diseases [10]. It is used as the first immunization to protect the baby against many bacteria and viruses [11]. Colostrum feeding increases the postnatal infertility period, returns to pregestational weight, and reduces the risk of breast and ovarian cancer for mothers [12].

In contrast to these advantages, a portion of colostrum is discarded in some societies by considering it heavy, thick, dirty, not given until the placenta is passed, toxic, and harmful to an infant's health [13, 14]. Most mothers practiced prelacteal feedings such as honey, butter, sugar water, and plain water in the first three days after birth instead of colostrum [15]. All these practices lead to the suppression of lactation as prolactin gradually ceases and the breast stops further secretion of milk [16]. Studies have revealed that children who do not receive colostrum are more likely to develop numerous infections and become undernourished [17-19]. The prevalence of colostrum avoidance in the developing countries ranges from 16%-92% [16, 20-23].

In Ethiopia breastfeeding is almost universal across a country, however, it does not always meet WHO/UNICEF recommendations[24]. Studies revealed that more than 25% of the mothers were giving prelacteal feeding instead of colostrum to their newborn [25]. Nearly 40% of the mothers did not initiate colostrum within one hour of birth and only 60% of mothers practiced exclusive breastfeeding in the first 6 months of life [26, 27]. In Ethiopia, colostrum was seen as abnormal milk causing abdominal problems and to mitigate this problem most mothers discarded the portion of the colostrum[13].

Different independent and fragmented studies have been conducted to assess colostrum avoidance in Ethiopia while their reports show great discrepancy across the region in the country. In the Afar region, 76.9% of mothers discard colostrum while only 3.3% of mothers in the South Nation Nationality People Region have discarded colostrum [28, 29]. Therefore, reliable and summarized information is essential to refine government policies and interventions. Hence, the main aim of this systematic review and meta-analysis was to estimate the pooled prevalence of colostrum avoidance and associated factors in Ethiopia. This review can have vital importance to show summarized evidence and suggest possible applicable strategies for planning, decision making, and resource allocation in the Ethiopian health care system.

Methods

Identification and selection of studies

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used to write this systematic review and meta-analysis [30]. Relevant studies were searched from PubMed/MEDLINE online, Science Direct, and Hinari databases. Gray literature was also identified from Google and Google Scholar. We also searched the literature from the direct website of Ethiopian journals and WHO reports. All searches were conducted from July 1st to August 20th/2020. The term 'colostrum' was searched within different variations such as colostrum avoidance, colostrum discarding, and colostrum feeding. The key terms used to retrieve primary studies were (Prevalence OR Magnitude AND (colostrum avoidance OR colostrum feeding OR colostrum discarding) AND Ethiopia). We also used key terms to ((Factors OR determinants OR risk factors OR correlates) AND (colostrum avoidance OR colostrum feeding OR colostrum discarding) AND Ethiopia to search literature regarding factors associated with colostrum avoidance in Ethiopia. All kinds of literature available until August

20, 2020, were identified and evaluated for eligibility and included in the systematic review and meta-analysis using prepared eligibility assessment criteria.

Eligibility criteria

The eligibility criterion was established before searching for studies related to our outcomes. The inclusion criteria were publications in the English language and studies conducted in Ethiopia that reported the prevalence of colostrum avoidance and associated factors from 2010 to 2020. Observational studies on colostrum avoidance /feeding/ were included in the meta-analysis to estimate the pooled prevalence and identify factors associated with colostrum avoidance. Studies with unclear outcomes and poor quality were not included in this meta-analysis. Qualitative studies were also excluded from this meta-analysis.

Data extraction

Two authors (JN and BG) extracted all the necessary data, independently using a standardized data extraction format prepared in Microsoft Excel. The extraction format contains different columns, such as the name of the first author, publication year, region where the studies were conducted, sample size, response rate, and prevalence of colostrum avoidance for the first objective. For the second objective (factors associated with colostrum avoidance), the data extraction format was prepared in the form of a two by two table. Differences between the two authors during data extraction were solved thoroughly and by re-extracting the data of the primary article together.

Outcome measurements

This review has two main objectives. The first objective was to estimate the pooled prevalence of colostrum avoidance in Ethiopia. The second objective was to determine the pooled effects of factors associated with colostrum avoidance. The prevalence of colostrum avoidance was calculated by dividing the number of mothers who avoided colostrum by the total number of mothers who have been included in the study and multiplied by a hundred (100). For the second objective, the odds ratio was used to measure the level of the association between colostrum avoidance and its associated factors. The odds ratio was calculated from primary studies using two by two tables.

Quality assessment

The quality of the included studies was assessed by using the Newcastle-Ottawa quality assessment scale [31]. The tool has three main parts. The first five components were used to assess the methodological quality of each study. The second part assesses the comparability of primary studies, and the final part of the tool measured the quality of the original articles concerning their statistical analysis. Two authors (JN, BG) independently evaluated the qualities of original articles by using quality assessment guidelines. After assessing the quality of each study, articles with high quality (a minimum score of 6 out of 10 scores) were included in this review. Any difference between the two authors during the quality assessment of primary studies was solved by the third author's mediation decision and solved the difference.

Statistical procedure

The extracted data from Microsoft Excel format were exported to STATA Version 14.0 statistical software for analysis. The characteristics of the original articles were described using tables and forest plots. Statistical heterogeneity was evaluated by the I^2 test [32]. The percentage of variability due to heterogeneity rather than sampling error or chance in effect estimate was determined through the I^2 test. The I^2 test does not depend on the number of studies incorporated into the study. A random-effect meta-analysis model was used to estimate the pooled prevalence of colostrum avoidance. The pooled effect size was estimated in the form of an odds ratio. Subgroup analysis was also performed by region to minimize the random variations in the point estimates of the primary studies. Egger's weighted regression and Begg's rank correlation test were used to assess publication bias at a 5% significance level [33, 34]. $P < 0.05$ was considered the presence of statistically significant publication bias.

Results

Searching results

In the initial search, we found a total of 327 records from the electronic search database of Midline/PubMed, Science Direct, Hinari, Google, and Google Scholar. After removing duplications 278 records remained. Then reviewing their titles and abstracts, we excluded 217 records because these articles were unrelated to our objective. After assessing 61 full articles, 26 articles were further excluded due to differences in the study population and outcome. Finally, 35 studies were included in this systematic review and meta-analysis (**figure 1**).

Characteristics of the included articles

This meta-analysis included 35 primary studies covering a total of 16,896 study participants. The studies were conducted from 2010 to 2020 and retrieved from seven regions of the country including 13 studies from the Amhara region, 11 studies from the south region, 4 studies from Oromia, 3 studies from Afar, 2 studies from Tigray, 1 study from Somalia and 1 study from the Harar region [14, 17, 24, 28, 29, 35-66] (**Table 1**). Five studies conducted in Jigjiga Town, Harar, wolaita zone, Debre Markos, and Mezan-tepi were institution based cross-sectional studies, and the remaining 30 articles were community-based cross-sectional studies. The sample size of the primary studies included in this review ranged from 202 to 860 as reported from Mezan-Tepi (South region) and kersa district Oromia region respectively [24, 46]. The highest prevalence of colostrum avoidance was reported from in Afar region 79.9% and the lowest was reported in the Gununo Health Centre in the Wolaita zone South region 3.3% [28, 29].

Meta-analysis

A random-effect model was used to estimate the pooled prevalence of colostrum avoidance in Ethiopia. The pooled estimate of colostrum avoidance in Ethiopia was 20.5% (95% CI; 16.46, 24.45) (**figure 2**). Substantial heterogeneity was observed between primary studies ($I^2 = 98.4\%$ and $p = 0.000$). Publication bias was checked using the Egger's test, and the results showed that there was significant publication bias, as evidenced by $p < 0.01$. Duval and Tweedie's trim and fill methods were used to estimate the number of studies missed from a meta-analysis as a source of publication bias but the finding was not significant [67]. We also observed the asymmetrical distribution of the funnel plot indicating, publication bias (**figure 3**). We also performed subgroup analysis by a region having more than two studies conducted. According to the results, the pooled prevalence of

colostrum avoidance was highest in the Afar region, 49.6% (95% CI: 21.7, 77.5), $I^2 = 99.4\%$ and the lowest prevalence was in the Tigray region, 10.6% (95% CI: 2.1, 19.2), $I^2 = 89.2$. This meta-analysis also revealed that the pooled prevalence of colostrum avoidance was higher in rural mothers (24.9%, 95% CI; 17.2, 32.6) than in urban mothers 16.7% (95% CI; 13.0, 20.3) (**figure 4**).

Factors associated with colostrum avoidance

During this review, we identified numerous factors associated with colostrum avoidance among primary studies in Ethiopia. Variables reported as a significant association with colostrum avoidance in at least three primary studies were included in this meta-analysis. Accordingly, antenatal care (ANC) visits, place of delivery, breastfeeding counseling during ANC, timely initiation of breastfeeding, and prelacteal feeding were found to have a significant association with colostrum avoidance.

Antenatal care (ANC) visits during pregnancy were reported as a factor associated with colostrum avoidance among the three primary studies included in this review [35, 56, 58]. A total of 1659 mothers were included to analyze the association between ANC visits and colostrum avoidance. The pooled odds ratio showed that mothers having ANC visits during pregnancy were 72.6% less likely to avoid colostrum than their counterparts [OR= 0.274 (95% CI; 0.175, 0.428)] (**Figure 5**).

Place of delivery was identified as factor associated with colostrum avoidance among the five primary studies included in our meta-analysis [35, 48, 49, 56, 58]. To analyze the association between place of delivery and colostrum avoidance, 2,709 participants were included. Accordingly, mothers who delivered at home were 3.8 times more likely to discard colostrum than mothers who gave birth at health institutions [OR= 3.8 (95% CI; 2.9, 4.9)](**figure 6**).

Four primary articles included in this review reported that breastfeeding counseling during ANC was associated with colostrum avoidance [28, 44, 49, 58] with a total of 1,700 study participants. Mothers who received breastfed counselling during the ANC visit were 73.9% less likely to avoid colostrum than mothers who did not receive breastfed counseling during ANC [OR= 0.261(95% CI; 0.147 - 0.462)] (**Figure 7**).

Timely initiation of breastfeeding was associated with colostrum avoidance among the three primary studies included in our review [48, 49, 56]. A total of 1832 study participants were included to analyze the association between the timely initiation of breastfeeding and colostrum avoidance. Mothers who initiated breastfeeding beyond 1 hour of delivery were 3.8 times more likely to avoid colostrum than mothers who initiated breastfeeding within 1 hour of delivery [OR = 3.8 (95% CI; 1.9, 7.4)](**figure 8**).

Three primary studies included in this review were reported as prelacteal feeding practice was associated with colostrum avoidance [44, 49, 56]. A total of 1,616 participants were included to analyze the association between prelacteal feeding practice and colostrum avoidance. Accordingly, the odds of colostrum avoidance among mothers practicing prelacteal feeding was 5.8 times higher than mothers who never practice prelacteal feeding [OR= 5.77 (95 % CI; 4.03- 8.22)] (**figure 9**).

Discussion

The WHO recommended colostrum feeding for all newborn within one hour after delivery, However mothers in most developing countries have not been effectively given colostrum to their newborn [6]. The current systematic review and meta-analysis were conducted to show the pooled prevalence of colostrum avoidance and associated factors in Ethiopia. To the best of our knowledge, this is the first systematic review and meta-analysis in the country.

The results of this meta-analysis showed that the pooled prevalence of colostrum avoidance was 20.5% (95% CI; 16.46, 24.45). This result was in line with studies conducted in other developing countries such as Bangladesh 18%, Nepal 16.5%, and India 24.5% [11, 20, 68]. Pooled colostrum avoidance in this meta-analysis was higher than studies conducted in Kancheepuram District of India 8.5%, and Burkina Faso 16% [22, 69]. The variation might be due to the difference in maternal health service utilization between study populations. The pooled prevalence of colostrum avoidance in this meta-analysis was low compared to studies conducted in Pakistan 27.9%, Uttarakhand of India 92%, Nepal 67.3%, Bangladesh 37%, South Sudan 38.8% and Kuwait 82% [20, 21, 70-73]. The possible explanation for this difference might be due to the difference in infant feeding styles and socio-cultural practices regarding breastfeeding across the countries. The other possible reason for this inconsistency might be the variations in socioeconomic status and utilization of maternal health services.

Regarding factors associated with colostrum avoidance; antenatal care (ANC) visits during pregnancy, home delivery, delayed initiation of breastfeeding, prelacteal feeding, and breastfed counseling during ANC were identified as significant associated factors for colostrum avoidance. Mothers having ANC visits were 72.6% less likely to discard colostrum than mothers who did not have ANC visits during pregnancy. This might be because discussion regarding neonatal feeding with health professionals during ANC may increase maternal awareness of the advantages of colostrum feeding.

This review showed that the odds of colostrum avoidance among home-delivered mothers were 3.8 times higher than those among mothers who gave birth at the health institution. This finding was supported by studies conducted in Pakistan and India [21, 68]. Home deliveries are usually attended by traditional birth attendants and grandmothers who thought colostrum causes abdominal cramps for infants. Hence home delivery may be safe for different feeding malpractices such as colostrum avoidance and prelacteal feeding. Mothers who did not receive breastfeeding counselling during ANC visits were 73.9% more likely to avoid colostrum than their counterparts. The possible explanation for this significant association might be that breastfed counseling is useful to change the behaviour of mothers, reduce postnatal nutritional malpractice and increase mothers' awareness of optimal breastfeeding, which can decrease colostrum avoidance.

The results of this analysis showed that the odds of colostrum avoidance were 3.8% times higher among mothers who initiated breastfeeding within 1 hour after birth than among mothers who delayed breastfeeding more than 1 hour after delivery. A similar finding was reported from studies conducted in Pakistan, Nepal, and Uttarakhand, India [20, 21, 70]. The reason might be that delayed initiation of breastfeeding after delivery would have more time for nutritional malpractice such as colostrum avoidance and prelacteal feeding.

Mothers who practiced prelacteal feeding were 5.8 times more likely to discard colostrum than their counterparts. This is consistent with a study conducted in Egypt in which the majority of mothers give prelacteal feeding to their new-born by considering colostrum as bad to their babies [74]. Some cultural communities

anticipate that prelacteal feeding is preferred for newborns over colostrum since it is considered expired yellowish-dirty milk that could cause abdominal cramps [13].

Limitation of the study

The limitation of this systematic review and meta-analysis was that all included primary studies were cross-sectional study designs which made it difficult to establish cause-effect relationships.

Conclusions

In this systematic review and meta-analysis, one of five mothers discarded colostrum in Ethiopia. It was higher in rural than urban mothers. Colostrum avoidance was associated with ANC visits, place of delivery, breastfed counseling during ANC, timely initiation of breastfeeding, and prelacteal feeding. Therefore strengthened ANC visits, institutional delivery, breastfed counseling, early initiation of breastfeeding, and avoidance of prelacteal feeding are recommended interventions to reduce colostrum avoidance in Ethiopia. Furthermore, promoting the health benefit of colostrum and its nutritional value is recommended as a strategy to improve colostrum feeding in the community.

Declarations

Ethics approval

Not applicable

Consent for publication

Not applicable

Availability of data and materials

The data used for this study are available here. It will be shared upon request and will be obtained by email to the corresponding author using "nigussiejemberu@gmail.com. Or jemberu2123@gmail.com".

Competing interests

All authors declare that they have no competing interests.

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Authors' contributions

JN and BG conceived the idea, participated in data extraction, analysis, and draft writing. AM and MM participated in the analysis, manuscript preparation, and revision. All authors read and approved the final version of the manuscript to be considered for publication.

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Tables

Table 1: Summary of included studies in the systematic review and meta-analysis of colostrum avoidance and factors associated in Ethiopia, 2020

Author	publication year	place	region	Sample size	Response rate	prevalence	Quality score
Yalew WA, et al	2014	Bahir dar	Amhara	400	94.8	33.5	
G/slassie, et al	2020	Gozamen	Amhara	741	100	22.1	
Tamiru et al	2012	jimma arjo	oromia	375	97.6	27.5	
Musse Obsiy	2019	Jiggiga	somalia	570	96.3	29.5	
mekuria and edris	2015	Debre markos	Amhara	413	97.6	37.3	
Tewabe et al	2017	motta	Amhara	405	95.7	20.3	
Azeze et al	2019	Boditi	South	403	97.8	27.5	
Zewde	2020	Harar	harar	295	96.4	8	
Belachew	2019	Bahir dar	Amhara	472	94.5	16.3	
Wassie et al	2020	wolaita	South	342	98.8	3.3	
Shewasinad et al	2017	mezan tepi	South	201	97.1	22.2	
Gebreyesus et al	2017	kombolcha	Amhara	414	100	11.37	
Tilahun et al	2016	Debre Berhan	Amhara	409	98.3	14.9	
Egata et al	2013	kersa	oromia	860	97.7	8.5	
Bililign et al	2016	North wollo	Amhara	782	92.65	11.1	
Legesse et al	2015	Raya kobo	Amhara	630	100	13.5	
Hadona et al	2020	Jinka	South	420	98.4	9.8	
Tadesse et al.	2016	sorro	South	579	96.2	29.2	
Temesgen Kelaye et al	2016	worda	South	421	100	16	
Lake et al	2018	Bedessa	South	413	100	8.96	
Gebretsadik et al	2020	afar	afar	389	99.7	76.9	
Abie and Goshu	2019	Debre tabor	Amhara	297	98.1	25.6	
Gebreemeskel et al	2019	rural eastern	Tigray	787	98	15	
Yimer and Liben	2018	North wollo	Amhara	782	96.5	12	
Seid et al	2013	Bhair dar	Amhara	815	99.5	16.7	
Weldesamuel et al	2018	aksum	Tigray	477	98.5	6.3	

misgan legesse et al	2016	Afambo	afar	370	100	34.9
Tamiru et al	2013	ariba minch zuria	South	383	100	11.2
Gualu et al	2017	Debre markos	Amhara	378	89.4	20.9
Sorato	2016	chencha	south	226	92	19.5
Daniel Geleta et al	2018	Welehti	Oromia	421	100	48.6
Gargamo	2020	Wolaita	South	396	100	12.6
Liben	2016	Amibara district	afar	403	99	36.9
Shibru H et al	2018	Hula district	South	634	100	3.9
Hailemariam et al	2015	Wollega	Oromia	593	99	8.8

Figures

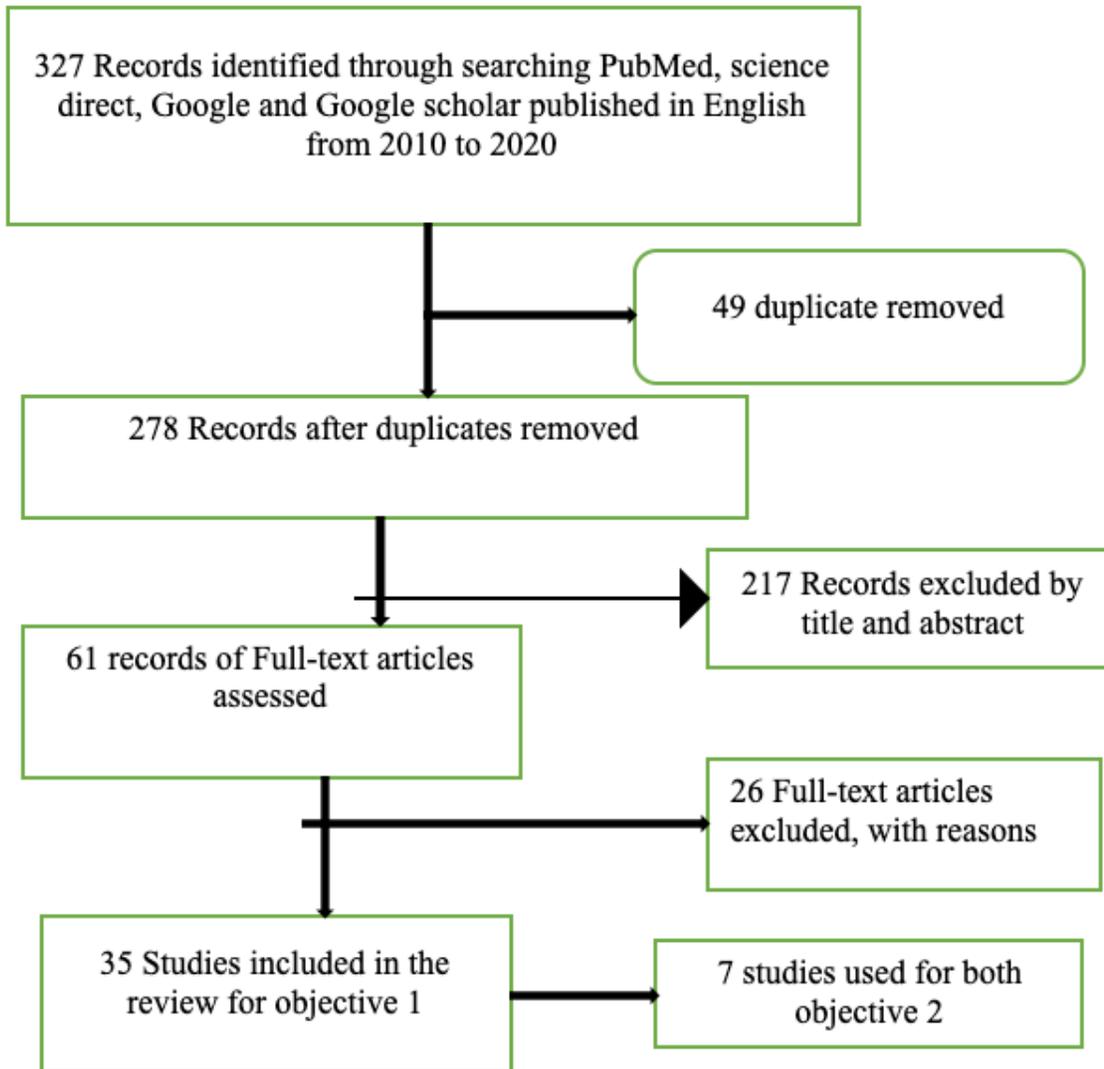


Figure 1

Flow chart of the selection process for the studies included in the analysis.

Pooled prevalence of colostrum avoidance in Ethiopia

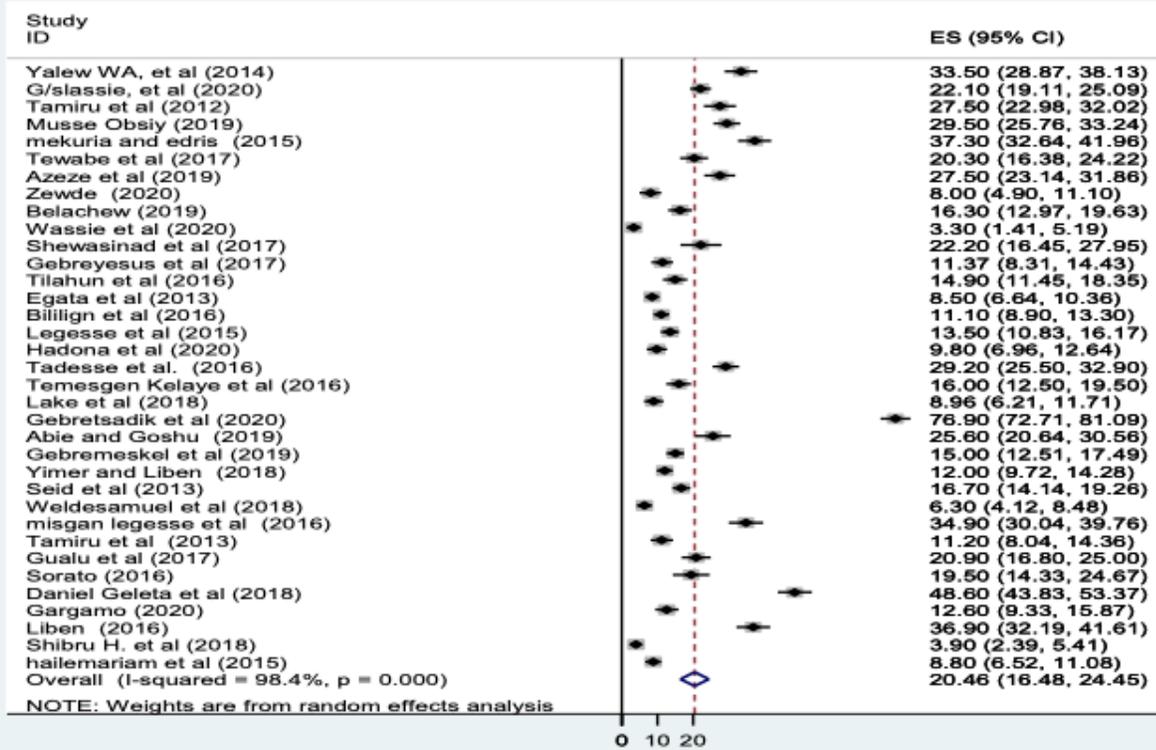


Figure 2

Forest plot for the pooled prevalence of colostrum avoidance in Ethiopia, 2020.

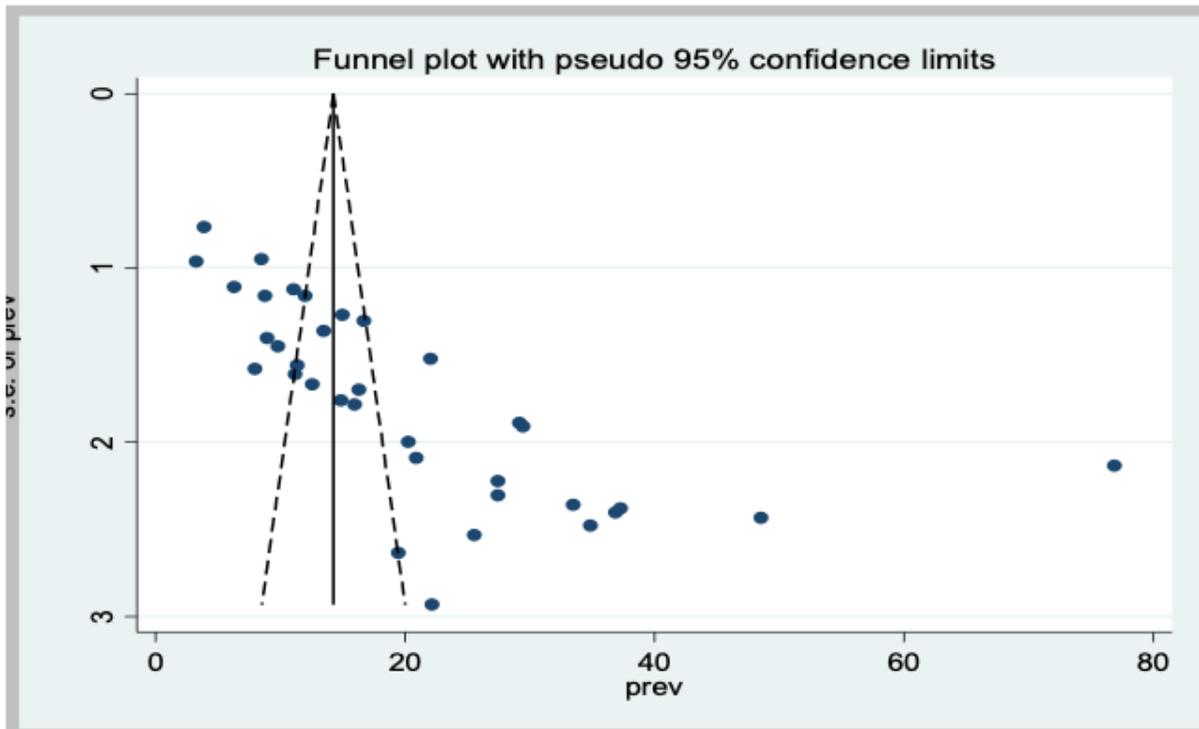


Figure 3

Funnel plot showing symmetric distribution of articles on colostrum avoidance in Ethiopia, 2020.

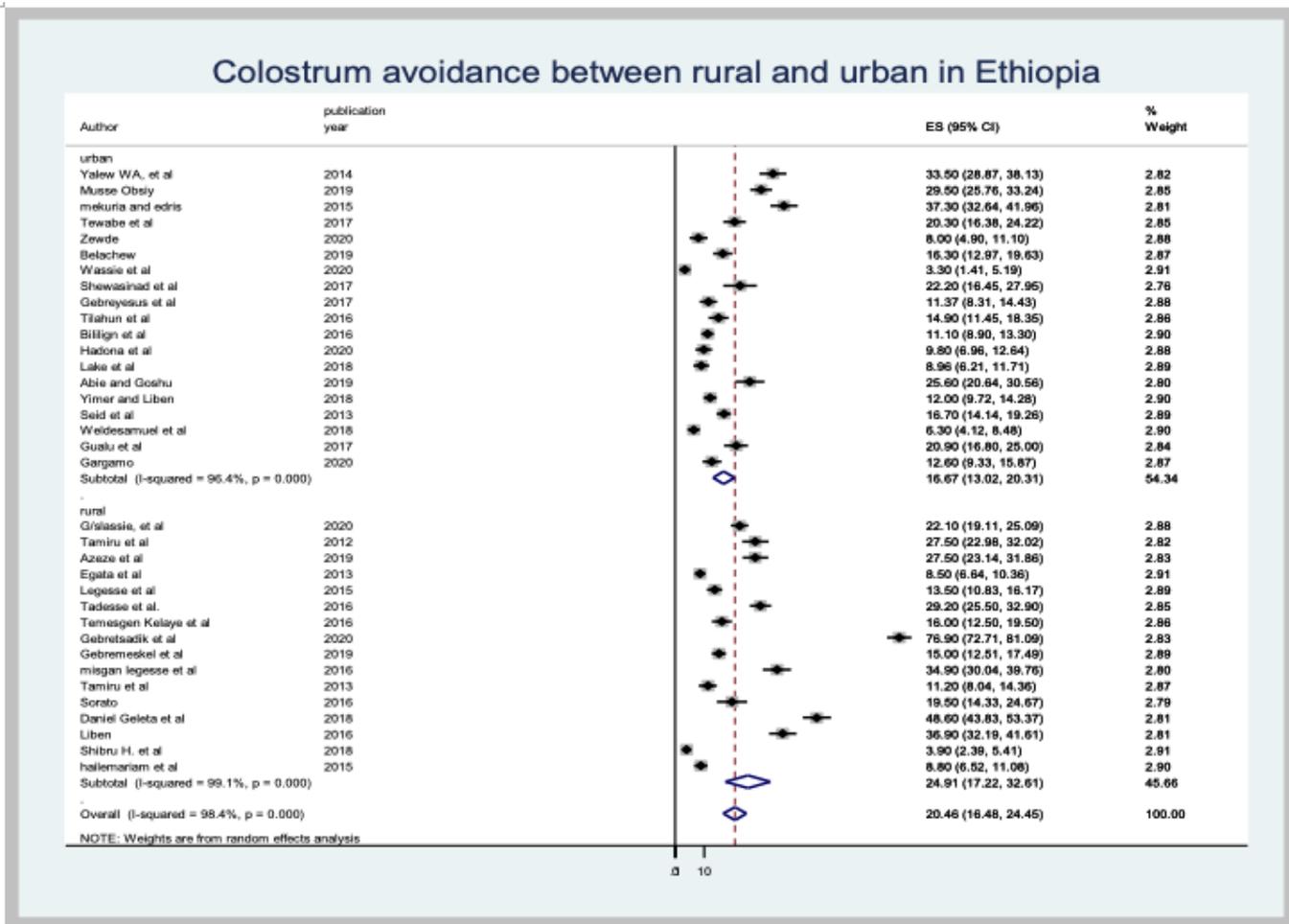


Figure 4

colostrum avoidance between rural and urban in Ethiopia, 2020

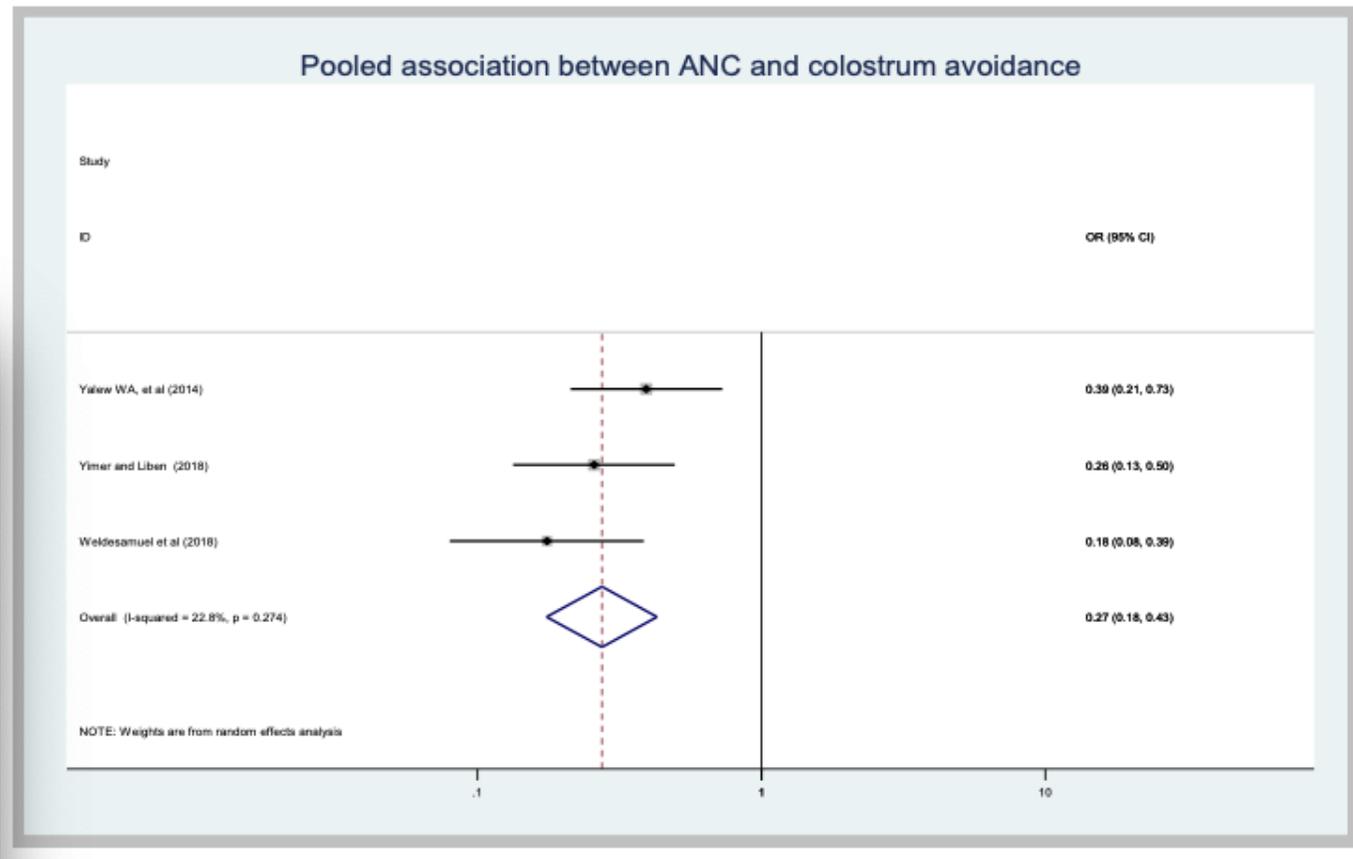


Figure 5

Association of anti-natal (ANC) visit with colostrum avoidance

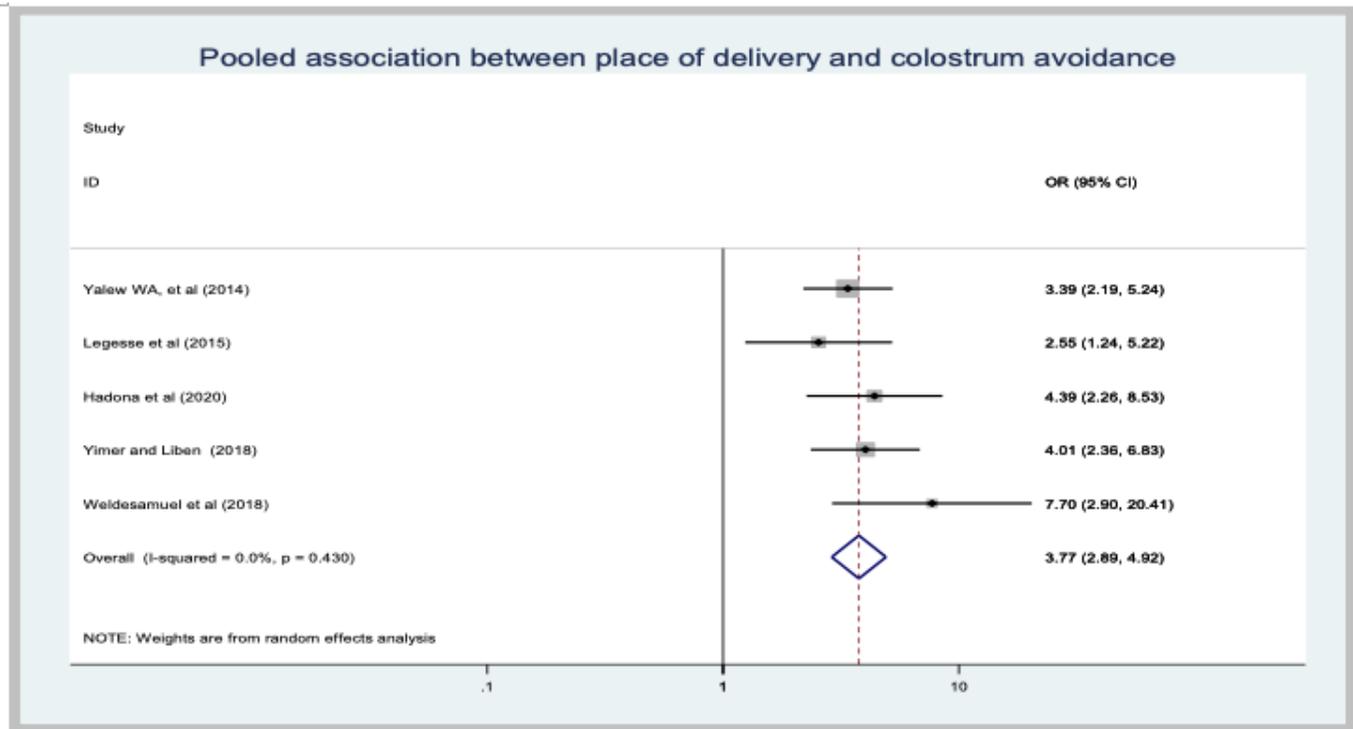


Figure 6

Association of place of delivery with colostrum avoidance

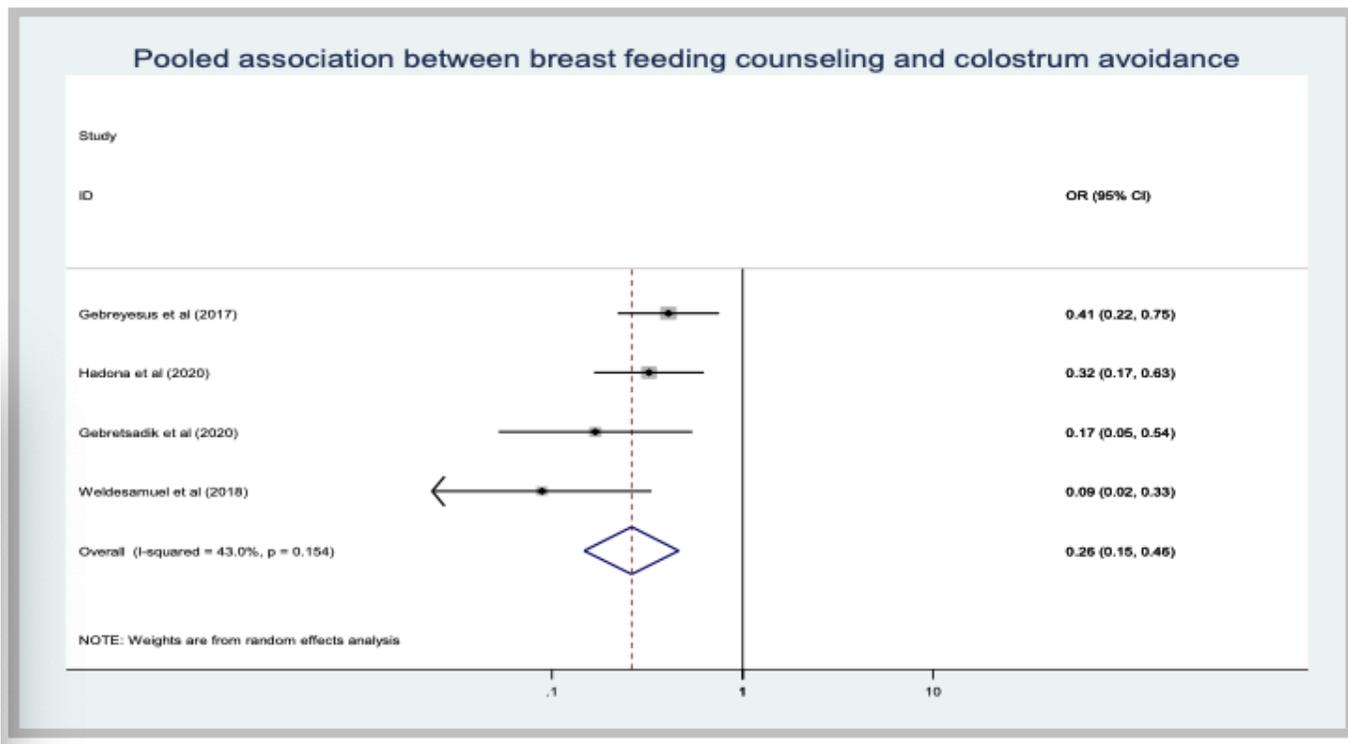


Figure 7

Association of breast-feeding counseling during pregnancy with colostrum avoidance

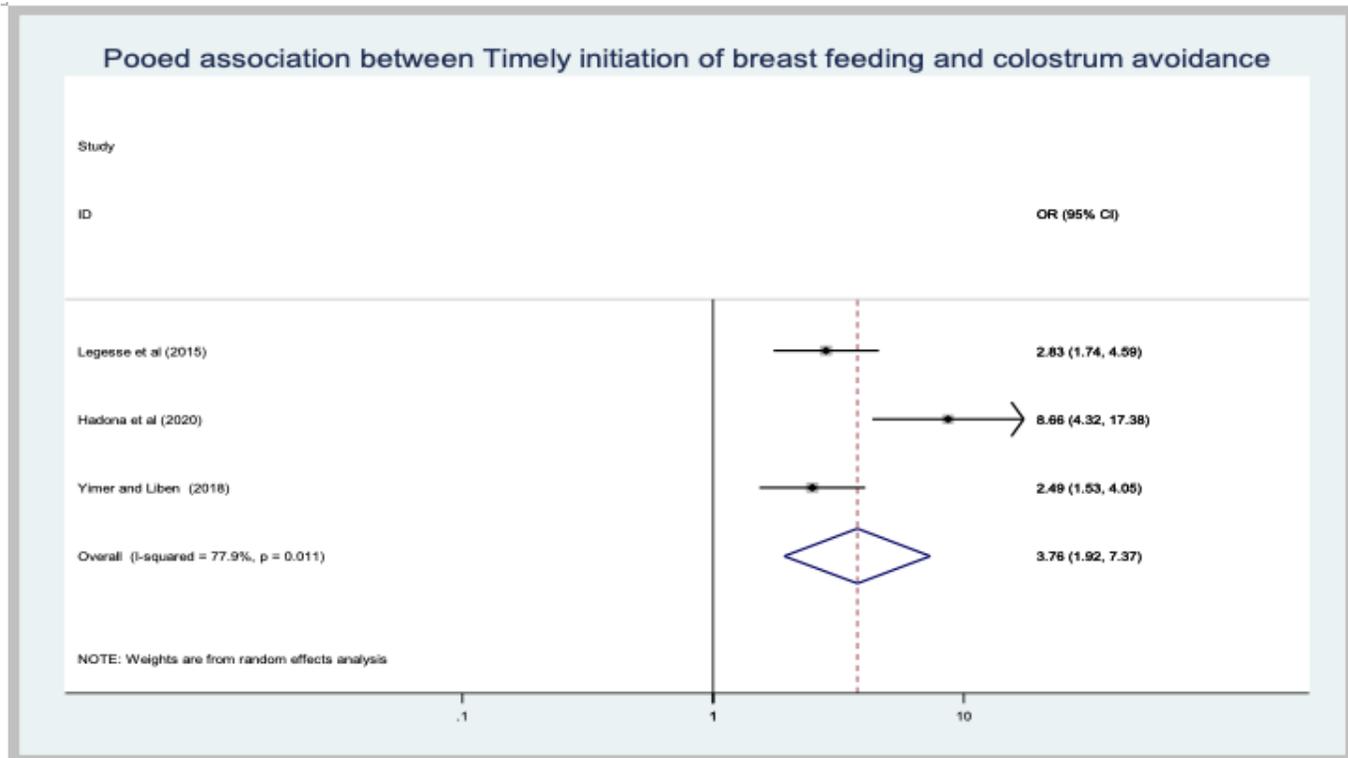


Figure 8

Association of timely initiation breast feeding with colostrum avoidance

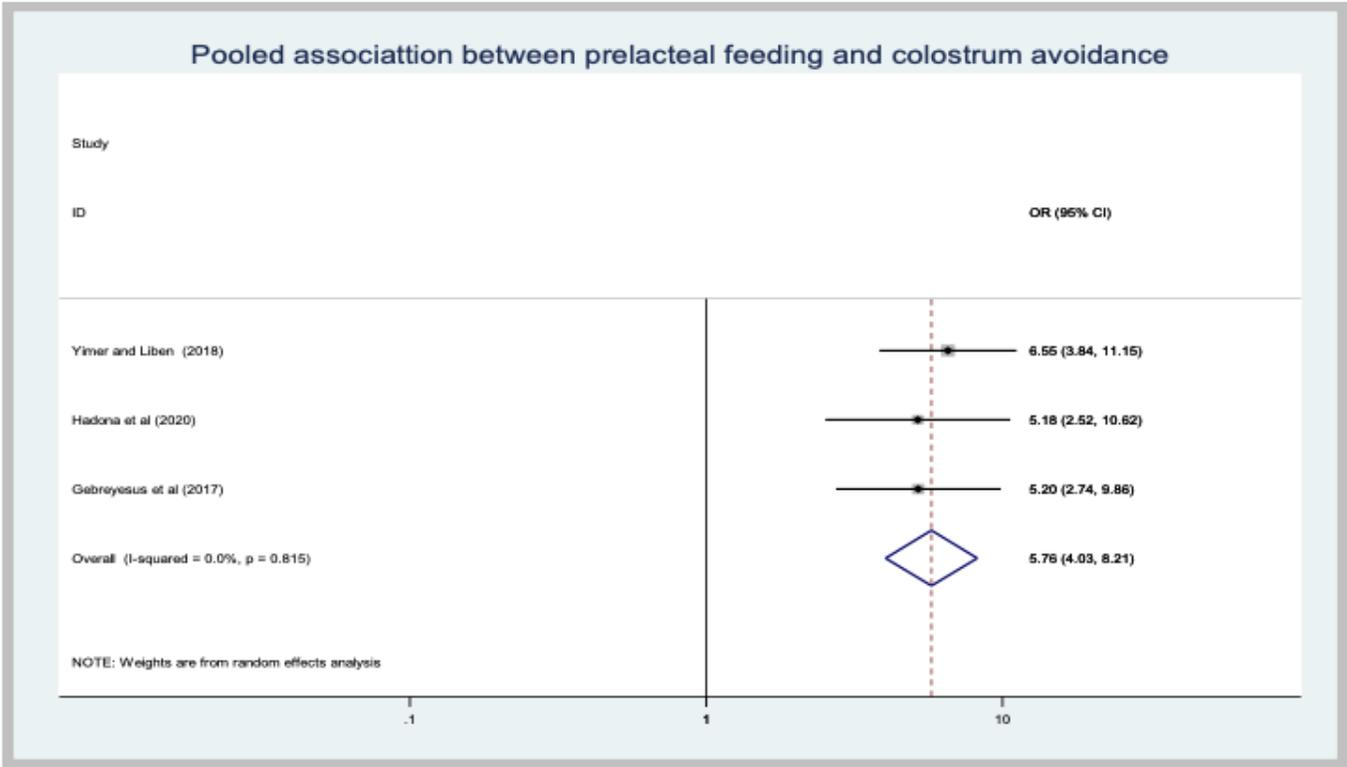


Figure 9

Association of prelacteal feeding with colostrum avoidance