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Review Article

Association of age and colostrum discarding with breast-feeding practice in Ethiopia: systematic review and meta-analyses

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Abstract

Objective: To investigate whether maternal/caregiver's age, infant age (0–6 months) and discarding colostrum affects timely initiation of breast-feeding (TIBF) and exclusive breast-feeding (EBF) in Ethiopia.

Design: A systematic search of PubMed, SCOPUS, EMBASE, CINHAL, Web of Science and WHO Global Health Library electronic databases was done for all articles published in English from 2000 to January 2018. Two reviewers independently screened, extracted and graded the quality of studies using Newcastle–Ottawa Scale. A weighted inverse-variance random-effects model meta-analysis, cumulative meta-analysis and mixed-effects meta-regression analysis were done.

Setting: All observational studies conducted in Ethiopia.

Participants: Mothers of children aged less than 2 years.

Result: A total of forty articles (fourteen studies on TIBF and twenty-six on EBF) were included. TIBF was associated with colostrum discarding (OR = 0·38; 95 % CI 0·21, 0·68) but not with maternal/caregiver's age (OR = 0·98; 95 % CI 0·83, 1·15). In addition, colostrum discarding (OR = 0·53; 95 % CI 0·36, 0·78) and infant age (OR = 1·77; 95 % CI 1·38, 2·27) were significantly associated with EBF but not maternal/caregiver's age (OR = 1·09; 95 % CI 0·84, 1·41).

Conclusions: There was no association between maternal/caregiver's age and breast-feeding practice (EBF and TIBF). Colostrum discarding was associated with both EBF and TIBF. This evidence could be helpful to counsel all mothers of reproductive age and who discard colostrum.

Keywords
Breast-feeding
Maternal age
Infant
Review
Meta-analysis
Ethiopia

The WHO and UNICEF define timely initiation of breast-feeding (TIBF) as putting a newborn to breast within 1 h of birth and exclusive breast-feeding (EBF) as feeding infants only human milk through breast-feeding or expressed breast milk and no other liquids or solids, except for drops or syrups with nutritional supplements or medicine[1]. All infants should receive human milk within the first hour of birth, be exclusively breast-fed for the first 6 months and thereafter be introduced to nutritionally adequate and safe complementary foods with continued breast-feeding for at least 2 years[2,3]. Breast-feeding is one of the most cost-effective interventions that prevents maternal and newborn morbidity and mortality[4–7]. For example, TIBF and EBF prevent 22 and 60 % of neonatal deaths, respectively[2,8,9]. Furthermore, EBF for a longer duration benefits child neurodevelopment and increases intelligence quotient[10].

Despite the aforementioned advantages, significantly low percentages of mothers initiate breast-feeding within the first hour of birth and maintain EBF for 6 months. Globally, 44 and 40 % of newborns are breast-fed within the first hour and breast-feed exclusively for 6 months, respectively[4,11]. In developing countries, the prevalence of TIBF ranges from 22·4 to 52·8 %[12–18] and EBF prevalence ranges from 10·0 to 49·1 %[11,12,13,19,20]. In Ethiopia, based on our previous meta-analyses[21], the national prevalence of TIBF and EBF is 66·5 and 60·1 %, respectively.

Previous studies have identified several associated factors of TIBF and EBF, including maternal/caregiver's age, newborn age and colostrum discarding[12–18,22–25]. Previous studies show that infant age and colostrum discarding have been associated with late initiation of breast-feeding and non-exclusive breast-feeding[14,16,26–28]. Regarding maternal/caregiver's age, most of the reviewed literature reveals that older mothers practise TIBF[15,16,19,24] and EBF[13,18,20,22,29] at higher rates than young mothers,

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although the age cut-off value varies between studies. Another study[23] which measured age as a continuous variable also concluded that increased maternal age is positively associated with TIBF and EBF. On the contrary, some studies showed that increased maternal age was associated with delayed initiation of breast-feeding and non-exclusive breast-feeding[12,25]. Furthermore, other studies showed absence of an association[17,30]. Taken together, inconsistencies persist and the association is inconclusive.

Hence, there is an urgent need to synthesize individual studies' data to make a better conclusion on the association of maternal age, infant age and colostrum discarding with breast-feeding practice (i.e. TIBF and EBF). So far, several systematic reviews and meta-analyses have been conducted on TIBF and EBF[14,16,24,31–33]. In Ethiopia, there is a paucity of systematic review and meta-analysis with regard to associated factors of TIBF and EBF. The present meta-analyses and systematic review aimed to determine whether maternal/caregiver's age, infant age and colostrum discharging affect TIBF and EBF in Ethiopia. We hypothesized that: (i) increased maternal age would be positively associated with breast-feeding practice due to accumulated experience; (ii) increased infant age would be negatively associated with EBF; and (iii) colostrum discarding would be negatively associated with breast-feeding practice.

Following international recommendations[2], the Ethiopian Government has taken steps to improve infant and young child feeding practices. Several national nutritional strategies[34], guidelines[35] and nutrition programmes[36,37] have been developed by Ministry of Health of Ethiopia since 2004. Likewise, the Health Sector Transformation Plan of Ethiopia[38] has a target to increase EBF to 72 % by 2020. Furthermore, Ethiopia has recently started celebrating World Breast-feeding Week every year[39]. However, TIBF and EBF coverages are still below the very good rating of WHO, which is 90 % or above[40]. This can be attributed to several factors including colostrum discarding. It is also linked to infant as well as maternal/caregiver's age[13–16,18–20,22–24,26–29]. This meta-analysis information could be valuable to provide updated evidence to

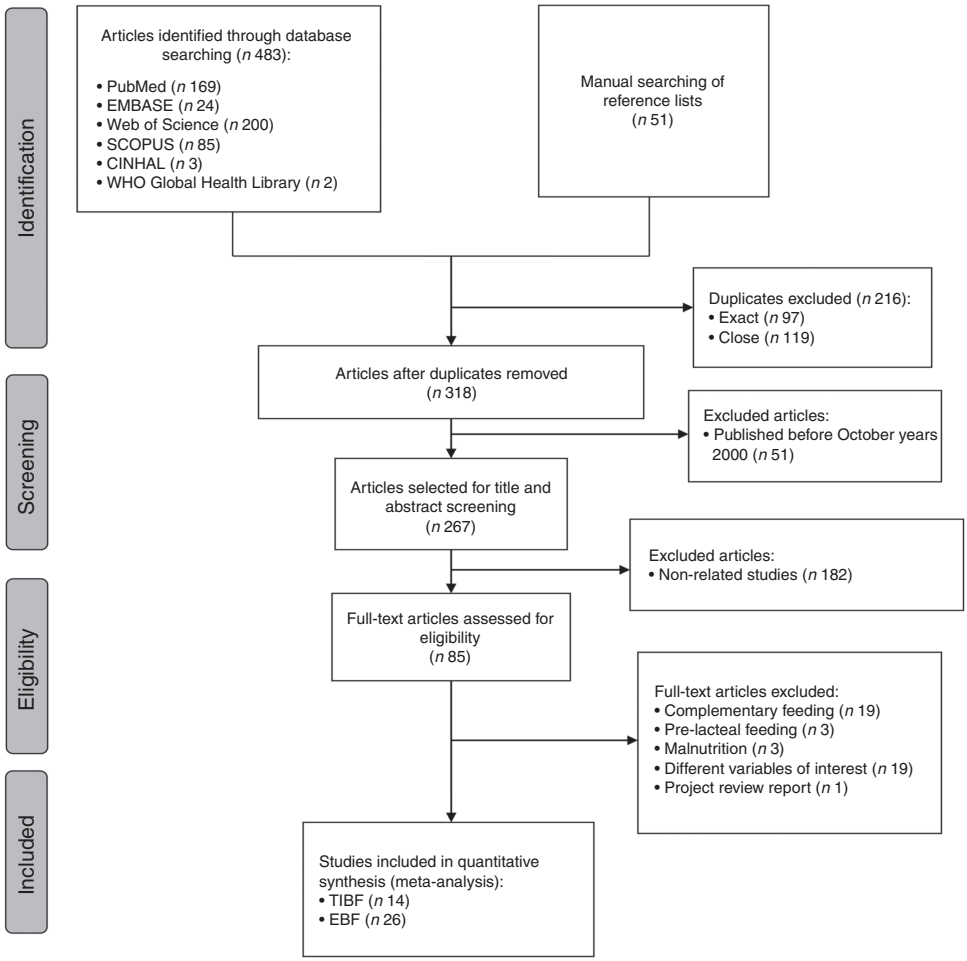

Fig. 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram of the literature screening and selection process for studies included in the present systematic review and meta-analysis on factors affecting timely initiation of breast-feeding (TIBF) and exclusive breast-feeding (EBF) in Ethiopia. Note '*n*' in each stage represents the total number of studies that fulfilled a particular criterion

Table 1 Characteristics of studies included in the present systematic review and meta-analysis on factors affecting timely initiation of breast-feeding (TIBF) in Ethiopia

Study	Study area (region and place)	Study method/ design	Study population	Calculated sample size/ participated	Factor	Breast-feeding initiation (outcome)		
						Within 1 h	After 1 h	Total
Maternal/caregiver's age *v.* TIBF								
Wolde *et al.* (2014)[52]	Oromia, Nekemte town	Cross-sectional	Mothers who had child aged <24 months	182/174	<25 years	43	5	48
					≥25 years	111	15	126
					Total	154	20	174
Woldemichael and Kibie (2016)[53]	Oromia, Tiyo woreda	Cross-sectional study	Mothers who had children aged <1 year	386/373	<25 years	83	39	122
					≥25 years	168	83	251
					Total	251	122	373
Adugna (2014)[54]	SNNPR, Arba Minch Zuria woreda	Cross-sectional study	Women who had children aged <2 years	384/383	<25 years	181	132	313
					≥25 years	38	32	70
					Total	219	164	383
Beyene *et al.* (2017)[55]	SNNPR, Dale woreda	Cross-sectional study	Mothers of children aged <24 months	634/634	<25 years	180	49	229
					≥25 years	337	52	389
					Total	517	101	618
Alemayehu *et al.* (2014)[56]	Tigray, Axum town	Cross-sectional study	Mothers who had children aged 6–12 months	418/418	<25 years	75	49	124
					≥25 years	169	125	294
					Total	244	174	418
Berhe *et al.* (2013)[57]	Tigray, Mekelle town	Cross-sectional study	Mothers of children aged 0–24 months	361/361	<25 years	120	27	147
					≥25 years	158	52	210
					Total	278	79	357
Setegn *et al.* (2011)[58]	Oromia, Goba district	Cross-sectional study	Mothers with children aged <12 months	668/608	<25 years	107	108	215
					≥25 years	207	177	384
					Total	314	285	599
Tamiru and Tamrat (2015)[59]	SNNPR, Arba Minch Zuria woreda	Cross-sectional study	Mothers of infants aged 2 years or younger	384/384	<25 years	150	109	259
					≥25 years	70	54	124
					Total	220	163	383
Regassa (2014)[60]	SNNPR, Sidama zone	Cross-sectional study	Mothers with infants between 0 and 6 months old	1100/1094	<25 years	354	77	431
					≥25 years	522	141	663
					Total	876	218	1094
Ekubay *et al.* (2018)[61]	Addis Ababa town	Cross-sectional study	Mothers with infants aged ≤6 months	597/583	<25 years	134	94	228
					≥25 years	195	141	336
					Total	329	235	564

Table 1 *Continued*

Study	Study area (region and place)	Study method/ design	Study population	Calculated sample size/ participated	Factor	Breast-feeding initiation (outcome)		
						Within 1 h	After 1 h	Total
Discarding colostrum *v.* TIBF								
Wolde *et al.* (2014)[52]	Oromia, Nekemte town	Cross-sectional study	Mothers who had child aged <24 months	182/174	Discarding	10	3	13
					No	144	17	161
					Total	154	20	174
Adugna (2014)[54]	SNNPR, Hawassa city	Cross-sectional study	Mothers with infants aged 0–6 months	541/529	Discarding	21	21	42
					No	198	143	341
					Total	219	164	383
Hailemariam *et al.* (2015)[62]	Oromia, East Wollega zone	Cross-sectional study	Mothers who had children aged <24 months	594/593	Discarding	30	15	45
					No	443	81	524
					Total	473	96	569
Tewabe (2016)[63]	Amhara, Motta town	Cross-sectional study	Mothers with infant aged <6 months	423/405	Discarding	49	33	82
					No	270	53	323
					Total	319	86	405
Tilahun *et al.* (2016)[64]	Amhara, Debre Berhan town	Cross-sectional study	Mothers who had children aged <6 months	416/409	Discarding	15	46	61
					No	241	91	332
					Total	256	137	393
Liben and Yesuf (2016)[65]	Afar, Amibara district	Cross-sectional study	Mothers of children aged <24 months	407/403	Discarding	83	142	225
					No	68	88	156
					Total	151	230	381

SNNPR, Southern Nations, Nationalities and Peoples' Region.

Table 2 Characteristics of studies included in the present systematic review and meta-analysis on factors affecting exclusive breast-feeding (EBF) in Ethiopia

Study	Study area (region and place)	Study method/design	Study population	Calculated sample size/participated	Factor	Exclusive breast-feeding		
						Yes	No	Total
Maternal/caregiver's age *v.* EBF								
Abera (2012)[66]	Harari, Harar town	Cross-sectional study	Mothers of children aged <2 years	604/583	<25 years	49	31	80
					≥25 years	158	161	319
					Total	207	192	399
Getahun *et al.* (2017)[67]	SNNPR, Kemba woreda	Cross-sectional study	Mothers who have children aged 6 months–2 years	567/562	<25 years	134	105	239
					≥25 years	200	123	323
					Total	334	228	562
Asfaw *et al.* (2015)[73]	Amhara, Debre Berhan district	Cross-sectional study	Mothers with their index infant aged <12 months	634/634	<25 years	47	61	108
					≥25 years	388	138	526
					Total	435	199	634
Gizaw *et al.* (2017)[68]	Afar, Hadaleala district	Cross-sectional study	Mothers who have children aged 6–24 months	258/254	<25 years	56	23	79
					≥25 years	132	43	175
					Total	188	66	254
Hunegnaw *et al.* (2017)[69]	Amhara, Gozamin district	Cross-sectional study	Mothers who had infants aged 6–12 months	506/478	<25 years	72	26	98
					≥25 years	286	104	390
					Total	358	130	488
Lenja *et al.* (2016)[70]	SNNPR, Offa district	Cross-sectional study	Mothers of infants aged <6 months	403/396	<25 years	96	22	118
					≥25 years	213	65	278
					Total	309	87	396
Setegn *et al.* (2012)[71]	Oromia, Bale zone, Goba district	Cross-sectional study	Mother–infant pairs	668/608	<25 years	79	27	106
					≥25 years	120	53	173
					Total	199	80	279
Sonko and Worku (2015)[72]	SNNPR, Halaba special woreda	Cross-sectional study	Mothers with children aged <6 months	422/420	<25 years	56	24	80
					≥25 years	240	100	340
					Total	296	124	420
Regassa (2014)[60]	SNNPR, Sidama zone	Cross-sectional study	Mothers with infants aged 0–6 months	1100/1094	<25 years	78	14	92
					≥25 years	120	22	142
					Total	198	36	234
Alemayehu *et al.* (2014)[56]	Tigray, Axum town	Cross-sectional study	Mothers who had children aged 6–12 months	418/418	<25 years	46	78	124
					≥25 years	125	169	294
					Total	171	247	418
Berhe *et al.* (2013)[57]	Tigray, Mekelle town	Cross-sectional study	Mothers of children aged 0–24 months	361/361	<25 years	54	32	86
					≥25 years	56	39	95
					Total	110	71	181
Teka *et al.* (2015)[74]	Tigray, Enderta woreda	Cross-sectional study	Mothers having children aged <24 months	541/530	<25 years	139	52	191
					≥25 years	233	106	339
					Total	372	158	530
Sefene *et al.* (2013)[75]	Amhara, Bahir Dar city	Cross-sectional study	Mothers having children aged <6 months	170/159	<25 years	18	25	43
					≥25 years	60	56	116
					Total	78	81	159
Infant age *v.* EBF								
Arage and Gedamu (2016)[82]	Amhara, Debre Tabor town	Cross-sectional study	Mothers of infants aged <6 months	470/453	≤3 months	201	80	281
					>3 months	96	72	168
					Total	297	152	449

Table 2 *Continued*

Study	Study area (region and place)	Study method/design	Study population	Calculated sample size/participated	Factor	Exclusive breast-feeding		
						Yes	No	Total
Alemayehu *et al.* (2009)[76]	Nine regions, national	EDHS	Women with infants aged <6 months	14 500/1142	≤3 months	682	1335	2017
					>3 months	326	683	1009
					Total	1008	2018	3026
Asemahagn (2016)[77]	Amhara, Azezo district	Cross-sectional study	Women having children aged 0–6 months	346/332	≤3 months	129	22	151
					>3 months	133	48	181
					Total	262	70	332
Liben *et al.* (2016)[78]	Afar, Dubti town	Cross-sectional study	Mothers of infants aged <6 months	346/333	≤3 months	199	36	235
					>3 months	71	27	98
					Total	270	63	333
Seid *et al.* (2013)[79]	Amhara, Bahir Dar city	Cross-sectional study	Mothers who delivered in the last 12 months	819/819	≤3 months	103	91	194
					>3 months	300	366	666
					Total	403	457	860
Setegn *et al.* (2012)[71]	Oromia, Bale zone, Goba district	Cross-sectional study	Mother–infant pairs	668/608	≤3 months	122	27	149
					>3 months	61	33	94
					Total	183	60	243
Sonko and Worku (2015)[72]	SNNPR, Halaba special woreda	Cross-sectional study	Mothers with children aged <6 months	422/420	≤3 months	121	43	164
					>3 months	175	81	256
					Total	296	124	420
Tadesse *et al.* (2016)[80]	SNNPR, Sorro district	Cross-sectional study	Mothers with infants aged 0–5 months	602/579	≤3 months	214	129	343
					>3 months	56	115	171
					Total	270	244	514
Tewabe *et al.* (2017)[81]	Amhara, Motta town, East Gojjam zone	Cross-sectional study	Mothers with infants aged <6 months	423/405	≤3 months	106	68	174
					>3 months	97	134	231
					Total	203	202	405
Berhe *et al.* (2013)[57]	Tigray, Mekelle town	Cross-sectional study	Mothers of children aged 0–24 months	361/361	≤3 months	96	51	147
					>3 months	14	20	34
					Total	110	71	181
Elyas *et al.* (2017)[83]	Addis Ababa, capital city	Cross-sectional study	Mothers of children aged 0–24 months	421/380	<3 months	26	38	64
					>3 months	25	29	54
					Total	51	67	118
Discarding colostrum *v.* EBF								
Arage and Gedamu (2016)[82]	Amhara, Debre Tabor town	Cross-sectional study	Mothers of infants aged <6 months	470/453	Discarding	7	5	12
					No	361	280	641
					Total	368	285	653
Egata *et al.* (2013)[84]	Oromia, Kersa district	Cross-sectional study (EDHS based)	Mothers of children <2 years of age	881/860	Discarding	44	29	73
					No	573	214	787
					Total	617	243	860
Lenja *et al.* (2016)[70]	SNNPR, Offa district	Cross-sectional study	Mothers of infants aged <6 months	403/396	Discarding	53	33	86
					No	256	49	305
					Total	309	82	391
Liben *et al.* (2016)[78]	Afar, Dubti town	Cross-sectional study	Mothers of infants aged <6 months	346/333	Discarding	33	19	52
					No	237	44	281
					Total	270	63	333
Mekuria and Edris (2015)[85]	Amhara, Debre Markos	Cross-sectional study	Mothers who had an infant <6 months old	423/413	Discarding	83	71	154
					No	168	91	259
					Total	251	162	413

Table 2 *Continued*

Study	Study area (region and place)	Study method/design	Study population	Calculated sample size/participated	Factor	Exclusive breast-feeding		
						Yes	No	Total
Seid *et al.* (2013)[79]	Amhara, Bahir Dar city	Cross-sectional study	Mothers who delivered in the last 12 months	819/819	Discarding	56	80	136
					No	356	323	679
					Total	412	403	815
Tadesse *et al.* (2016)[80]	SNNPR, Sorro district	Cross-sectional study	Mothers with infants aged 0–5 months	602/579	Discarding	68	101	169
					No	202	143	345
					Total	270	244	514
Tewabe *et al.* (2017)[81]	Amhara, Motta town, East Gojjam zone	Cross-sectional study	Mothers with infants aged <6 months	423/405	Discarding	18	64	82
					No	185	138	323
					Total	203	202	405
Tamiru *et al.* (2012)[86]	Oromia, Jimma Arjo woreda	Cross-sectional study	Mothers of index children aged 0–6 months	384/382	Discarding	61	42	103
					No	122	157	279
					Total	183	199	382
Tamiru and Tamrat (2015)[59]	SNNPR, Arba Minch Zuria woreda	Cross-sectional study	Mothers of infants aged 2 years or younger	384/384	Discarding	23	19	42
					No	232	110	342
					Total	255	129	384
Alemayehu *et al.* (2014)[56]	Tigray, Axum town	Cross-sectional study	Mothers who had children aged 6–12 months	418/418	Discarding	49	118	167
					No	122	66	188
					Total	171	184	355
Teka *et al.* (2015)[74]	Tigray, Enderta woreda	Cross-sectional study	Mothers having children aged <24 months	541/530	Discarding	350	141	491
					No	22	17	39
					Total	372	158	530
Echamo (2012)[87]	SNNPR, Arbaminch town	Cross-sectional study	Mothers having children aged 6–12 months	768/768	Discarding	32	101	133
					No	325	310	635
					Total	357	411	768

SNNPR, Southern Nations, Nationalities and Peoples' Region; EDHS, Ethiopian Demographic and Health Survey.

develop national guidelines and strategies, including on colostrum discarding.

Methods

Protocol registration and publication

The protocol has been registered with the University of York Centre for Reviews and Dissemination's international prospective register of systematic reviews (PROSPERO; http://www.crd.york.ac.uk/PROSPERO/display_record.asp?ID=CRD42017056768) and published[41].

Data source and search strategy

For all available publications, systematic searchs of PubMed, SCOPUS, EMBASE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Web of Science and WHO Global Health Library electronic databases was done. In addition, bibliographies of identified articles and grey literatures were hand-searched. A comprehensive search strategy was developed for each database in consultation with a medical information specialist (see online supplementary material, Supplemental File 1).

Eligibility criteria

All observational studies (cross-sectional, case–control, cohort, survey and surveillance reports) conducted in Ethiopia, published in English from 2000 to January 2018, were included. This period was selected because population demography changes over time and we wanted to include the latest evidences in the country. In addition, most of the published studies on the topic were conducted in this period. However, studies on preterm infants, infants in a neonatal intensive care unit or a special care baby unit, and low-birth-weight infants were excluded. Mothers or infants with HIV/AIDS were also excluded because health-care workers provide breast-feeding counselling and related interventions due to WHO recommendations on HIV and infant feeding. Consequently, the level of EBF in mothers or infants with HIV/AIDS may be higher and the associated factors may not be the same as those of HIV-uninfected mothers. Further, commentaries, anonymous reports, letters, duplicate studies, editorials, qualitative studies and citations without full text were excluded.

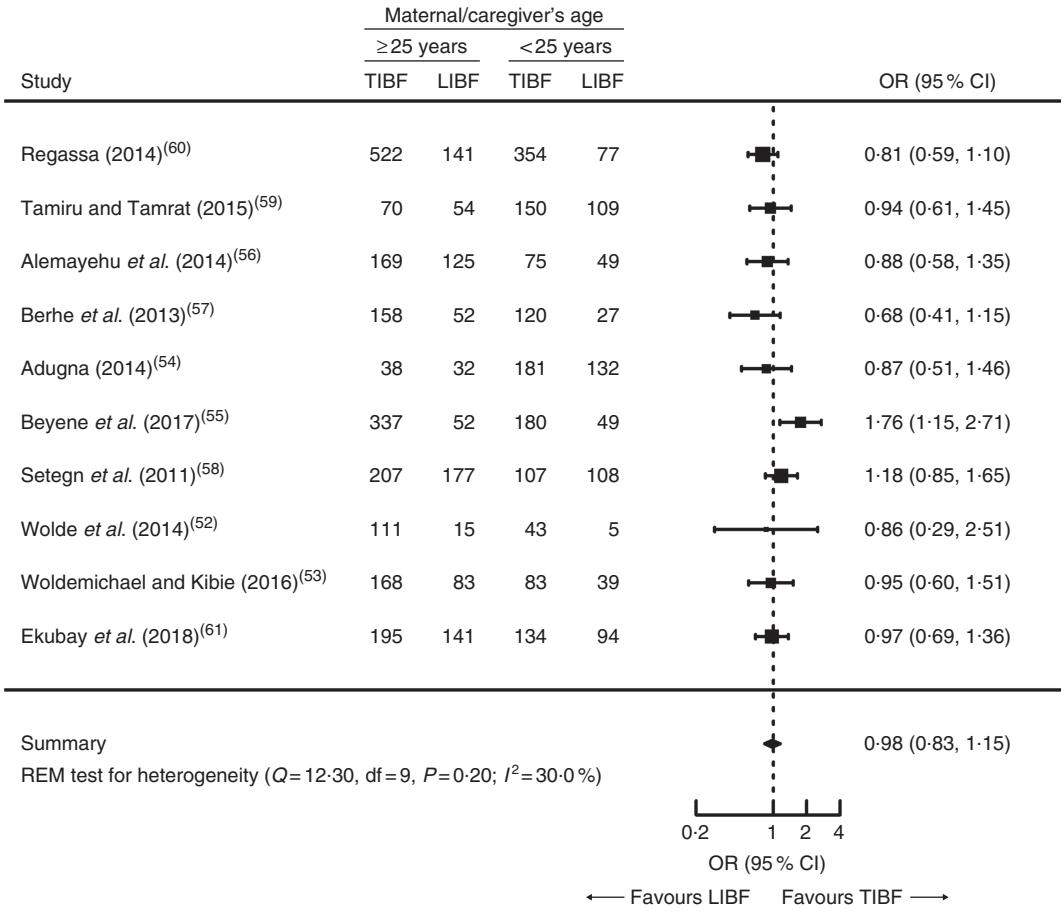

Fig. 2 Forest plot of ten studies on the association of maternal/caregiver's age with timely initiation of breast-feeding (TIBF) in Ethiopia. The study-specific OR and 95 % CI are represented by the black square and horizontal line, respectively, with area of the square proportional to the specific-study weight to the overall meta-analysis. The centre of the black diamond represents the pooled OR and its width represents the pooled 95 % CI (LIBF, late initiation of breast-feeding; REM, random-effects model)

Study screening and selection

All studies obtained from databases and manual search were exported to EndNote citation manager. The title and abstract of all studies were screened by two reviewers (S.M.A. and T.D.H.) independently. Agreement between the reviewers, as measured by Cohen's κ, was 0·76. Any disagreement was resolved by discussion. When consensus could not be reached, a third reviewer, who also had expertise in this area, approved the final list of retained studies. A full-text review was performed by two independent investigators (S.M.A. and T.D.H.).

Quality assessment and data extraction

The Newcastle–Ottawa Scale, which has good inter-rater reliability and validity, was used to assess the quality of studies and for potential publication bias[42,43]. The Newcastle–Ottawa Scale includes three categorical criteria with a maximum score of 9: a maximum of four stars are allotted for 'selection'; a maximum of two stars are allotted for 'comparability'; and a maximum of three stars are allotted for 'outcome'. The quality of each study was rated using the following scoring algorithm: ≥7, 'good'; 2–6, 'fair'; and ≤1, 'poor'[44]. Only studies of 'good' quality were selected for the final review and analysis.

In addition, to define outcome measurements, the WHO infant and young child feeding practice guideline was strictly followed. TIBF was assessed by 'since birth', while EBF was assessed in one of the following ways: 24 h recall/seven repeated 24 h recalls/6-month recalling method/7 d self-recall/since birth dietary recall method. Based on previous systematic review reports[24,45,46], maternal/caregiver's age was dichotomized as ≥25 *v.* <25 years old whereas infant age was dichotomized as ≤3 *v.* 3–6 months. The Joanna Briggs Institute tool[47] was used to extract the following data: study area (region and place), method (design), population, number of mothers (calculated sample size and participated in actual study) and cross-tabulated data. Geographic regions were categorized based on the current Federal Democratic Republic of Ethiopia administrative structure. Discrepancies were resolved by consensus and cross-checking with the full text.

Statistical analysis

A weighted inverse-variance random-effects model meta-analyses was implemented. In addition, to illustrate the trend of evidence regarding the effect of newborn gender, antenatal clinic and postnatal clinic attendance on breast-feeding practices, a cumulative meta-analysis was done.

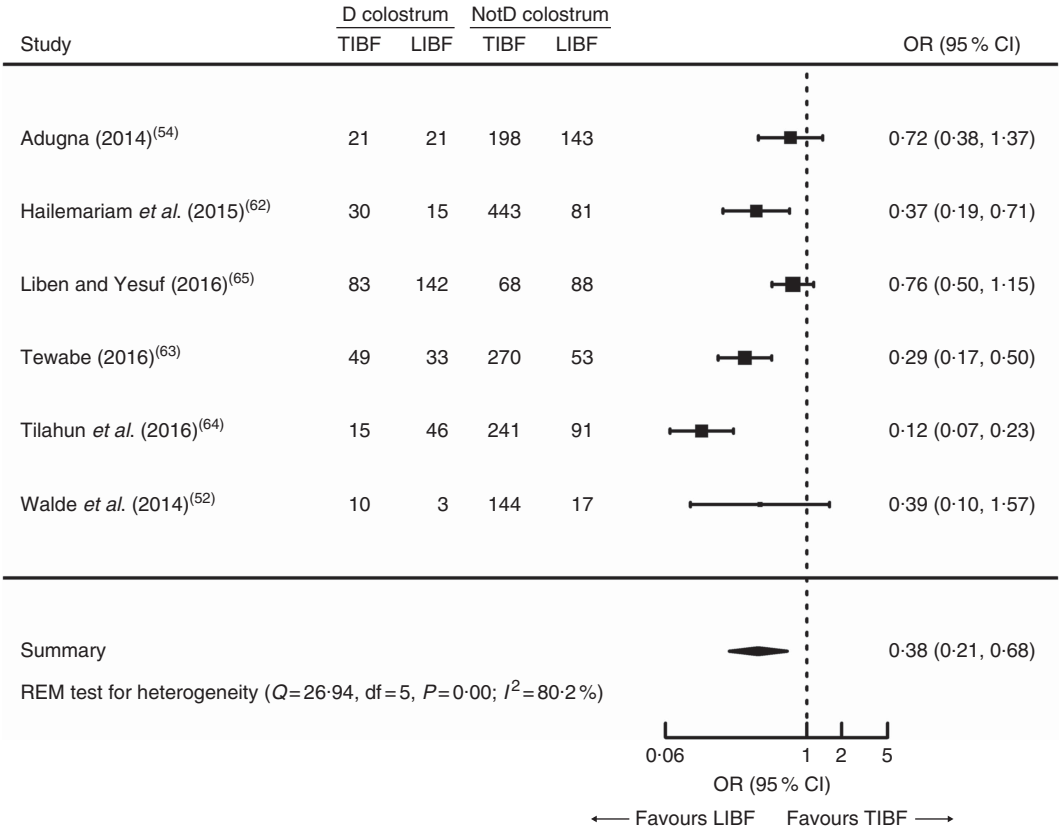

Fig. 3 Forest plot of six studies on the association of colostrum discarding with timely initiation of breast-feeding (TIBF) in Ethiopia. The study-specific OR and 95 % CI are represented by the black square and horizontal line, respectively, with area of the square proportional to the specific-study weight to the overall meta-analysis. The centre of the black diamond represents the pooled OR and its width represents the pooled 95 % CI (D, discarding; NotD, not discarding; LIBF, late initiation of breast-feeding; REM, random-effects model)

Publication bias was assessed by visual inspection of the funnel plot and Egger's regression test for funnel plot asymmetry using SE as a predictor in a mixed-effects meta-regression model at P value threshold of ≤0·01[48]. The Duval and Tweedie trim-and-fill method[49] was used if we found an asymmetric funnel plot, which indicates publication bias. Cochran's Q χ^2 test, τ^2 and I^2 statistics were used to test for heterogeneity, estimate the amount of total/residual heterogeneity and measure the variability attributed to heterogeneity, respectively[50]; for the current meta-analysis, we used a reference value of $I^2 > 80\,\%$ to indicate substantial variability related to heterogeneity[41]. Mixed-effects meta-regression analysis was done to identify possible sources of between-study heterogeneity. The data were analysed using 'metaphor' packages in R software version 3.2.1 for Windows[51].

Data synthesis and reporting

We analysed the data in two groups of outcome measurements: TIBF and EBF. Results for each variable are shown using forest plots. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline was strictly followed (see online supplementary material, Supplemental File 2).

Minor changes from the published protocol

Before analysis was done, we made the following changes to our methods from the published protocol[41]. We added the Joanna Briggs Institute tool[47] to extract the data. In addition, we used the Duval and Tweedie trim-and-fill method[49] to manage publication bias. Furthermore, cumulative meta-analysis and mixed-effects meta-regression analysis were done to reveal the trend of evidence on each associated factor and to identify possible sources of between-study heterogeneity, respectively.

Result

Search results

We obtained 169 articles from PubMed, twenty-four from EMBASE, 200 from Web of Science, eighty-five from SCOPUS and five from other (CINHAL and WHO Global Health Library) electronic database searching. Fifty-one

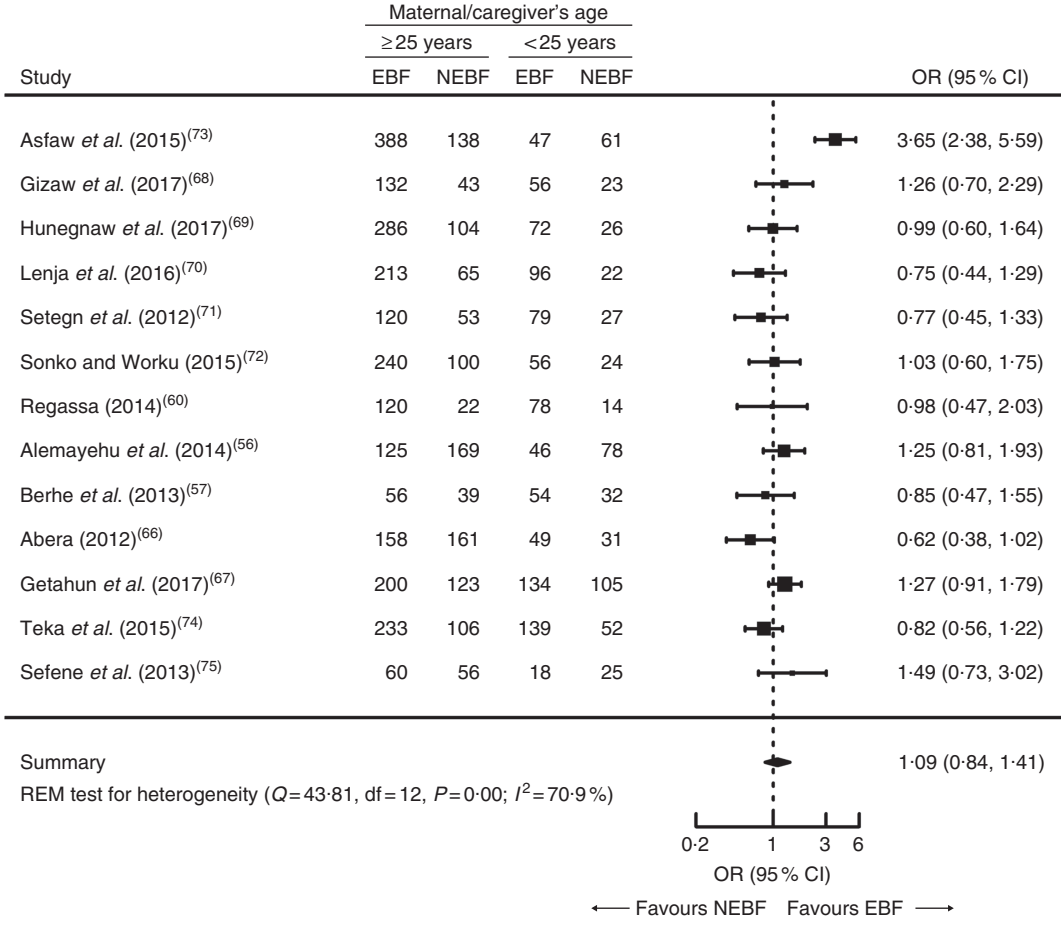

Fig. 4 Forest plot of thirteen studies on the association of maternal/caregiver's age with exclusive breast-feeding (EBF) in Ethiopia. The study-specific OR and 95 % CI are represented by the black square and horizontal line, respectively, with area of the square proportional to the specific-study weight to the overall meta-analysis. The centre of the black diamond represents the pooled OR and its width represents the pooled 95 % CI (NEBF, non-exclusive breast-feeding; REM, random-effects model)

additional articles were found through a manual search of reference lists of included articles. After removing duplicates and screening of titles and abstracts, the full texts of eighty-five studies were reviewed to assess eligibility. Forty-five articles were excluded after a full-text review due to several reasons: nineteen studies on complementary feeding, three on pre-lacteal feeding, three on malnutrition, nineteen with different variables of interest and one project review report. As a result, forty articles (i.e. fourteen studies on TIBF and twenty-six on EBF) fulfilled the inclusion criteria and were included in the meta-analyses. The PRISMA flow diagram of the literature screening and selection process is shown in Fig. 1.

Study characteristics

Of the fourteen studies on TIBF, most were conducted in the Southern Nations, Nationalities and Peoples' Region (SNNPR) and Oromia region. Regarding maternal/caregiver's residence, six of the studies were conducted among urban dwellers (Table 1).

The majority of the twenty-six studies on EBF were done in Amhara and SNNPR regions with eight and seven studies, respectively. Furthermore, two studies used nationally representative data of the Ethiopian Demographic and Health Survey (EDHS). Likewise, nearly half of the studies were conducted in urban residents (Table 2).

Timely initiation of breast-feeding

Among the fourteen studies, ten studies[52–61] reported the association between TIBF and maternal/caregiver's age in 4963 mothers. The pooled OR of maternal/caregiver's age was 0·98 (95 % CI 0·83, 1·15, $P = 0·78$; Fig. 2). Although not statistically significant, mothers aged ≥25 years had 2 % lower chance of initiating breast-feeding within 1 h of birth compared with their younger counterparts. Egger's regression test for funnel plot asymmetry was not significant ($z = -0·40$, $P = 0·69$; see online supplementary material, Supplemental Fig. 1).

Likewise, six out of fourteen studies reported the association between TIBF and colostrum discarding in 2305 mothers[52,54,62–65]. The pooled OR of colostrum discarding was found to be 0·38 (95 % CI 0·21, 0·68, $P = 0·001$; Fig. 3). Compared with mothers who feed colostrum, mothers who discard colostrum had 62 % significantly lower

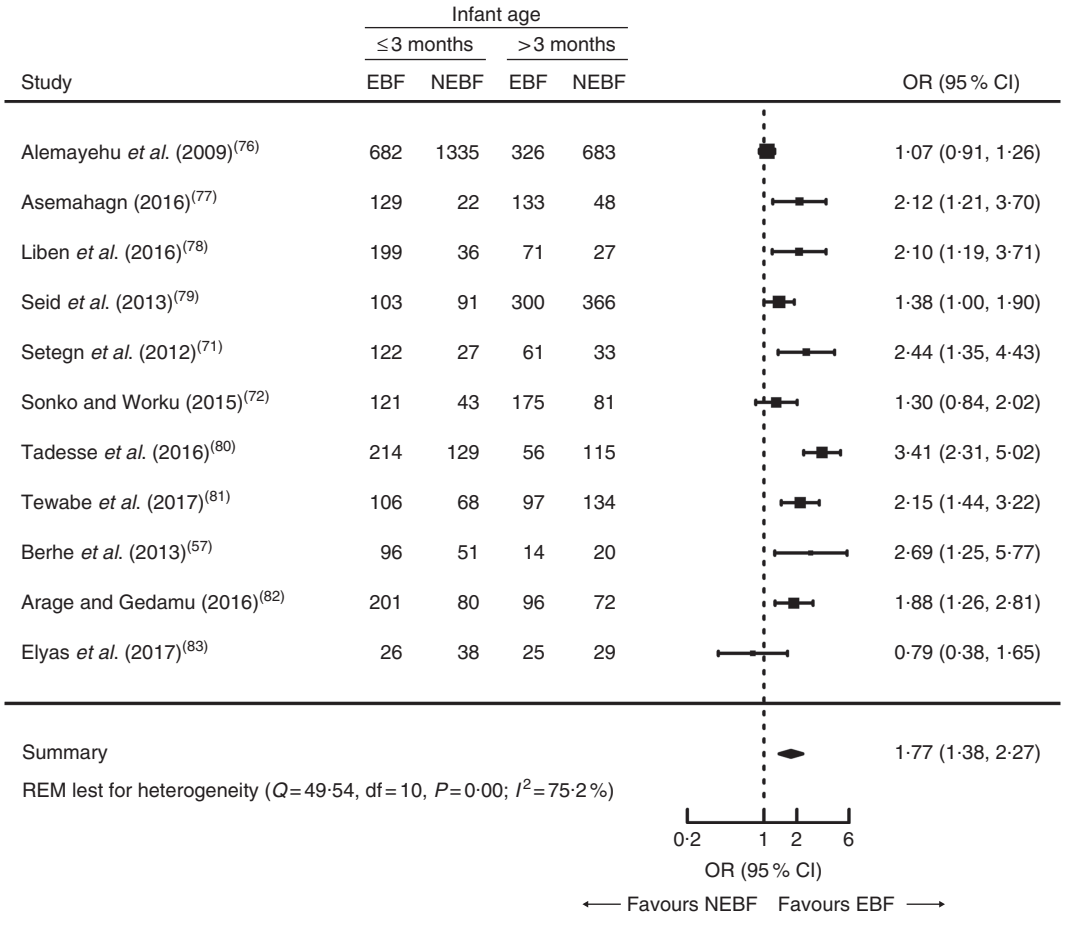

Fig. 5 Forest plot of eleven studies on the association of infant age with exclusive breast-feeding (EBF) in Ethiopia. The study-specific OR and 95 % CI are represented by the black square and horizontal line, respectively, with area of the square proportional to the specific-study weight to the overall meta-analysis. The centre of the black diamond represents the pooled OR and its width represents the pooled 95 % CI (NEBF, non-exclusive breast-feeding; REM, random effects model)

chance of initiating breast-feeding within 1 h. Egger's regression test for funnel plot asymmetry was not significant ($z = -0{\cdot}24$, $P = 0{\cdot}81$; see online supplementary material, Supplemental Fig. 2).

Exclusive breast-feeding

Thirteen studies[56,57,60,66–75] involving 4929 individuals reported the association between EBF and maternal/caregiver's age. As shown in Fig. 4, the pooled OR of maternal/caregiver's age was 1·09 (95 % CI 0·84, 1·41, $P = 0{\cdot}51$). Mothers aged ≥25 years had 9 % higher chance of EBF during the first 6 months compared with mothers <25 years old; however, it was not statistically significant. Egger's regression test for funnel plot asymmetry was not significant ($z = -0{\cdot}60$, $P = 0{\cdot}55$; see online supplementary material, Supplemental Fig. 3).

In addition, eleven[57,71,72,76–83] out of twenty-six studies reported the association between EBF and infant age with a total sample of 6881 mothers. The pooled OR of infant age was 1·77 (95 % CI 1·38, 2·27, $P = 0{\cdot}001$; Fig. 5). Children aged ≤3 months had 77 % statistically significant higher chance of being exclusively breast-fed compared with children >3 months old. Egger's regression test for funnel plot asymmetry was not significant ($z = 0{\cdot}82$, $P = 0{\cdot}41$; see online supplementary material, Supplemental Fig. 4).

Finally, thirteen studies[56,59,70,74,78–82,84–87] reported the association between EBF and colostrum discarding with a sample of 6803 mothers. As indicated in Fig. 6, the pooled OR of colostrum discarding was 0·53 (95 % CI 0·36, 0·78, $P < 0{\cdot}001$). Mothers who discard colostrum had 47 % statistically significant lower chance of EBF during the first 6 months compared with mothers who feed colostrum. Egger's regression test for funnel plot asymmetry was not significant ($z = 0{\cdot}84$, $P = 0{\cdot}40$; see online supplementary material, Supplemental Fig. 5).

Cumulative meta-analysis

As illustrated in Fig. 7, the effect of increased maternal age on TIBF has been increasing slowly over time whereas the effect of discarding colostrum (Fig. 8) has been increasing dramatically. Similarly, the effect of maternal age (Fig. 9), discarding colostrum (Fig. 10) and infant age (Fig. 11) on EBF has been increasing.

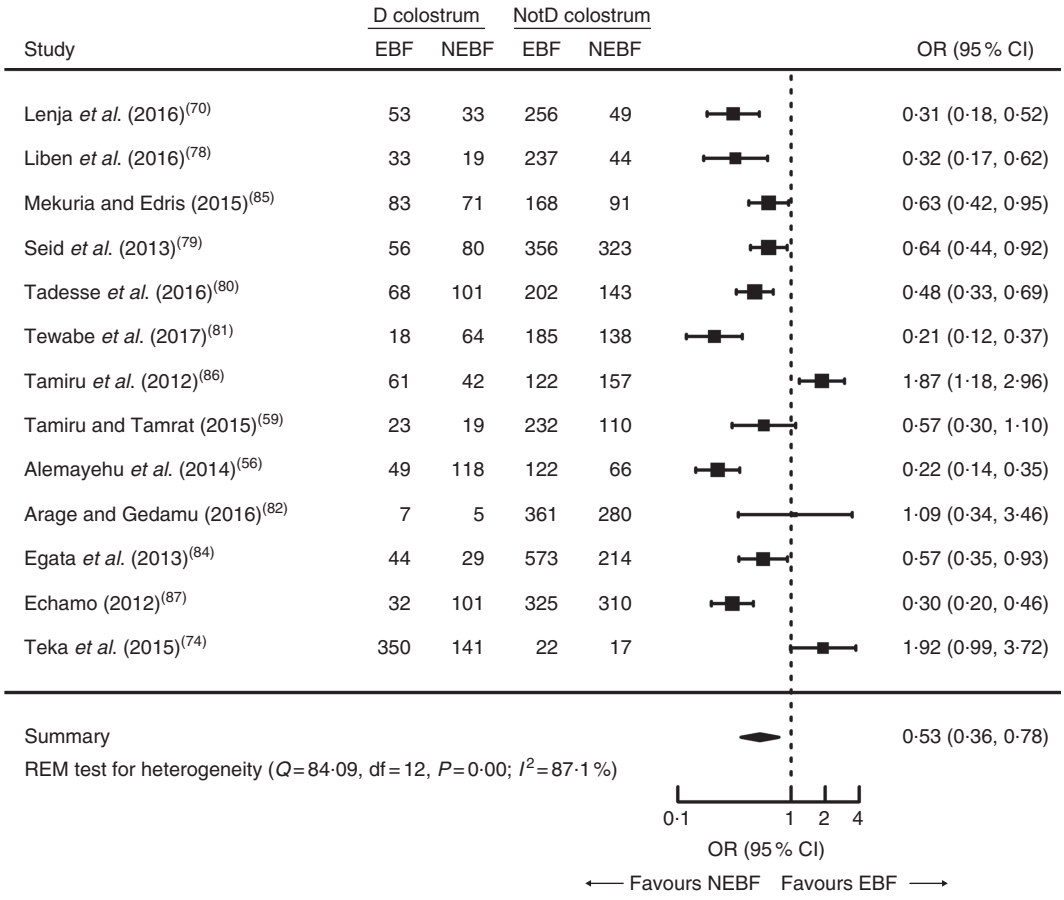

Fig. 6 Forest plot of thirteen studies on the association of discarding colostrum with exclusive breast-feeding (EBF) in Ethiopia. The study-specific OR and 95 % CI are represented by the black square and horizontal line, respectively, with area of the square proportional to the specific-study weight to the overall meta-analysis. The centre of the black diamond represents the pooled OR and its width represents the pooled 95 % CI (D, discarding; NotD, not discarding; NEBF, non-exclusive breast-feeding; REM, random-effects model)

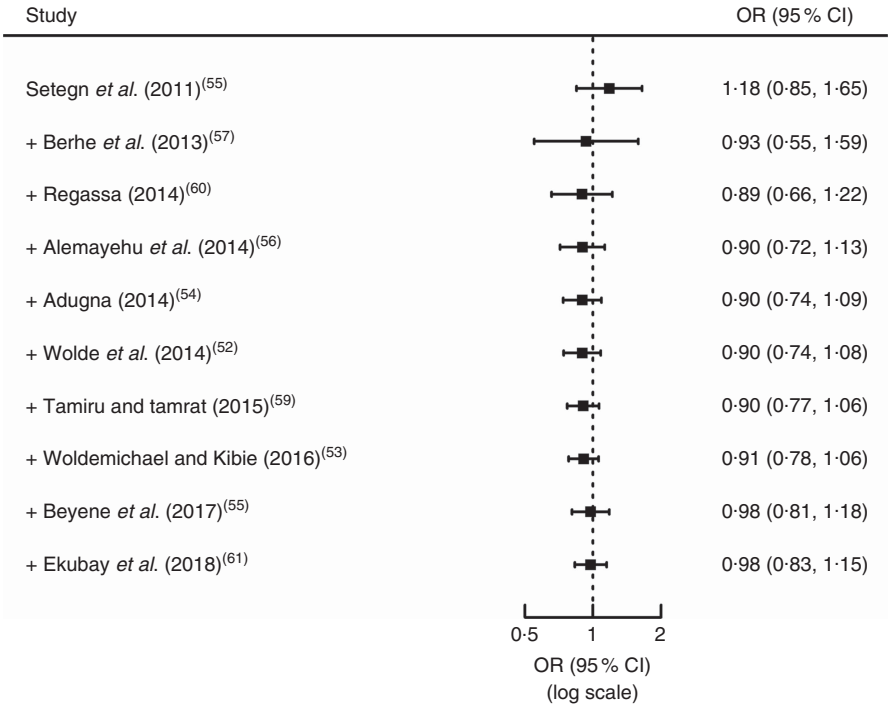

Fig. 7 Forest plot showing the results from a cumulative meta-analysis of studies examining the effect of maternal age on timely initiation of breast-feeding in Ethiopia. The study-specific (first data point)/cumulative OR and 95 % CI are represented by the black square and horizontal line, respectively

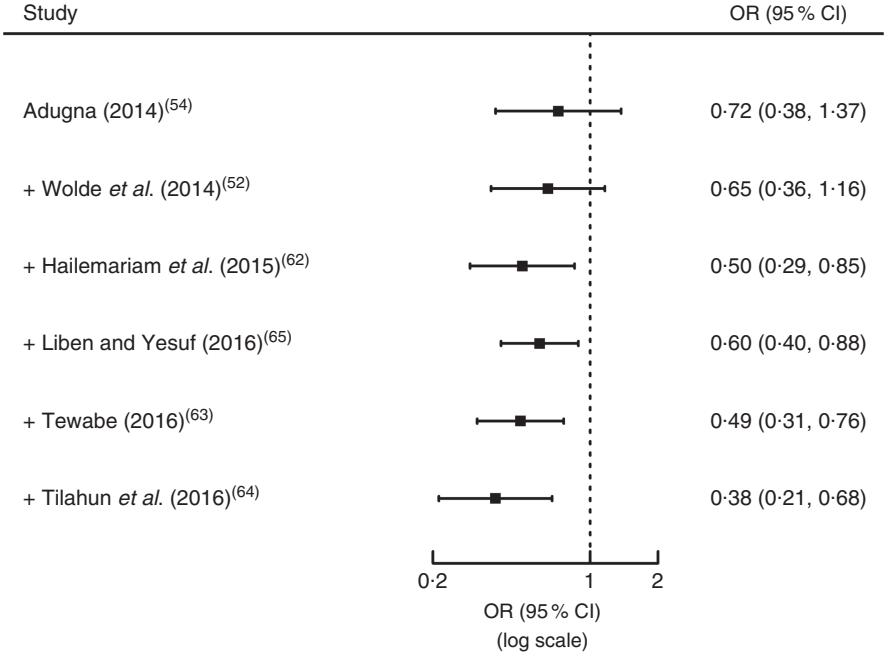

Fig. 8 Forest plot showing the results from a cumulative meta-analysis of studies examining the effect of discarding colostrum on timely initiation of breast-feeding in Ethiopia. The study-specific (first data point)/cumulative OR and 95 % CI are represented by the black square and horizontal line, respectively

Meta-regression analysis

In studies reporting the association between TIBF and discarding colostrum, 95 % of the heterogeneity was due to variation in study area (region), residence of mothers, sample size and publication year. Based on the omnibus test, however, none of these factors influenced their association ($QM = 6{\cdot}46$, df = 7, $P = 0{\cdot}49$; Table 3). In studies reporting the association between TIBF and maternal age, there was no statistically significant heterogeneity between studies ($\tau^2 = 2\,\%$, $Q = 12{\cdot}30$, df = 9, $P = 0{\cdot}20$); as a result, it

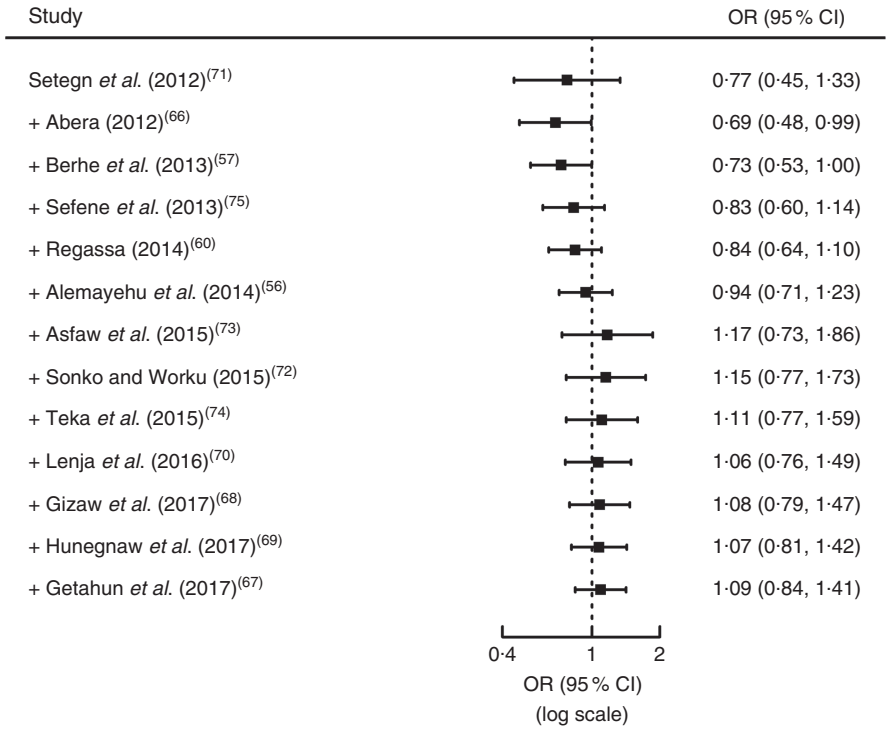

Fig. 9 Forest plot showing the results from a cumulative meta-analysis of studies examining the effect of maternal age on exclusive breast-feeding in Ethiopia. The study-specific (first data point)/cumulative OR and 95 % CI are represented by the black square and horizontal line, respectively

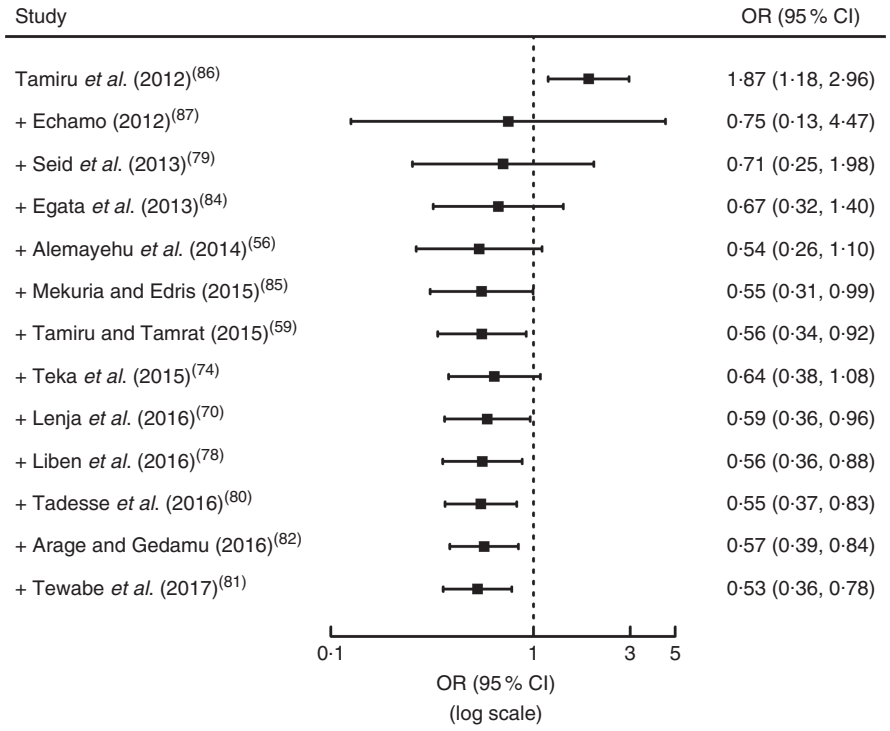

Fig. 10 Forest plot showing the results from a cumulative meta-analysis of studies examining the effect of discarding colostrum on exclusive breast-feeding in Ethiopia. The study-specific (first data point)/cumulative OR and 95 % CI are represented by the black square and horizontal line, respectively

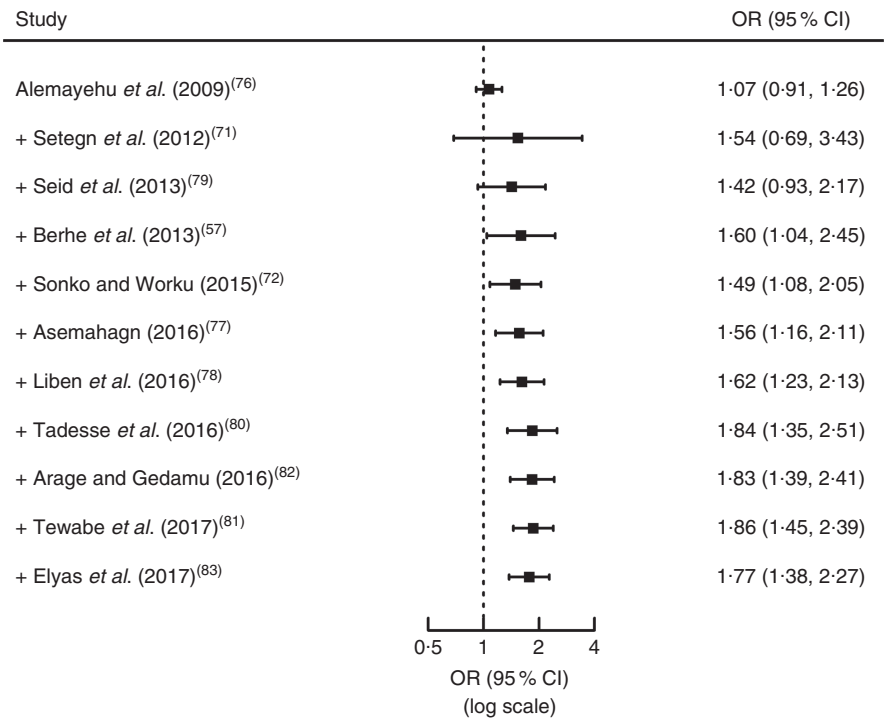

Fig. 11 Forest plot showing the results from a cumulative meta-analysis of studies examining the effect of infant age on exclusive breast-feeding in Ethiopia. The study-specific (first data point)/cumulative OR and 95 % CI are represented by the black square and horizontal line, respectively

is not relevant to investigate the possible reasons for heterogeneity.

In EBF, 100·0, 88·2 and 51·1 % of the heterogeneity among studies reporting maternal age, infant age and discarding colostrum was due to variation in study area (region), residence of mothers, sample size and publication year, respectively. Based on the omnibus test, study area (region), publication year and sample size significantly influenced the association between maternal age and EBF practice ($QM = 42{\cdot}27$, df = 9, $P < 0{\cdot}001$). Study area (region) and publication year also significantly influenced the association between infant age and EBF practice ($QM = 27{\cdot}24$, df = 8, $P = 0{\cdot}0006$). Furthermore, residence and publication year significantly influenced the association between discarding colostrum and EBF ($QM = 16{\cdot}66$, df = 8, $P = 0{\cdot}03$; Table 3).

Discussion

The present study examined the associations of TIBF and EBF with colostrum discarding, maternal/caregiver's age and infant age. To our knowledge, our study is the first systematic review and meta-analysis on this topic in Ethiopia to date. The meta-analysis uncovered that colostrum discarding was significantly associated with TIBF but not maternal/caregiver's age. On the other hand, colostrum discarding and infant age were found to be significantly associated with EBF but not maternal/caregiver's age.

We found that mothers who discard colostrum had 62 % significantly lower chance of initiating breast-feeding within 1 h compared with mothers who feed colostrum to their child. This may be explained by the attempt of discarding colostrum to get white milk taking time, which therefore results in a delayed initiation of breast-feeding.

In the present meta-analysis, we found a statistically significant association between EBF and infant age. This finding confirmed our hypothesis and is consistent with a large body of evidence showing that increased infant age is negatively associated with EBF[14,16,26,27,88,89]. This may be due to the fact that giving traditional postpartum care and support is common in Ethiopia immediately after birth, which may create opportunity for the mother to exclusively breast-feed the child. Since this traditional postpartum care and support decreases as the age of the infant increases, it may lead the mother to work outside. This may therefore force the mother to stop EBF. Evidence worldwide also agrees on the point that presence of social support is associated with better breast-feeding outcome[90–93]. Another possible reason is the workload and short maternity leave in Ethiopia, only two months postpartum until recently, which may influence the mother to withdraw EBF early. This hypothesis is supported by our previous meta-analyses[21], whereby maternal employment significantly lowered EBF, and other studies[92–95]. Moreover, this could also be related to the short birth interval in Ethiopia.

We noted that colostrum discarding was significantly associated with EBF. The finding was in line with studies conducted in Nepal[96] and Laos[97]. This may be due to

Table 3 Meta-regression analysis to identify possible reasons for between-study heterogeneity in studies included in the present systematic review and meta-analysis on factors affecting timely initiation of breast-feeding (TIBF) and exclusive breast-feeding (EBF) in Ethiopia

					CI	
Variable (reference category)*	Estimate	SE	*z* value	*P* value	Lower bound	Upper bound
TIBF						
Discarding colostrum						
Oromia region (Afar)	−1·29	0·97	−1·33	0·18	−3·20	0·62
SNNPR (Afar)	−0·32	0·68	−0·46	0·64	−1·65	1·02
Tigray region (Afar)	−0·97	0·66	−1·48	0·14	−2·26	0·31
Urban residence (Rural)	0·44	0·72	0·61	0·54	−0·96	1·85
Urban and rural residence (Rural)	1·25	0·63	1·98	0·05	0·01	2·49
Sample size	−0·002	0·001	−1·89	0·06	−0·004	0·0001
Publication year	−0·10	0·10	−1·01	0·31	−0·29	0·09
EBF						
Maternal age						
Amhara region (Afar)	−0·86	0·49	−1·75	0·08	−1·82	0·11
Harari region (Afar)	−2·99	0·75	−4·01	<0·0001	−4·45	−1·53
Oromia region (Afar)	−3·02	0·88	−3·45	0·001	−4·74	−1·30
SNNPR (Afar)	−1·19	0·42	−2·85	0·004	−2·02	−0·37
Tigray region (Afar)	−2·03	0·54	−3·69	0·0002	−3·10	−0·95
Urban residence (Rural)	0·67	0·36	1·85	0·06	−0·04	1·39
Urban and rural residence (Rural)	0·31	0·22	1·40	0·16	−0·12	0·75
Sample size	0·003	0·001	2·91	0·004	0·001	0·005
Publication year	−0·23	0·11	−2·11	0·03	−0·45	−0·02
Infant age†						
Afar region (Addis Ababa)	1·88	0·61	3·08	0·002	0·69	3·08
Amhara region (Addis Ababa)	1·55	0·49	3·20	0·001	0·60	2·51
All regions (Addis Ababa)	2·07	0·79	2·62	0·01	0·52	3·63
Oromia (Addis Ababa)	2·92	0·81	3·60	0·0003	1·33	4·51
SNNPR (Addis Ababa)	1·73	0·49	3·50	0·001	0·76	2·71
Tigray region (Addis Ababa)	3·16	0·91	3·46	0·001	1·38	4·96
Sample size	0·002	0·001	1·92	0·05	−0·00	0·004
Publication year	0·36	0·13	2·75	0·006	0·10	0·62
Discarding colostrum						
Amhara region (Afar)	0·40	0·69	0·58	0·56	−0·95	1·75
Oromia region (Afar)	−2·04	1·25	−1·63	0·10	−4·48	0·41
SNNPR (Afar)	−1·33	0·96	−1·38	0·17	−3·22	0·56
Tigray region (Afar)	−0·95	0·86	−1·11	0·27	−2·62	0·73
Urban residence (Rural)	−1·81	0·71	−2·56	0·01	−3·19	−0·42
Urban and rural residence (Rural)	0·57	0·94	0·61	0·54	−1·27	2·42
Sample size	−0·002	0·001	−1·10	0·27	−0·01	0·002
Publication year	−0·47	0·19	−2·46	0·01	−0·84	−0·09

SNNPR, Southern Nations, Nationalities and Peoples' Region.
*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.

the fact that discarding colostrum leads to pre-lacteal feeding. In agreement with recent studies[98–103], maternal/caregiver's age was not significantly associated with either EBF or TIBF. This is against our hypothesis and disproves the notion that older mothers have better breast-feeding experience than young mothers that helps them to practise optimal TIBF and EBF. However, there is robust evidence that, if supported, all reproductive-age mothers can maintain optimal TIBF and EBF equally[27,94,104]. Therefore, the discrepancy may be due to the following reasons: (i) most studies used maternal age rather than age at first birth; (ii) different studies have used different age categories; and (iii) breast-feeding is not age dependent or can be confounded by innate maternal behaviour.

The present meta-analyses study has several implications. It provided evidence on breast-feeding practice and its associated factors in an Ethiopian context, which can be useful for cross-country/cross-cultural comparison and for breast-feeding improvement initiatives in Ethiopia. The present study provides an overview of up-to-date evidence for nutritionists and public health professionals. The findings also indicate emphasis should be given for all age groups of mothers/caregivers during breast-feeding intervention. Furthermore, the study points out that colostrum discarding and associated beliefs should be considered during designing breast-feeding interventions.

The association was estimated in a large sample size and recent and nationally representative studies were included. In addition, the present systematic review and meta-analysis was conducted based on a registered and published protocol, and guidelines for the Meta-analysis of

Observational Studies in Epidemiology (MOOSE) were strictly followed. The study has also several limitations. First, some studies were excluded because of the difference in age category. Second, almost all included studies were observational, which hinders inference of causality. Third, even though we used broad search strategies, the possibility of missing relevant studies cannot be fully exempted. Fourth, based on the conventional methods of statistical testing, a few analyses suffered from high levels of between-study heterogeneity. The cause of the heterogeneity was carefully explored and may be due to differences in study area; therefore, the result should be interpreted with caution.

Conclusion

In conclusion, colostrum discarding was a possible barrier for both TIBF and EBF. Additionally, increased infant age was found to be a risk factor for non-EBF. However, maternal/caregiver's age was not a determinant factor for both TIBF and EBF. Interventions targeted on increasing the rate of TIBF and EBF should give special focus on colostrum discarding. In addition, future research is required to identify other factors affecting duration of EBF in Ethiopia. Further investigation is also required to assess the effect of age at first birth.

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Supplementary material

To view supplementary material for this article, please visit https://doi.org/10.1017/S1368980019000314

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