Public Health Nutrition: 22(11), 2063–2082 doi:10.1017/S1368980019000314

Review Article

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

Sisay Mulugeta Alemu[1,*], Yihun Mulugeta Alemu[2] and Tesfa Dejenie Habtewold[3]
[1]Mental Health and Psychosocial Support Program, International Medical Corps, 2314 Dolo Ado, Ethiopia: [2]Department of Public Health, Bahir Dar University, Bahir Dar, Ethiopia: [3]Department of Epidemiology, University of Groningen, Groningen, The Netherlands

Submitted 20 February 2018: Final revision received 3 January 2019: Accepted 14 January 2019: First published online 8 March 2019

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,

*Corresponding author: Email sisaym8@gmail.com

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

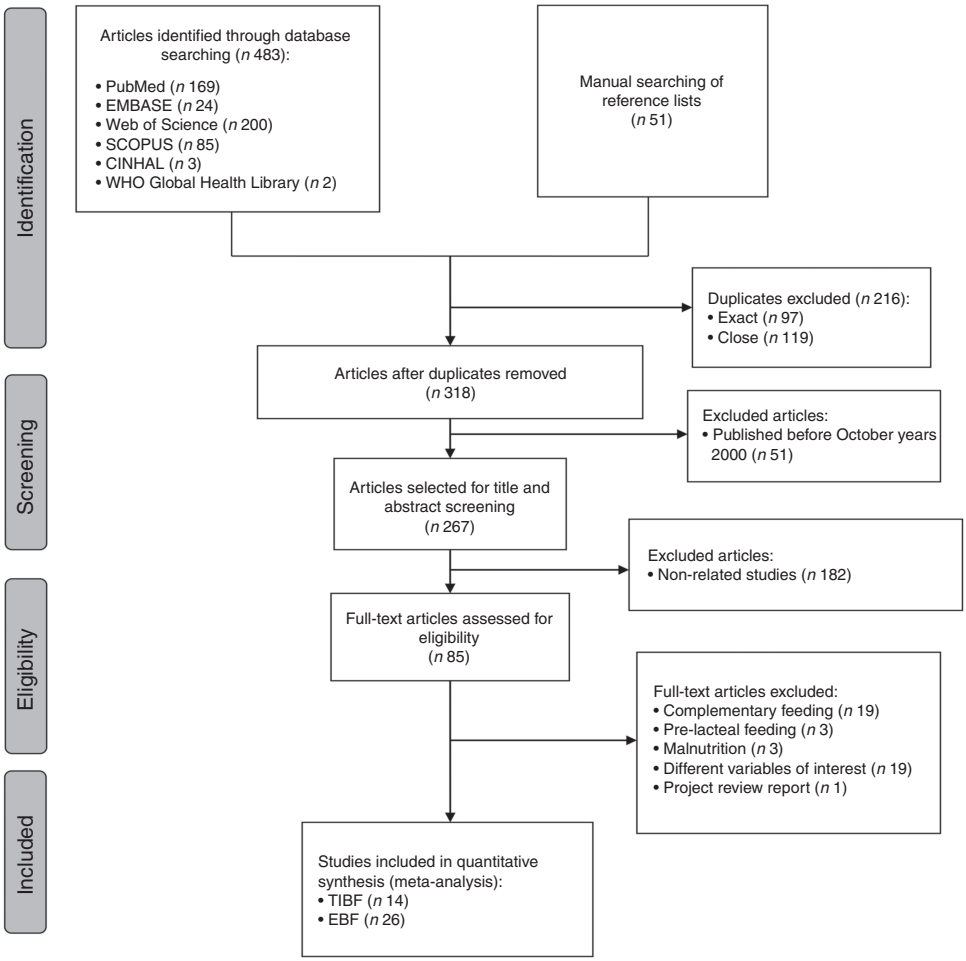

Fig. 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram of the literature screening and selection process for studies included in the present systematic review and meta-analysis on factors affecting timely initiation of breast-feeding (TIBF) and exclusive breast-feeding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

https://doi.org/10.1017/S1368980019000314 Published online by Cambridge University Press

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.

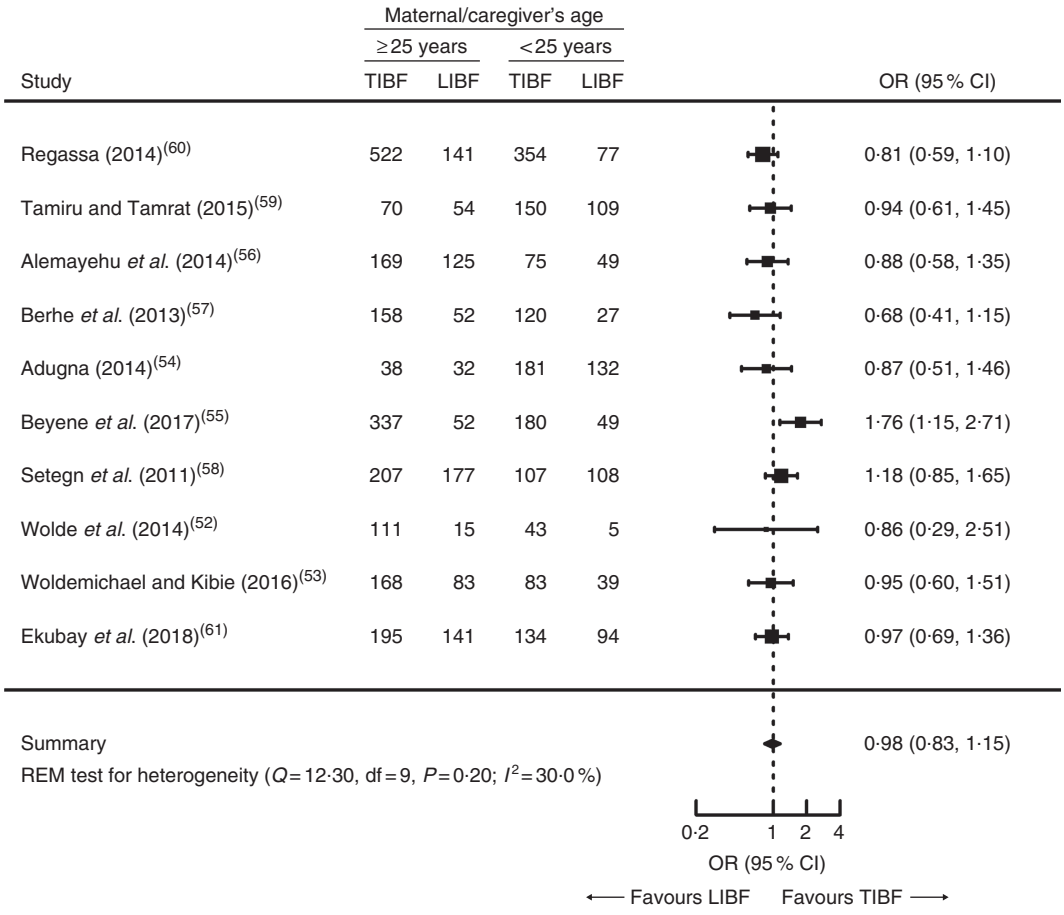

Fig. 2 Forest plot of ten studies on the association of maternal/caregiver's age with timely initiation of breast-feeding (TIBF) in Ethiopia. The study-specific OR and 95 % CI are represented by the black square and horizontal line, respectively, with area of the square proportional to the specific-study 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)

https://doi.org/10.1017/S1368980019000314 Published online by Cambridge University Press

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.

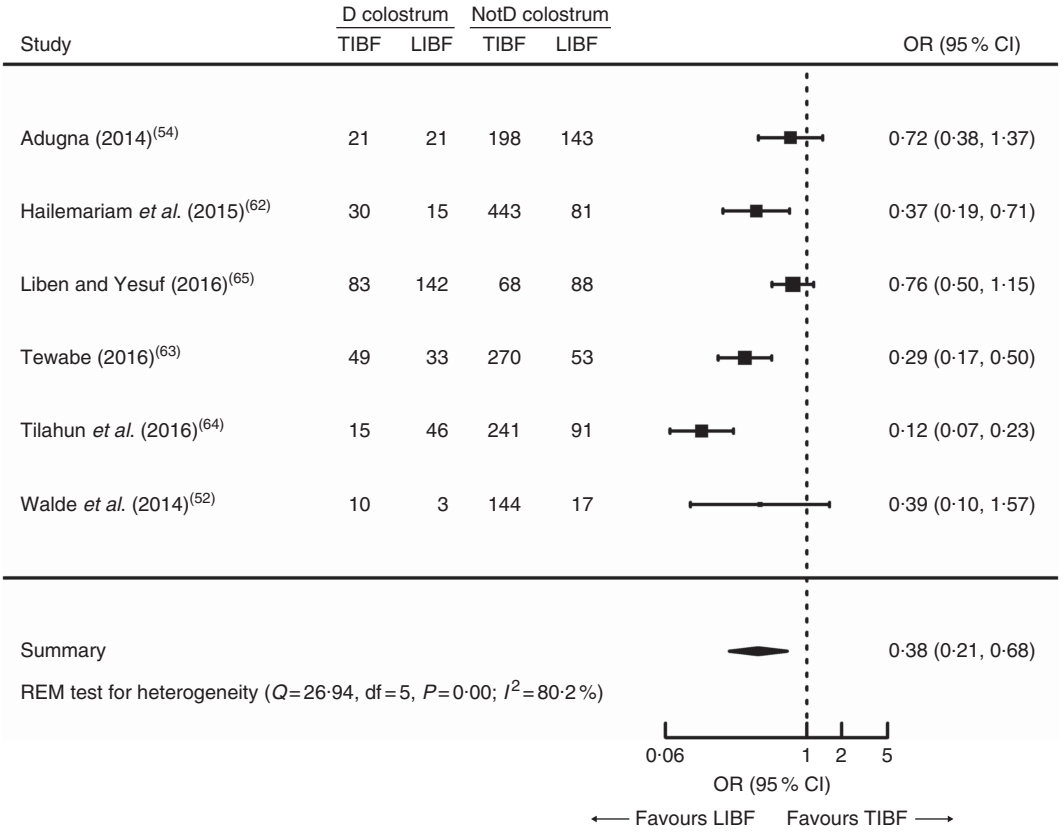

Fig. 3 Forest plot of six studies on the association of colostrum discarding with timely initiation of breast-feeding (TIBF) in Ethiopia. The study-specific OR and 95 % CI are represented by the black square and horizontal line, respectively, with area of the square proportional to the specific-study 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)

https://doi.org/10.1017/S1368980019000314 Published online by Cambridge University Press

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

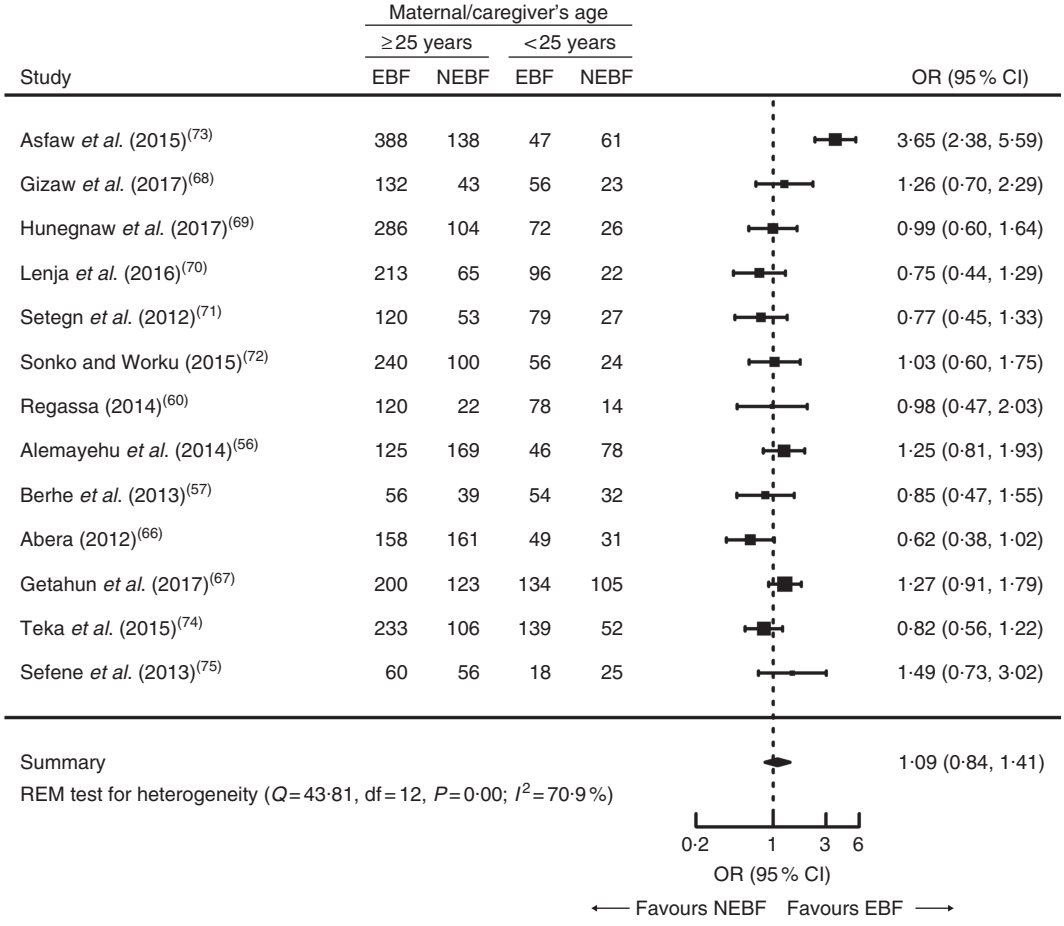

Fig. 4 Forest plot of thirteen studies on the association of maternal/caregiver's age with exclusive breast-feeding (EBF) in Ethiopia. The study-specific OR and 95 % CI are represented by the black square and horizontal line, respectively, with area of the square proportional to the specific-study weight 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)

https://doi.org/10.1017/S1368980019000314 Published online by Cambridge University Press

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

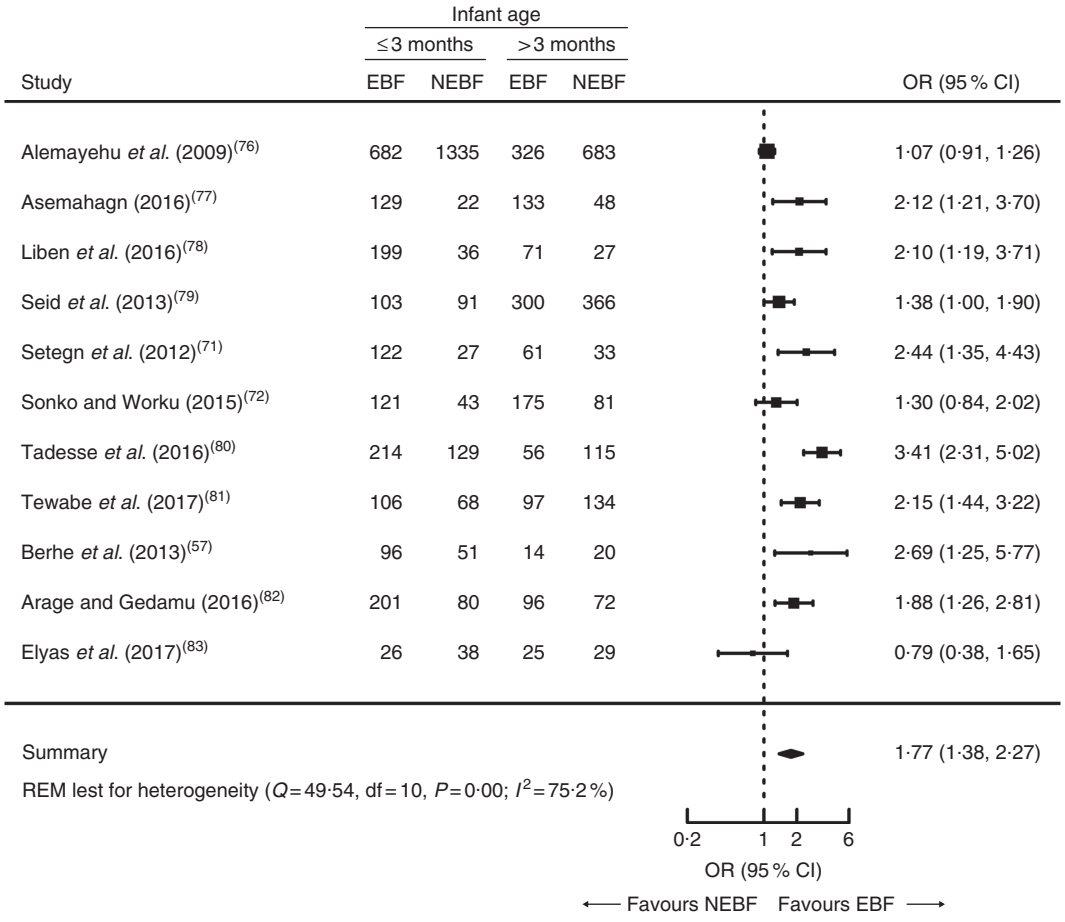

Fig. 5 Forest plot of eleven studies on the association of infant age with exclusive breast-feeding (EBF) in Ethiopia. The study-specific OR and 95 % CI are represented by the black square and horizontal line, respectively, with area of the square proportional to the specific-study weight to the overall 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)

https://doi.org/10.1017/S1368980019000314 Published online by Cambridge University Press

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.

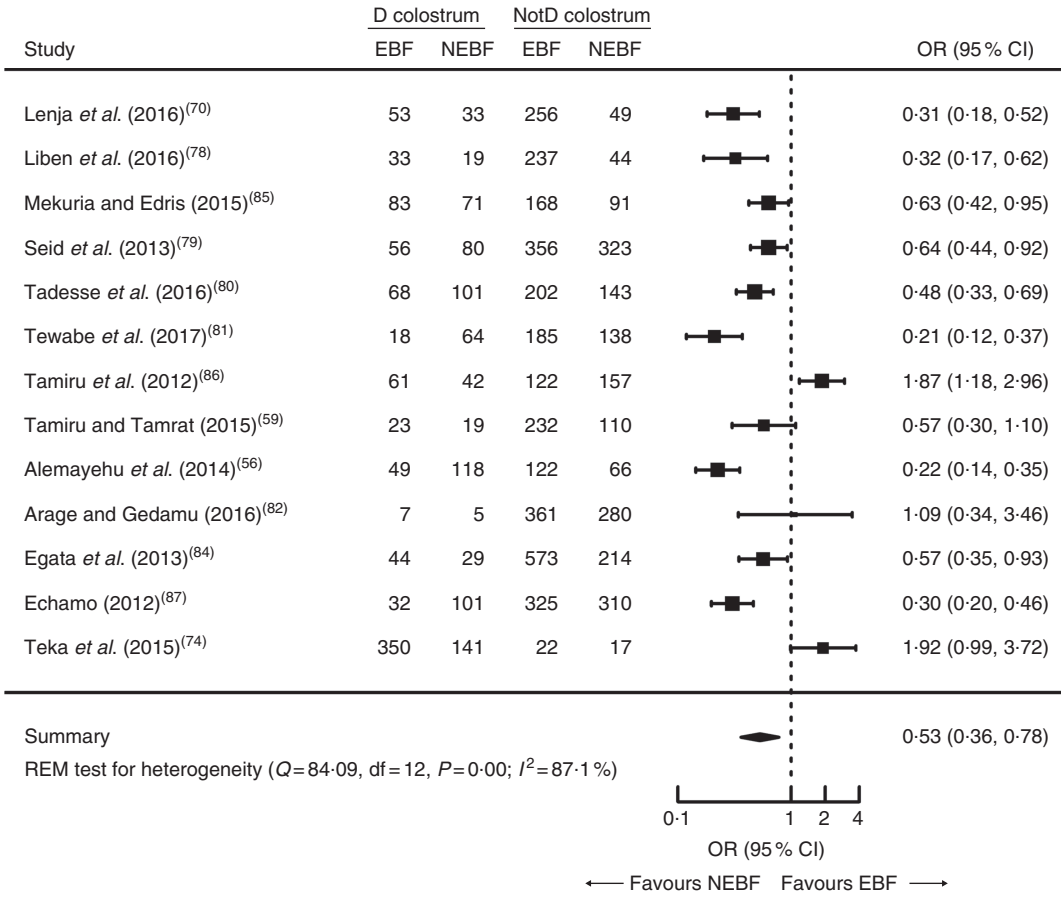

Fig. 6 Forest plot of thirteen studies on the association of discarding colostrum with exclusive breast-feeding (EBF) in Ethiopia. The study-specific OR and 95 % CI are represented by the black square and horizontal line, respectively, with area of the square proportional to the specific-study weight 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)

https://doi.org/10.1017/S1368980019000314 Published online by Cambridge University Press

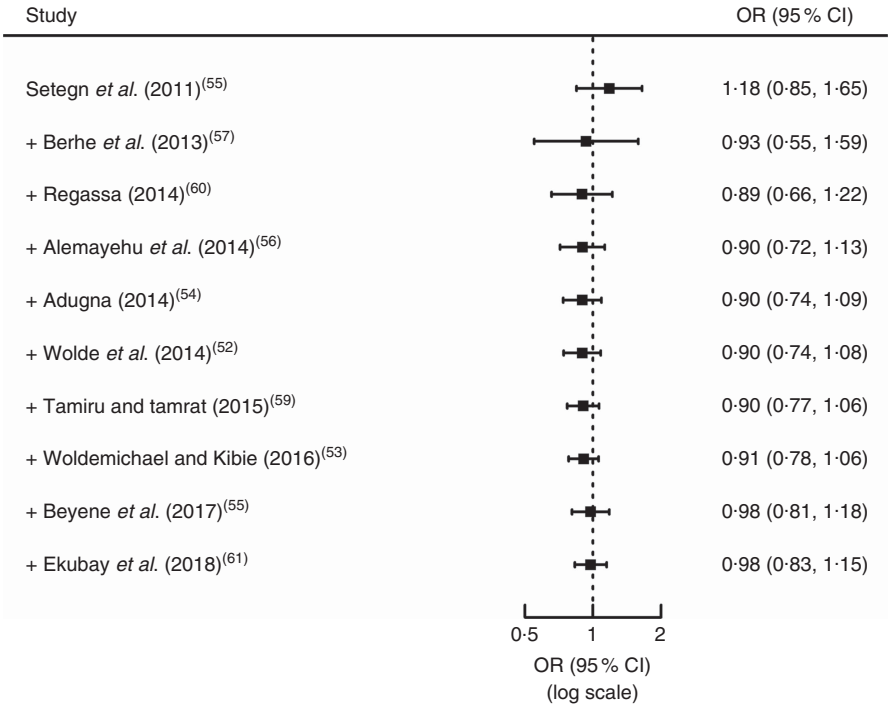

Fig. 7 Forest plot showing the results from a cumulative meta-analysis of studies examining the effect of maternal age on timely initiation of breast-feeding in Ethiopia. The study-specific (first data point)/cumulative OR and 95 % CI are represented by the black square and horizontal line, respectively

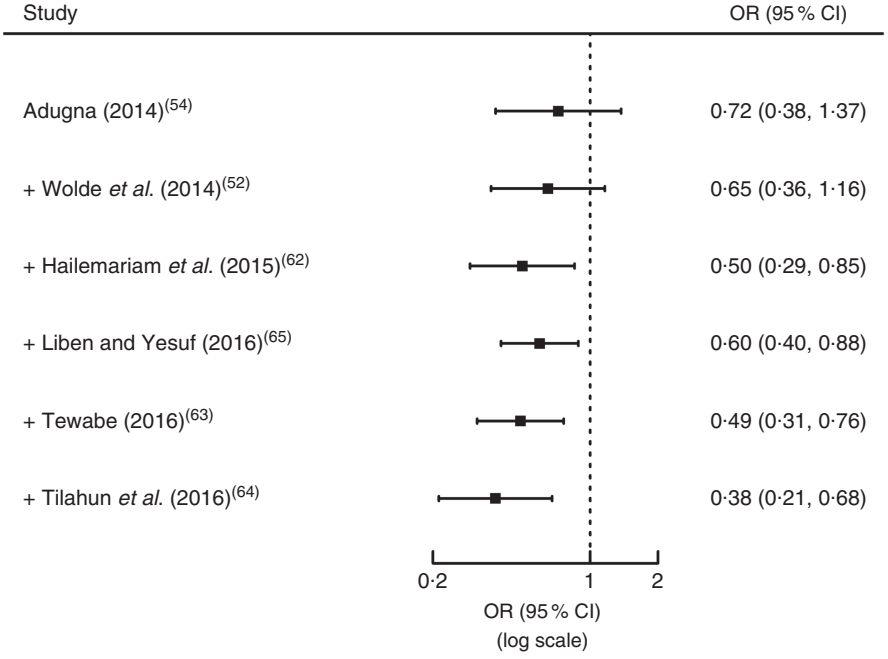

Fig. 8 Forest plot showing the results from a cumulative meta-analysis of studies examining the effect of discarding colostrum on timely initiation of breast-feeding in Ethiopia. The study-specific (first data point)/cumulative OR and 95 % CI are represented by the black square and horizontal line, respectively

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

https://doi.org/10.1017/S1368980019000314 Published online by Cambridge University Press

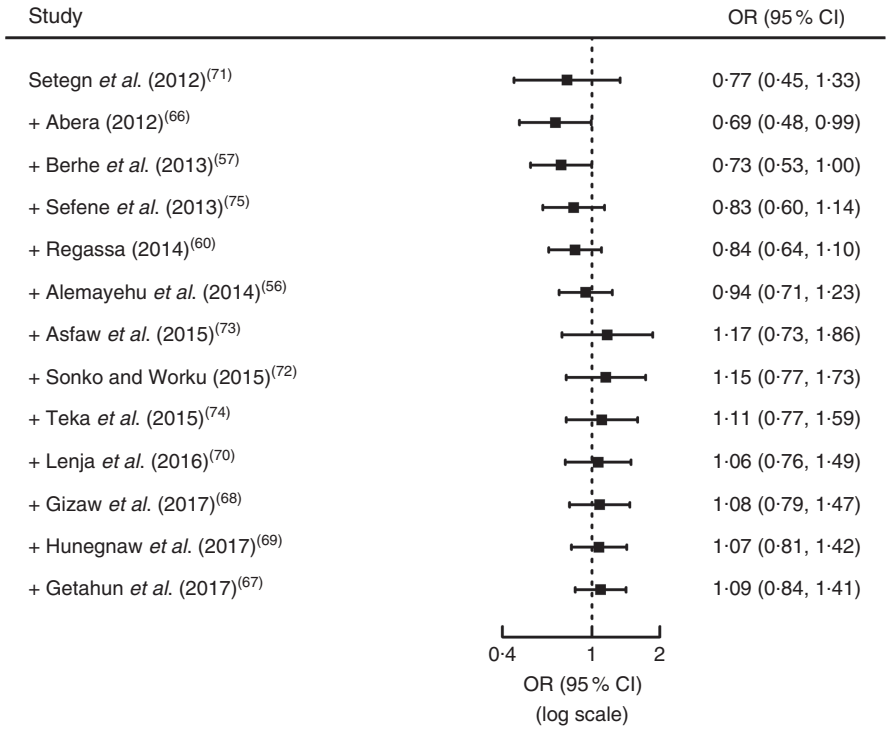

Fig. 9 Forest plot showing the results from a cumulative meta-analysis of studies examining the effect of maternal age on exclusive breast-feeding in Ethiopia. The study-specific (first data point)/cumulative OR and 95 % CI are represented by the black square and horizontal line, respectively

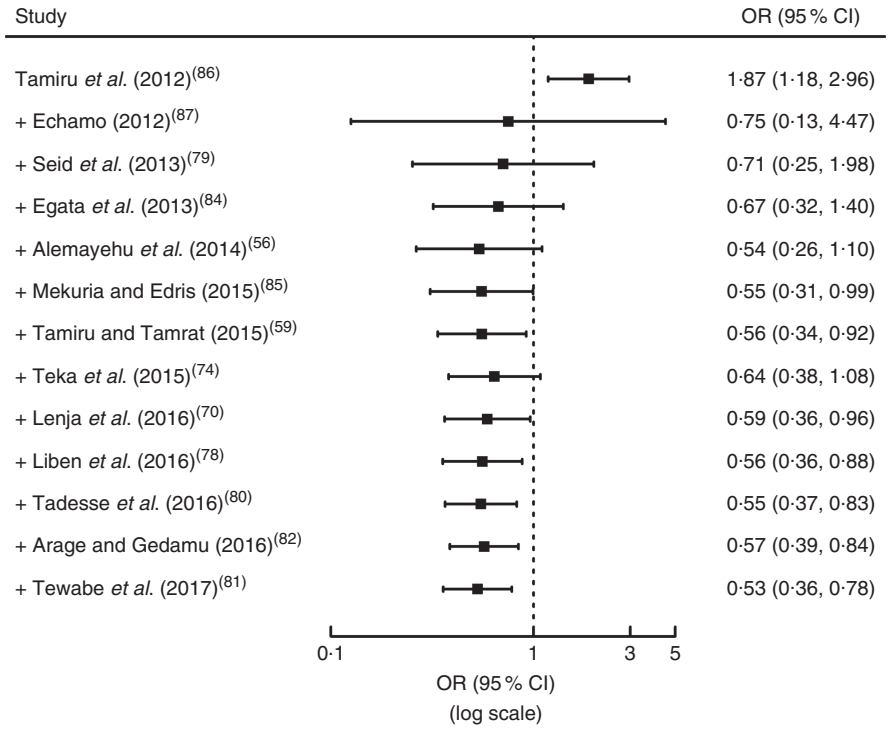

Fig. 10 Forest plot showing the results from a cumulative meta-analysis of studies examining the effect of discarding colostrum on exclusive breast-feeding in Ethiopia. The study-specific (first data point)/cumulative OR and 95 % CI are represented by the black square and horizontal line, respectively

https://doi.org/10.1017/S1368980019000314 Published online by Cambridge University Press

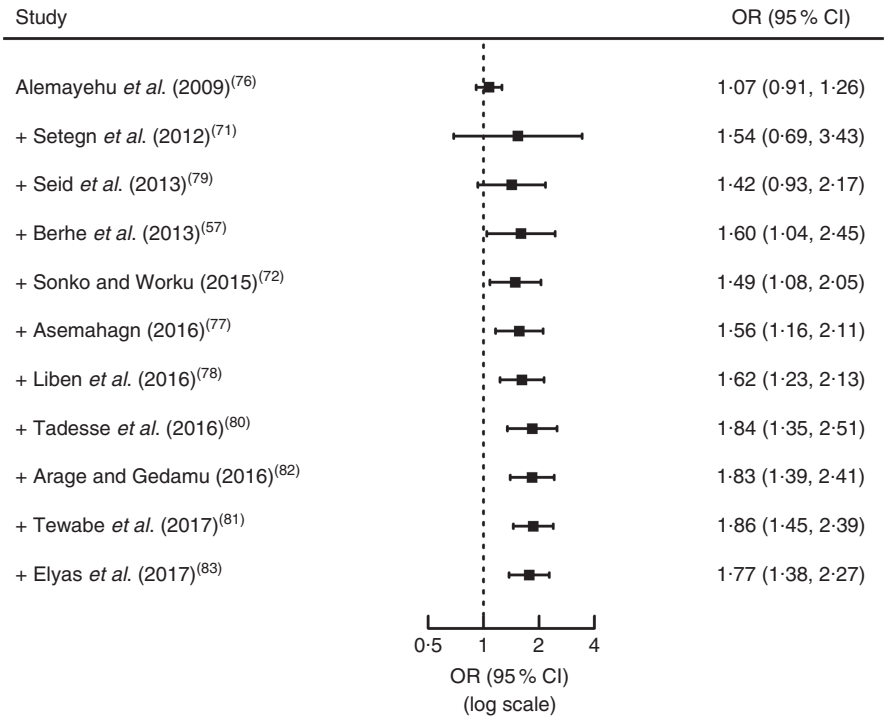

Fig. 11 Forest plot showing the results from a cumulative meta-analysis of studies examining the effect of infant age on exclusive breast-feeding in Ethiopia. The study-specific (first data point)/cumulative OR and 95 % CI are represented by the black square and horizontal line, respectively

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

https://doi.org/10.1017/S1368980019000314 Published online by Cambridge University Press

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

https://doi.org/10.1017/S1368980019000314 Published online by Cambridge University Press

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.

Acknowledgements

Acknowledgements: The authors' special gratitude goes to Sjoukje van der Werf (University of Groningen, the Netherlands) for her support developing the search strings and Balewgizie Sileshi (University of Groningen, the Netherlands) for his support during title and abstract screening. *Financial support:* This study received no specific grant from any funding agency in the public, commercial or not-for-profit sectors. *Conflict of interest:* None declared. *Authorship:* T.D.H. and S.M.A. conceived of and designed the study. T.D.H. developed syntax for searching databases and analysed the data. T.D.H. and S.M.A. wrote and revised the manuscript. All authors read the submitted manuscript and gave final approval. *Ethics of human subject participation:* Not applicable.

Supplementary material

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

References

1. World Health Organization (2008) *Indicators for Assessing Infant and Young Child Feeding Practices: Part 1: Definitions. Conclusions of a consensus meeting held 6–8 November 2007 in Washington DC, USA*. Geneva: WHO.
2. World Health Organization (2003) *Global Strategy for Infant and Young Child Feeding*. Geneva: WHO.
3. World Health Organization (2003) *Complementary Feeding: Report of the Global Consultation, and Summary of Guiding Principles for Complementary Feeding of the Breastfed Child*. Geneva: WHO.
4. UNICEF & World Health Organization (2017) Global Breastfeeding Scorecard, 2017: Tracking Progress for Breastfeeding Policies and Programmes. https://www.who.int/nutrition/publications/infantfeeding/global-bf-scorecard-2017-methology.pdf?ua=1 (accessed February 2019).
5. Ip S, Chung M, Raman G *et al.* (2007) Breastfeeding and maternal and infant health outcomes in developed countries. *Evid Technol Asses (Full Rep)* issue 153, 1–186.
6. Islam M, Rahman S, Kamruzzaman MI *et al.* (2013) Effect of maternal status and breastfeeding practices on infant nutritional status – a cross sectional study in the south-west region of Bangladesh. *Pan Afr Med J* **16**, 139.
7. Patel DV, Bansal SC, Nimbalkar AS *et al.* (2015) Breastfeeding practices, demographic variables, and their association with morbidities in children. *Adv Prev Med* **2015**, 892825.
8. Edmond KM, Zandoh C, Quigley MA *et al.* (2006) Delayed breastfeeding initiation increases risk of neonatal mortality. *Pediatrics* **117**, e380–e386.
9. UNICEF (2007) *The State of the World's Children 2008: Child Survival*. New York: UNICEF.
10. Belfort MB (2017) The science of breastfeeding and brain development. *Breastfeed Med* **12**, 459–461.
11. UNICEF (2016) Infant and young child feeding: Global Database. https://data.unicef.org/topic/nutrition/infant-and-young-child-feeding/ (accessed September 2018).
12. Kitano N, Nomura K, Kido M *et al.* (2016) Combined effects of maternal age and parity on successful initiation of exclusive breastfeeding. *Prev Med Rep* **3**, 121–126.
13. Ludvigsson JF & Ludvigsson J (2005) Socio-economic determinants, maternal smoking and coffee consumption, and exclusive breastfeeding in 10 205 children. *Acta Paediatr* **94**, 1310–1319.
14. Senarath U, Dibley MJ & Agho KE (2010) Factors associated with nonexclusive breastfeeding in 5 east and southeast Asian countries: a multilevel analysis. *J Hum Lact* **26**, 248–257.
15. Tarrant RC, Younger KM, Sheridan-Pereira M *et al.* (2010) The prevalence and determinants of breast-feeding initiation and duration in a sample of women in Ireland. *Public Health Nutr* **13**, 760–770.
16. Victor R, Baines SK, Agho KE *et al.* (2013) Determinants of breastfeeding indicators among children less than 24 months of age in Tanzania: a secondary analysis of the 2010 Tanzania Demographic and Health Survey. *BMJ Open* **3**, e001529.
17. Meinzen-Derr JK, Guerrero ML, Altaye M *et al.* (2006) Risk of infant anemia is associated with exclusive breastfeeding and maternal anemia in a Mexican cohort. *J Nutr* **136**, 452–458.
18. Lande B, Andersen L, Baerug A *et al.* (2003) Infant feeding practices and associated factors in the first six months of life: the Norwegian infant nutrition survey. *Acta Paediatr* **92**, 152–161.
19. Dennis CL (2002) Breastfeeding initiation and duration: a 1990–2000 literature review. *J Obstet Gynecol Neonatal Nurs* **31**, 12–32.
20. Hruschka DJ, Sellen DW, Stein AD *et al.* (2003) Delayed onset of lactation and risk of ending full breast-feeding early in rural Guatemala. *J Nutr* **133**, 2592–2599.

21. Habtewold TD, Mohammed SH, Endalamaw A *et al.* (2018) Breast and complementary feeding in Ethiopia: new national evidence from systematic review and meta-analyses of studies in the past 10 years. *Eur J Nutr*. Published online: 18 September 2018. doi: 10.1007/s00394-018-1817-8.
22. Fisher J, Hammarberg K, Wynter K *et al.* (2013) Assisted conception, maternal age and breastfeeding: an Australian cohort study. *Acta Paediatr* **102**, 970–976.
23. Amin T, Hablas H & Al Qader AA (2011) Determinants of initiation and exclusivity of breastfeeding in Al Hassa, Saudi Arabia. *Breastfeed Med* **6**, 59–68.
24. Esteves TMB, Daumas RP, Oliveira MICd *et al.* (2014) Factors associated to breastfeeding in the first hour of life: systematic review. *Rev Saude Publica* **48**, 697–708.
25. Kaneko A, Kaneita Y, Yokoyama E *et al.* (2006) Factors associated with exclusive breast-feeding in Japan: for activities to support child-rearing with breast-feeding. *J Epidemiol* **16**, 57–63.
26. Nyanga NM, Musita C, Otieno A *et al.* (2012) Factors influencing knowledge and practice of exclusive breastfeeding in Nyando district, Kenya. *Afr J Food Agric Nutr Dev* **12**, issue 6; available at https://www.ajol.info/index.php/ajfand/article/view/82781
27. Patel A, Badhoniya N, Khadse S *et al.* (2010) Infant and young child feeding indicators and determinants of poor feeding practices in India: secondary data analysis of National Family Health Survey 2005–06. *Food Nutr Bull* **31**, 314–333.
28. Legesse M, Demena M, Mesfin F *et al.* (2015) Factors associated with colostrum avoidance among mothers of children aged less than 24 months in Raya Kobo district, north-eastern Ethiopia: community-based cross-sectional study. *J Trop Pediatr* **61**, 357–363.
29. Chye JK, Zain Z, Lim WL *et al.* (1997) Breastfeeding at 6 weeks and predictive factors. *J Trop Pediatr* **43**, 287–292.
30. Koosha A, Hashemifesharaki R & Mousavinasab N (2008) Breast-feeding patterns and factors determining exclusive breast-feeding. *Singapore Med J* **49**, 1002–1006.
31. Scott JA & Binns CW (1999) Factors associated with the initiation and duration of breastfeeding: a review of the literature. *Breastfeed Rev* **7**, 5–16.
32. Takahashi K, Ganchimeg T, Ota E *et al.* (2017) Prevalence of early initiation of breastfeeding and determinants of delayed initiation of breastfeeding: secondary analysis of the WHO Global Survey. *Sci Rep* **7**, 44868.
33. Alebel A, Dejenu G, Mullu G *et al.* (2017) Timely initiation of breastfeeding and its association with birth place in Ethiopia: a systematic review and meta-analysis. *Int Breastfeed J* **12**, 44.
34. Federal Ministry of Health, Family Health Department, Ethiopia (2004) National Strategy for Infant and Young Child Feeding, p. 21. https://extranet.who.int/nutrition/gina/sites/default/files/ETH%202004%20National%20Strategy%20for%20Infant%20and%20Young%20Child%20Feeding.pdf (accessed February 2019).
35. Federal Democratic Republic of Ethiopia (2016) *National Guideline on Adolescent, Maternal, Infant and Young Child Nutrition*. Addis Ababa: Ministry of Health.
36. Federal Democratic Republic of Ethiopia (2016) *National Nutrition Program 2016–2020*. Addis Ababa: Ministry of Health.
37. Federal Democratic Republic of Ethiopia (2013) *National Nutrition Programme June 2013–June 2015*. Addis Ababa: Ministry of Health.
38. Federal Democratic Republic of Ethiopia (2015) *Health Sector Transformation Plan 2015/16–2019/2020 (2008–2012 EFY)*. Addis Ababa: Ministry of Health.
39. UNICEF (2009) News Note: World Breastfeeding Week CELEBRATED in Ethiopia. https://www.unicef.org/media/media_50700.html (accessed February 2019).
40. World Health Organization & LINKAGES (2003) *Infant and Young Child Feeding: A Tool for Assessing National Practices, Policies and Programmes*. Geneva: WHO.
41. Habtewold TD, Islam MA, Sharew NT *et al.* (2017) SystEmatic review and meta-aNAlysis of infanT and young child feeding Practices (ENAT-P) in Ethiopia: protocol. *BMJ Open* **7**, e017437.
42. Hartling L, Hamm M, Milne A *et al.* (2012) *Validity and Inter-Rater Reliability Testing of Quality Assessment Instruments*. Rockville, MD: Agency for Healthcare Research and Quality.
43. Hootman JM, Driban JB, Sitler MR *et al.* (2011) Reliability and validity of three quality rating instruments for systematic reviews of observational studies. *Res Synth Methods* **2**, 110–118.
44. McPheeters ML, Kripalani S, Peterson NB *et al.* (2012) Closing the quality gap: revisiting the state of the science (vol. 3: quality improvement interventions to address health disparities). *Evid Rep Technol Assess (Full Rep)* issue 208:3, 1–475.
45. Boccolini CS, Carvalho ML & Oliveira MI (2015) Factors associated with exclusive breastfeeding in the first six months of life in Brazil: a systematic review. *Rev Saude Publica* **49**, 91.
46. Sharma IK & Byrne A (2016) Early initiation of breastfeeding: a systematic literature review of factors and barriers in South Asia. *Int Breastfeed J* **11**, 17.
47. Munn Z, Tufanaru C & Aromataris E (2014) JBI's systematic reviews: data extraction and synthesis. *Am J Nurs* **114**, 49–54.
48. Egger M, Smith GD, Schneider M *et al.* (1997) Bias in meta-analysis detected by a simple, graphical test. *BMJ* **315**, 629–634.
49. Duval S & Tweedie R (2000) Trim and fill: a simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. *Biometrics* **56**, 455–463.
50. Higgins J & Thompson SG (2002) Quantifying heterogeneity in a meta-analysis. *Stat Med* **21**, 1539–1558.
51. Viechtbauer W (2010) Conducting meta-analyses in R with the metafor package. *J Stat Softw* **36**, 48.
52. Wolde T, Birhanu T & Ejeta E (2014) Prevalence and determinants of timely initiation of breastfeeding among lactating mothers of urban dwellers in Western Ethiopia: a community based cross sectional study. *Food Sci Qual Manage* **31**, 110–116.
53. Woldemichael B & Kibie Y (2016) Timely initiation of breastfeeding and its associated factors among mothers in Tiyo Woreda, Arsi Zone, Ethiopia: a community-based cross sectional study. *Clinics Mother Child Health* **13**, 2.
54. Adugna DT (2014) Women's perception and risk factors for delayed initiation of breastfeeding in Arba Minch Zuria, Southern Ethiopia. *Int Breastfeed J* **9**, 8.
55. Beyene MG, Geda NR, Habtewold TD *et al.* (2017) Early initiation of breastfeeding among mothers of children under the age of 24 months in Southern Ethiopia. *Int Breastfeed J* **12**, 1.
56. Alemayehu M, Abreha K, Yebyo H *et al.* (2014) Factors associated with timely initiation and exclusive breast feeding among mothers of Axum town, Northern Ethiopia. *Sci J Public Health* **2**, 394–401.
57. Berhe H, Mekonnen B, Bayray A *et al.* (2013) Determinants of breast feeding practices among mothers attending public health facilities, Mekelle, Northern Ethiopia; a cross sectional study. *Int J Pharmaceut Sci Res* **4**, 650.
58. Setegn T, Gerbaba M & Belachew T (2011) Determinants of timely initiation of breastfeeding among mothers in

Goba Woreda, South East Ethiopia: a cross sectional study. *BMC Public Health* **11**, 217.
59. Tamiru D & Tamrat M (2015) Constraints to the optimal breastfeeding practices of breastfeeding mothers in the rural communities of Arba Minch Zuria Woreda, Ethiopia: a community-based, cross-sectional study. *South Afr J Clin Nutr* **28**, 134–139.
60. Regassa N (2014) Infant and child feeding practices among farming communities in Southern Ethiopia. *Kontakt* **16**, e215–e222.
61. Ekubay M, Berhe A & Yisma E (2018) Initiation of breastfeeding within one hour of birth among mothers with infants younger than or equal to 6 months of age attending public health institutions in Addis Ababa, Ethiopia. *Int Breastfeed J* **13**, 4.
62. Hailemariam TW, Adeba E & Sufa A (2015) Predictors of early breastfeeding initiation among mothers of children under 24 months of age in rural part of West Ethiopia. *BMC Public Health* **15**, 1076.
63. Tewabe T (2016) Timely initiation of breastfeeding and associated factors among mothers in Motta town, East Gojjam zone, Amhara regional state, Ethiopia, 2015: a cross-sectional study. *BMC Pregnancy Childbirth* **16**, 314.
64. Tilahun G, Degu G, Azale T *et al.* (2016) Prevalence and associated factors of timely initiation of breastfeeding among mothers at Debre Berhan town, Ethiopia: a cross-sectional study. *Int Breastfeed J* **11**, 27.
65. Liben ML & Yesuf EM (2016) Determinants of early initiation of breastfeeding in Amibara district, Northeastern Ethiopia: a community based cross-sectional study. *Int Breastfeed J* **11**, 7.
66. Abera K (2012) Infant and young child feeding practices among mothers living in Harar, Ethiopia. *Harar Bull Health Sci* **4**, 66–78.
67. Getahun EA, Hayelom DH & Kassie GG (2017) Exclusive breast feeding practice and associated factors in Kemba Woreda, Southern Ethiopia, a community based cross-sectional study. *Int J Sci Technol Soc* **5**, 55.
68. Gizaw Z, Woldu W & Bitew BD (2017) Exclusive breastfeeding status of children aged between 6 and 24 months in the nomadic population of Hadaleala district, Afar Region, northeast Ethiopia. *Int Breastfeed J* **12**, 38.
69. Hunegnaw MT, Gezie LD & Teferra AS (2017) Exclusive breastfeeding and associated factors among mothers in Gozamin district, northwest Ethiopia: a community based cross-sectional study. *Int Breastfeed J* **12**, 30.
70. Lenja A, Demissie T, Yohannes B *et al.* (2016) Determinants of exclusive breastfeeding practice to infants aged less than six months in Offa district, Southern Ethiopia: a cross-sectional study. *Int Breastfeed J* **11**, 32.
71. Setegn T, Belachew T, Gerbaba M *et al.* (2012) Factors associated with exclusive breastfeeding practices among mothers in Goba district, south east Ethiopia: a cross-sectional study. *Int Breastfeed J* **7**, 17.
72. Sonko A & Worku A (2015) Prevalence and predictors of exclusive breastfeeding for the first six months of life among women in Halaba special woreda, Southern Nations, Nationalities and Peoples' Region/SNNPR/, Ethiopia: a community based cross-sectional study. *Arch Public Health* **73**, 53.
73. Asfaw MM, Argaw MD & Kefene ZK (2015) Factors associated with exclusive breastfeeding practices in Debre Berhan District, Central Ethiopia: a cross sectional community based study. *Int Breastfeed J* **10**, 23.
74. Teka B, Assefa H & Haileslassie K (2015) Prevalence and determinant factors of exclusive breastfeeding practices among mothers in Enderta woreda, Tigray, North Ethiopia: a cross-sectional study. *Int Breastfeed J* **10**, 2.
75. Sefene A, Birhanu D, Awoke W *et al.* (2013) Determinants of exclusive breastfeeding practice among mothers of children age less than 6 month in Bahir Dar city administration, Northwest Ethiopia; a community based cross-sectional survey. *Sci J Clin Med* **2**, 153–159.
76. Alemayehu T, Haidar J & Habte D (2009) Determinants of exclusive breastfeeding practices in Ethiopia. *Ethiop J Health Dev* **23**, issue 1; available at https://www.ajol.info/index.php/ejhd/article/view/44832
77. Asemahagn MA (2016) Determinants of exclusive breastfeeding practices among mothers in Azezo district, northwest Ethiopia. *Int Breastfeed J* **11**, 22.
78. Liben ML, Gemechu YB, Adugnew M *et al.* (2016) Factors associated with exclusive breastfeeding practices among mothers in Dubti town, Afar regional state, northeast Ethiopia: a community based cross-sectional study. *Int Breastfeed J* **11**, 4.
79. Seid AM, Yesuf ME & Koye DN (2013) Prevalence of exclusive breastfeeding practices and associated factors among mothers in Bahir Dar city, Northwest Ethiopia: a community based cross-sectional study. *Int Breastfeed J* **8**, 14.
80. Tadesse T, Mesfin F & Chane T (2016) Prevalence and associated factors of non-exclusive breastfeeding of infants during the first six months in rural area of Sorro District, Southern Ethiopia: a cross-sectional study. *Int Breastfeed J* **11**, 25.
81. Tewabe T, Mandesh A, Gualu T *et al.* (2017) Exclusive breastfeeding practice and associated factors among mothers in Motta town, East Gojjam zone, Amhara Regional State, Ethiopia, 2015: a cross-sectional study. *Int Breastfeed J* **12**, 12.
82. Arage G & Gedamu H (2016) Exclusive breastfeeding practice and its associated factors among mothers of infants less than six months of age in Debre Tabor town, Northwest Ethiopia: a cross-sectional study. *Adv Public Health* **2016**, 3426249.
83. Elyas L, Mekasha A, Admasie A *et al.* (2017) Exclusive breastfeeding practice and associated factors among mothers attending private pediatric and child clinics, Addis Ababa, Ethiopia: a cross-sectional study. *Int J Pediatr* **2017**, 8546192.
84. Egata G, Berhane Y & Worku A (2013) Predictors of non-exclusive breastfeeding at 6 months among rural mothers in east Ethiopia: a community-based analytical cross-sectional study. *Int Breastfeed J* **8**, 8.
85. Mekuria G & Edris M (2015) Exclusive breastfeeding and associated factors among mothers in Debre Markos, Northwest Ethiopia: a cross-sectional study. *Int Breastfeed J* **10**, 1.
86. Tamiru D, Belachew T, Loha E *et al.* (2012) Sub-optimal breastfeeding of infants during the first six months and associated factors in rural communities of Jimma Arjo Woreda, Southwest Ethiopia. *BMC Public Health* **12**, 363.
87. Echamo M (2012) Exclusive breast feeding in Arbaminch, SNNPR, Ethiopia. *Harar Bull Health Sci* **5**, 44–59.
88. Dorgham L, Hafez S, Kamhawy H *et al.* (2014) Assessment of initiation of breastfeeding, prevalence of exclusive breast feeding and their predictors in Taif, KSA. *Life Sci J* **11**, 1.
89. Agho KE, Dibley MJ, Odiase JI *et al.* (2011) Determinants of exclusive breastfeeding in Nigeria. *BMC Pregnancy Childbirth* **11**, 2.
90. Kanhadilok S & McGrath JM (2015) An integrative review of factors influencing breastfeeding in adolescent mothers. *J Perinat Educ* **24**, 119.
91. Emmanuel A (2015) A literature review of the factors that influence breastfeeding: An application of the health belief model. *Int J Nurs Health Sci* **2**, issue 3, 28–36.
92. Balogun OO, Dagvadorj A, Anigo KM *et al.* (2015) Factors influencing breastfeeding exclusivity during the first

6 months of life in developing countries: a quantitative and qualitative systematic review. *Matern Child Nutr* **11**, 433–451.
93. Kavle JA, LaCroix E, Dau H *et al.* (2017) Addressing barriers to exclusive breast-feeding in low- and middle-income countries: a systematic review and programmatic implications. *Public Health Nutr* **20**, 3120–3134.
94. Pereira-Santos M, Santana MdS, Oliveira DS *et al.* (2017) Prevalence and associated factors for early interruption of exclusive breastfeeding: meta-analysis on Brazilian epidemiological studies. *Rev Bras Saude Matern Infant* **17**, 59–67.
95. Ogbo FA, Eastwood J, Page A *et al.* (2017) The impact of sociodemographic and health-service factors on breast-feeding in sub-Saharan African countries with high diarrhoea mortality. *Public Health Nutr* **20**, 3109–3119.
96. Chandrashekhar T, Joshi H, Binu V *et al.* (2007) Breast-feeding initiation and determinants of exclusive breast-feeding – a questionnaire survey in an urban population of western Nepal. *Public Health Nutr* **10**, 192–197.
97. Barennes H, Empis G, Quang TD *et al.* (2012) Breast-milk substitutes: a new old-threat for breastfeeding policy in developing countries. A case study in a traditionally high breastfeeding country. *PLoS One* **7**, e30634.
98. Radwan H (2013) Patterns and determinants of breast-feeding and complementary feeding practices of Emirati mothers in the United Arab Emirates. *BMC Public Health* **13**, 171.
99. Ghwass MMA & Ahmed D (2011) Prevalence and predictors of 6-month exclusive breastfeeding in a rural area in Egypt. *Breastfeed Med* **6**, 191–196.
100. Yılmaz E, Öcal FD, Yılmaz ZV *et al.* (2017) Early initiation and exclusive breastfeeding: factors influencing the attitudes of mothers who gave birth in a baby-friendly hospital. *Turk J Obstet Gynecol* **14**, 1–9.
101. El-Gilany AH, El-Wehady A & El-Hawary A (2008) Maternal employment and maternity care in Al-Hassa, Saudi Arabia. *Eur J Contracept Reprod Health Care* **13**, 304–312.
102. Ogunlesi TA (2010) Maternal socio-demographic factors influencing the initiation and exclusivity of breastfeeding in a Nigerian semi-urban setting. *Matern Child Health J* **14**, 459–465.
103. Pandey S, Tiwari K, Senarath U *et al.* (2010) Determinants of infant and young child feeding practices in Nepal: secondary data analysis of Demographic and Health Survey 2006. *Food Nutr Bull* **31**, 334–351.
104. Perera PJ, Ranathunga N, Fernando MP *et al.* (2012) Actual exclusive breastfeeding rates and determinants among a cohort of children living in Gampaha district Sri Lanka: a prospective observational study. *Int Breastfeed J* **7**, 21.