



Exclusive Breastfeeding Duration and its Effect on the Health of the Children in Iran, a Meta Analysis

Hosein Dalili ^a, Mamak Shariat ^b, Fatemeh Nayeri ^a, Zahra Emami ^a, Roya Sahebi ^c, Leyla Sahebi ^{b,*}

^a Breastfeeding Research Center, Tehran University of Medical Science, Tehran, Iran

^b Maternal-Fetal and Neonatal Research Center, Tehran University of Medical Science, Tehran, Iran

^c Tabriz Health Center, Tabriz University of Medical Sciences, Tabriz, Iran

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ABSTRACT

Problem: Given the importance of exclusive breastfeeding (EB) duration on growth and to maintain health in children, we decided to systematically review the existing research on EB duration and its effect on the health of 2- to 5-year-old children in Iran.

Eligibility criteria: A systematic literature search was conducted in the Database of Abstracts of Reviews of Effects (DARE), Google Scholar, PubMed, Psyc INFO, Thomson Reuters, Cochrane, and Medical Library (MedLib) to detect appropriate studies (1994 to 2016). Outcomes of mean, mean difference, and proportions were pooled.

Sample: In this meta-analysis, 38 studies met the eligibility criteria.

Results: The pooled mean of EB was calculated as 4.1 months (CI 95%: 3.2, 4.99). The meta prevalence of EB up to 4 months and 5 to 6 months was estimated 65.0% (CI 95%: 54.0, 77.0) and 54% (CI 95%: 46.0, 62.0) respectively. Based on studies conducted over the years from 1994 to 2016, an increasing trend of EB was found in infants up to 4 months ($p \leq 0.0001$). Among children with anemia and respiratory diseases EB until 5 to 6 months was more common than in healthy children (CI 95%: 1.1, 2.11, and 1.01, 1.47 respectively).

Conclusion: The duration of EB (4.1 months) was equal to the lower limit recommended by the World Health Organization (WHO). Overall, the duration of EB until 5 to 6 months is sufficient if the child's iron intake is well-monitored.

Implication: Monitoring of the implementation of recent guidelines or even modification of the duration period of the iron administration is potentially necessary.

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Introduction

Human milk is a critical source of nutrients for the first 6 months of life and a large component of nutritional requirements for the first 2 years of life (Boland, 2005; Kim & Unger, 2010). This also provides myriad benefits to mothers, including, but not limited to, the prevention of breast and ovarian cancers (Centers for Disease Control and Prevention (CDC), 2007; Gafari Asl, Fadakar Sogheh, Ghavi, & Ahmad Shear bafi, 2014). Lactation has an impact on the economic burden of society by reducing the costs of human milk substitutes which can range from 15 to 20% of the per capita income in different communities (Olang, Farivar, Heidarzadeh, Strandvik, & Yngve, 2009).

Exclusive breastfeeding (EB) means that the infant receives only human milk. No other liquids or solids are given with the exception of oral rehydration solution, vitamins, minerals, or medicines (World Health Organization (WHO), 2003).

According to documents, on average, almost half of all infants up to 3 months of age are being exclusively breastfed. However, by the time infants reach the 6 months mark, <25% are exclusively breastfed (Stanhope and Lancaster, 2012). According to WHO, EB in the first 6 months of life prevents more than one million deaths (Rostamnegan & Amani, 2004). In children under 5 years old, the risk of death due to diseases and infections can increase if, as infants, they were either partially breastfed or not breastfed at all (Centers for Disease Control and Prevention (CDC), 2007): (“WHO | The optimal duration of exclusive breastfeeding,” 2015; Di Manno, Macdonald, & Knight, 2015).

The duration of EB is almost the same as the recommendations of the WHO (4 to 6 months) and the United Nations Children's Fund (UNICEF) (almost 6 months) (Kramer & Kakuma, 2004), but the optimal EB duration will be different based on the individual characteristics of the neonates and mothers, as well as social, economic, and geographical factors (Hosein Dalili et al., 2014; Kramer & Kakuma, 2004; WHO, 2001; Yarnoff, Allaire, & Detzel, 2013). In a meta-analysis conducted in 2004, there was no significant difference between developed and developing countries for the duration of EB, and in general, 6 months seemed ideal for the development of the child (Kramer & Kakuma, 2004). In Iran,

* Corresponding author.

E-mail address: sahebileila@yahoo.com (L. Sahebi).

several studies have been conducted on EB, but there is no complementary information regarding the duration of EB and its impact on the general health of the child. The aim of this study is to evaluate the pooled mean of the duration and prevalence of EB for up to 4 months and 5 to 6 months, as well as its effect on the health of the child, including weight, height, obesity, diarrhea, atopic syndrome, respiratory diseases, hemoglobin concentration, and iron concentration in Iranian children aged 2 to 5.

Methods

This meta-analysis had 2 parts. First, the estimate of EB duration; and second, its effect on the health of 2- to 5-year-old children.

Medical Subject Heading (MeSH), Cumulative Index to Nursing, and Allied Health Literature (CINAHL) databases were used to search for terms and keywords.

In order to identify relevant studies, we searched literature published in Persian and English from CINAHL, Cochrane Library, Current Contents, Database of Abstracts of Reviews of Effects (DARE), Google Scholar, PubMed, PsycINFO, Thomson Reuters, and Medical Library (MedLib). The process of searching, screening, and analyzing was conducted from December 2016 to October 2017. A search strategy (Box 1) was developed and studied by all authors.

First, the titles, abstracts, and keywords of identified papers were selected for potential eligibility. Next, the full texts of papers were studied to determine their eligibility for inclusion. We also searched reference lists of the articles identified.

The inclusion guidelines for our study included all available observational and analytical studies from 1994 to 2016 in English and Persian that had calculated duration or prevalence of EB as well as its effect on the health of children aged 2 to 5 years old. Studies with duplicate citations and studies in special sub-populations were excluded.

The pooled mean of EB duration was calculated using random-effects models. Heterogeneity was evaluated by the I^2 statistics. The pooled prevalence of EB up to 4 and 5 to 6 months was estimated by random-effects models. The pooled prevalence of EB based on subgroups as study design (cross sectional or other designs), sample size (<99, 100 to 299, 300 to 499, and ≥ 500), and study year (before 2000, 2000 to 2010, and after 2010) were investigated by meta-regression. Analyzing the relationship between EB duration and health status and survival were considered by pooled mean difference. Heterogeneity was evaluated by the χ^2 statistic (Metan, STATA).

Result

The computerized search yielded 83 references across 9 electronic databases. With the exclusion of duplicate references, 63 titles and abstracts remained. After reading the full texts, 38 studies met the eligibility criteria for pooled duration of EB and analysis of its consequences (Fig. 1).

Mean exclusive breastfeeding findings

Considering the average (CI 95%) length of EB in 2- to 5-year-old children in Iran (10 studies) (Abdollahi, Yazdani Charati, & Roohani, 2014; Fallah, Kazemnejad, Shoghli, Zayeri, & Moezi, 2016; Froozani, Permezhadeh, Motlagh, & Golestan, 1999; Khamnian, Azarfar, Ravanshad, & Hashemian, 2013; Morowatisharifabad, Hajizadeh, Akhavan Karbasi, & Fallahzadeh, 2013; Noughabi, Tehrani, Foroushani, Nayeri, & Baheiraei, 2014; Rakhshani & Mohammadi, 2009; Torabi, Managheb, Rahmanian, Zahedi, & Solhjoo, 2011; Vafae, Khabazkhou, Moradi, & Najafpoor, 2010; Veghari, 2011), the highest and lowest levels were calculated to be 5.6 months (3.05, 8.15) in Zabol, the Capital of Sistan and Baluchestan province on the Afghanistan border (Rakhshani & Mohammadi, 2009) and 1.05 (−1.58, 3.68) in Shiraz,

Box 1

Search strategy for EB duration and its effect on health of Iranian children with 2–5 years-old.

1. ("Duration" [Title/Abstract]) OR ("length" [Title/Abstract]) OR ("time" [Title/Abstract]) AND ("breast feeding" [Title/Abstract]) OR ("breastfeeding" [Title/Abstract]) AND ("Exclusive" [Title/Abstract]) AND ("Iran" [Title/Abstract])
2. ("Duration" [Title/Abstract]) OR ("length" [Title/Abstract]) OR ("time" [Title/Abstract]) AND ("breast feeding" [Title/Abstract]) OR ("breastfeeding" [Title/Abstract]) AND ("Exclusive" [Title/Abstract]) AND ("weight" [Title/Abstract])
3. ("Duration" [Title/Abstract]) OR ("length" [Title/Abstract]) OR ("time" [Title/Abstract]) AND ("breast feeding" [Title/Abstract]) OR ("breastfeeding" [Title/Abstract]) AND ("Exclusive" [Title/Abstract]) AND ("height" [Title/Abstract])
4. ("Duration" [Title/Abstract]) OR ("length" [Title/Abstract]) OR ("time" [Title/Abstract]) AND ("breast feeding" [Title/Abstract]) OR ("breastfeeding" [Title/Abstract]) AND ("Exclusive" [Title/Abstract]) AND ("atopic" [Title/Abstract])
5. ("Duration" [Title/Abstract]) OR ("length" [Title/Abstract]) OR ("time" [Title/Abstract]) AND ("breast feeding" [Title/Abstract]) OR ("breastfeeding" [Title/Abstract]) AND ("Exclusive" [Title/Abstract]) AND (survival [Title/Abstract])
6. ("Duration" [Title/Abstract]) OR ("length" [Title/Abstract]) OR ("time" [Title/Abstract]) AND ("breast feeding" [Title/Abstract]) OR ("breastfeeding" [Title/Abstract]) AND ("Exclusive" [Title/Abstract]) AND (death [Title/Abstract]) OR ("SIDS" [Title/Abstract])
7. ("Duration" [Title/Abstract]) OR ("length" [Title/Abstract]) OR ("time" [Title/Abstract]) AND ("breast feeding" [Title/Abstract]) OR ("breastfeeding" [Title/Abstract]) AND ("Exclusive" [Title/Abstract]) AND (respiratory [Title/Abstract])
8. ("Duration" [Title/Abstract]) OR ("length" [Title/Abstract]) OR ("time" [Title/Abstract]) AND ("breast feeding" [Title/Abstract]) OR ("breastfeeding" [Title/Abstract]) AND ("Exclusive" [Title/Abstract]) AND (iron deficiency [Title/Abstract])
9. ("Duration" [Title/Abstract]) OR ("length" [Title/Abstract]) OR ("time" [Title/Abstract]) AND ("breast feeding" [Title/Abstract]) OR ("breastfeeding" [Title/Abstract]) AND ("Exclusive" [Title/Abstract]) AND (anemia [Title/Abstract])
10. ("Duration" [Title/Abstract]) OR ("length" [Title/Abstract]) OR ("time" [Title/Abstract]) AND ("breast feeding" [Title/Abstract]) OR ("breastfeeding" [Title/Abstract]) AND ("Exclusive" [Title/Abstract]) AND (diarrhea [Title/Abstract])
11. ("Duration" [Title/Abstract]) OR ("length" [Title/Abstract]) OR ("time" [Title/Abstract]) AND ("breast feeding" [Title/Abstract]) OR ("breastfeeding" [Title/Abstract]) AND ("Exclusive" [Title/Abstract]) AND (obesity [Title/Abstract])
12. ("Duration" [Title/Abstract]) OR ("length" [Title/Abstract]) OR ("time" [Title/Abstract]) AND ("breast feeding" [Title/Abstract]) OR ("breastfeeding" [Title/Abstract]) AND ("Exclusive" [Title/Abstract]) AND (sleep disorders [Title/Abstract])

the capital of Fars province in south-central Iran (Froozani et al., 1999) respectively.

The pooled mean (CI 95%) of EB duration (in 10 studies) was calculated at 4.1 months (3.2, 4.997) (Abdollahi et al., 2014; Fallah et al., 2016; Froozani et al., 1999; Khamnian et al., 2013; Morowatisharifabad et al., 2013; Noughabi et al., 2014; Rakhshani & Mohammadi, 2009; Torabi et al., 2011; Vafae et al., 2010; Veghari, 2011) (Fig. 2) and no significant heterogeneity was observed across estimates of averages ($p = 0.44$).

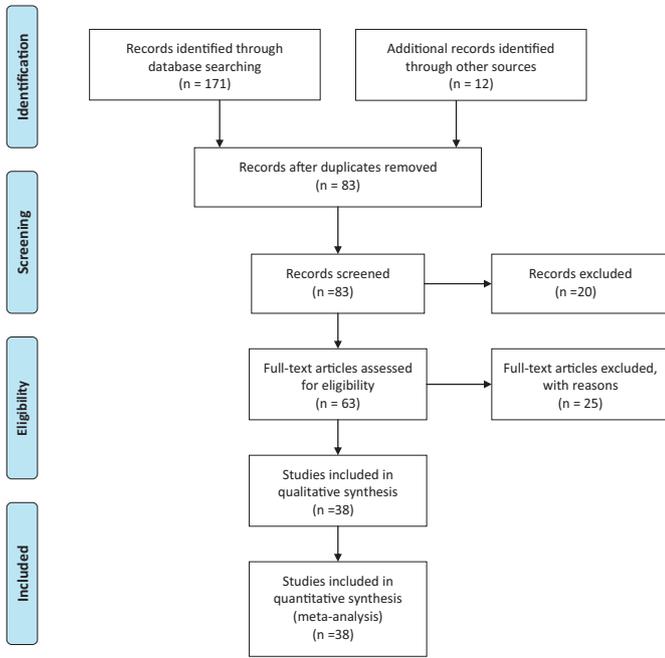


Fig. 1. PRISMA flow diagram.

EB prevalence findings

We summarized and analyzed EB prevalence for up to 4 months and 5 to 6 months.

Meta prevalence of EB up to 4 months among 11 studies (Abedzadeh, Saberi, & Sadat, 2005; Ayatollahi, Sharafi, & Haem, 2015; Ebrahimzadehkor, Kalantari, Abadi, & Kabir, 2014; Froozani et al., 1999; Khamnian et al., 2013; Khayyati, 2007; Koosha, 2008; Mirahmadizadeh et al., 2012; Noughabi et al., 2014; Olang et al., 2009; Vafaei et al., 2010) was estimated to be 65.0% (CI 95%: 54.0%, 77.0%). Based on studies conducted over the years from 1996 to 2016, an increasing trend of EB was found in infants up to 4 months ($p \leq 0.0001$). Also the heterogeneity of studies in EB of neonates in their first 4 months by sample size of studies was significant ($p \leq 0.0001$). The comparison of pooled prevalences of EB by some basic variables is accessible in Table 1.

The meta prevalence of EB in 5- to 6-month-olds among 31 studies was estimated at 54% (CI 95%: 46.0%, 62.0%). No heterogeneity was observed between EB proportions in this category between studies subgroups by years (before 2000, 2000 to 2010, and after 2010) ($p = 0.470$) and sample size ($p = 0.889$) (Abdollahi et al., 2014; Able, Shiva, & Nasiri, 2003; Almasi, Saberi, & Moravveji, 2010; Ayat Elahi, Nasihatkon, & Ayat Elahi, 2001; Ayatollahi et al., 2015; Hosein Dalili et al., 2014; Emamghorashi & Heydari, 2007; Esfahani & Fathizadeh, 2011; Fallah et al., 2016; Ghanbarnejad, Abedini, & Taqipoor, 2014; Ghayedammadi, Zafarmand, Heidari, Azita, & Dehghan, 2002; Hamidi et al., 2011; Heydarpour, Golbani, Heydarpour, & Timareh, 1390; Hosseini, Maracy, Sarrafzade, & Kelishadi, 2014; Imani, Mohammai, Rakhshai, & Shafiee, 2003; Khamnian, Azarfar, Ravanshad, & Hashemian, 2012; Mehrparvar & Varzandeh, 2011; Mirahmadizadeh et al., 2012; Mohammad Beygi, Mohammad Salehy, & Bayati, 2009; Mohsenzadeh, Mardani, Shahkarami, & Ebrahimzadeh, 2008; Morowatisharifabad et al., 2013; Naserpoor, Noughabi, & Sharifat, 2011; Noughabi et al., 2014; Poorahmad-Garbandi, Salaezade, &

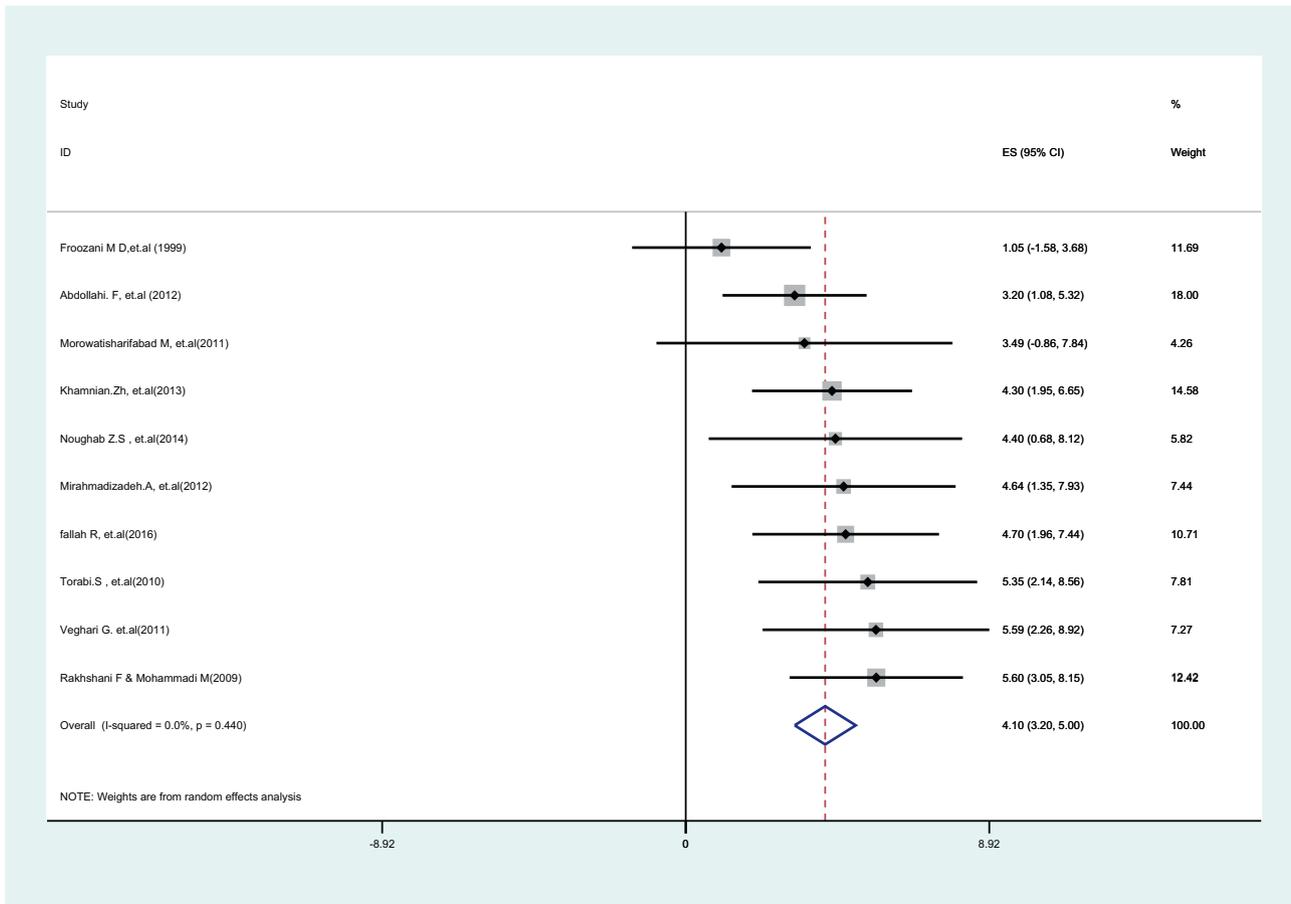


Fig. 2. Forest plot of pooled mean of exclusive breastfeeding duration in children 2–5 years-old, analyzed by Metan.

Table 1
Comparison of pooled prevalences of exclusive breast feeding by some basic variables.

Variables	Up to four months				5–6 months			
	n*	p**	CI 95%	p-Value	n*	p**	CI 95%	p-Value
Year	<2000	2	36.0	30.0, 42.0	0	–	–	0.470
	2000–2010	4	60.0	45.0, 75.0	10	59.0	41.0, 77.0	
	≥2010	5	78.0	70.0, 86.0	21	52.0	42.0, 61.0	
Sample size	<99	2	50.0	37.0, 63.0	0	–	–	
	100–299	2	43.0	38.0, 47.0	8	51.0	28.0, 75.0	0.889
	300–499	1	82.0	78.0, 86.0	14	53.0	37.0, 70.0	
	≥500	6	75.0	59.0, 90.0	9	57.0	43.0, 72.0	

*n: number of studies; p** = prevalence.

Etehad, 2014; M Ranjbaran et al., 2017; Roudbari, Roudbari, & Fazaeli, 2009; Saki, Eshraghian, & Tabesh, 2013; Torabi et al., 2011; Vafaei et al., 2010; Veghari, 2011) (Table 1).

Relationship between EB with disorders and mortality

The summary odds ratio of some disorders and sudden infant death syndrome (SIDS) based on EB duration (5 to 6 months and <4 months groups) is presented in the Table 2.

Among children with anemia and respiratory diseases EB until 5 to 6 months was more common than in healthy children (CI 95%; 1.1, 2.11) and (CI 95%; 1.01, 1.47) respectively (Table 2). Heterogeneity between studies on respiratory disease ($p\text{-value}_{\text{heterogeneity}} = 0.046$) was significant. But the output of anemia or iron deficiency with EB duration was valid ($p\text{-value}_{\text{heterogeneity}} = 0.32$) (Table 2). The odds of EB based on diarrhea, obesity, and SIDS groups are accessible in Table 2.

The pooled mean weight (CI 95%) of 4-month-old infants who received human milk exclusively, were bottle-fed, and who received a combination of human milk and formula (Froozani et al., 1999) (Abedzadeh et al., 2005) (Emamghorashi & Heydari, 2007) (Khadivzadeh, 2002) was respectively calculated to weigh 6.55, 6.12, and 6.97 kg in 4 studies, (Froozani et al., 1999) (Abedzadeh et al., 2005) (Emamghorashi & Heydari, 2007) 6.23, 5.27, and 7.20 kg in 3 studies, and 5.57, 3.67, and 7.47 kg in 1 study (Emamghorashi & Heydari, 2007) respectively.

The pooled mean weight (kg) (CI 95%) of 6-month-old children that received human milk exclusively (4 studies) (Emamghorashi & Heydari, 2007) (Mehrpour & Varzandeh, 2011) (Khadivzadeh, 2002) (Khabazkhoob et al., 2008), were bottle-fed (3 studies) (Emamghorashi & Heydari, 2007) (Mehrpour & Varzandeh, 2011) (Khabazkhoob et al., 2008) and a combination (one study) (Emamghorashi & Heydari, 2007) were respectively, 7.57, 6.73, and 8.40; 7.47, 6.43, and 8.50; and 6.97, 5.38, and 8.56.

The pooled height (cm) mean (CI 95%) of 4-month-old newborns that were breastfed exclusively (in 4 studies) (Emamghorashi & Heydari, 2007) (Mehrpour & Varzandeh, 2011) (Khadivzadeh, 2002) (Khabazkhoob et al., 2008), were bottle-fed (3 studies) (Emamghorashi & Heydari, 2007) (Mehrpour & Varzandeh, 2011)

(Khabazkhoob et al., 2008) and received a combination (one study) (Emamghorashi & Heydari, 2007) was calculated at 63.44, 60.88, and 66.01; 60.84, 56.16, and 65.52; and 59.62, 53.03, and 66.21 respectively. Pooled height (cm) mean (CI 95%) of 6-month-old children that had human milk exclusively (2 studies) (Emamghorashi & Heydari, 2007) (Khadivzadeh, 2002), were bottle-fed (one study) (Emamghorashi & Heydari, 2007) and partial feeding (one study) (Emamghorashi & Heydari, 2007) was estimated to be 66.50, 62.45, and 70.55; 64.28, 58.11, and 70.45; and 63.60, 58.01, and 69.19.

A summary of comparison weight and height of newborns based on type of feeding (exclusively human milk, bottle, and partial human milk intake) is shown in Table 3.

Discussion

This meta-analysis intended to evaluate the mean duration and prevalence of EB as well as its relationship with mortality and morbidity in children 2 to 5 years old. Although this subject is of importance, few review studies have been conducted in Iran.

The pooled mean duration of EB in Iran in 11 studies was calculated at 4.1 months (CI 95%; 3.2, 4.9) (Abdollahi et al., 2014; Fallah et al., 2016; Froozani et al., 1999; Khamnian et al., 2013; Morowatisharifabad et al., 2013; Noughabi et al., 2014; Rakhshani & Mohammadi, 2009; Torabi et al., 2011; Vafaei et al., 2010; Veghari, 2011). This was likely valid, due to the homogeneity between studies. This duration landed within WHO's recommended range (WHO, 2001), but closer to the lower end of the recommendations.

In this review, the prevalence of EB up to 4 months and 5 to 6 months was estimated to be 65% and 54% respectively (Abdollahi et al., 2014; Abedzadeh et al., 2005; Able et al., 2003; Almasi et al., 2010; Ayat Elahi et al., 2001; Ayatollahi et al., 2015; Hosein Dalili et al., 2014; Emamghorashi & Heydari, 2007; Esfahani & Fathizadeh, 2011; Fallah et al., 2016; Froozani et al., 1999; Ghanbarnejad et al., 2014; Ghayedammadi et al., 2002; Hamidi et al., 2011; Heydarpour et al., 1390; Hosseini et al., 2014; Imani et al., 2003; Khamnian et al., 2012, 2013; Khayyati, 2007; Khosravi & Rouhani, 2004; Koosha, 2008; Mehrpour & Varzandeh, 2011; Mirahmadizadeh et al., 2012; Mohammad Beygi et al., 2009; Mohsenzadeh et al., 2008;

Table 2
Pooled odds ratio of some morbidity and sudden infant death syndrome (SIDS) by exclusive breast feeding duration (less than four months and 5–6 months).

Variables	Number of study	Pooled odds ratio ^c	CI 95%	χ^2 (p-value) ^d
Anemia or iron deficiency	3	1.38	1.1, 2.11	2.26 (0.32)
Respiratory diseases ^a	3	1.07	1.01, 1.47	8.60 (0.014)
Atopic syndrome ^b	2	0.767	0.5, 1.19	3.98 (0.046)
Diarrhea	1	0.343	0.16, 0.74	0.000 (.)
Obesity	1	2.73	1.06, 7.04	0.000 (.)
Stop weight	1	0.47	0.11, 2.03	0.000 (.)
Sudden infant death syndrome	1	1.77	0.95, 3.30	0.000 (.)

^a All disease that encompasses pathological conditions affecting the organs and tissues that make gas exchange possible in higher organisms, and includes conditions of the upper respiratory trachea, bronchi, bronchioles, alveoli, pleura and pleural cavity, and the nerves and muscles of breathing.

^b Atopic syndrome is characterized by a tendency to be hyper allergic and with one or more of the following: eczema, allergic rhinitis, or allergic asthma.

^c Pooled odd ratio analysis done between at least two studies (outcomes in diarrhea, obesity, stop weight and sudden infant death syndrome variables aren't pooled).

^d χ^2 (p-value): heterogeneity test between studies.

Table 3
Summary of comparison weight and height of four and six months children based on type of feeding (exclusively breast, bottle and partial feeding).

Anthropometric indices	Feeding type: (1 exclusive, 2 bottle, 3 partial)	Four months		Six months	
		n*	MD** (CI 95%)	n*	MD** (CI 95%)
Weight (mean; kg)	1&2	3	0.51 (0.32, 0.71)	1	0.43 (0.18, 0.69)
	1&3	1	0.89 (0.65, 1.12)	1	0.55 (0.32, 0.77)
Height (mean; cm)	1&2	3	0.21 (0.02, 0.40)	1	0.97 (0.71, 1.23)
	1&3	1	0.28 (0.05, 0.50)	1	0.96 (0.72, 1.19)

*n = number of studies; MD** = mean difference.

Morowatisharifabad et al., 2013; Naserpoor et al., 2011; Noughabi et al., 2014; Olang et al., 2009; Poorahmad-Garbandi et al., 2014; Ranjbaran et al., 2017; Roudbari et al., 2009; Saki et al., 2013; Torabi et al., 2011; Vafaee et al., 2010; Veghari, 2011). Although the prevalence of EB at 5 to 6 months of age in the studies before 2010 (59%) was higher than it was after 2010 (52%), this difference was not significant. On the other hand, the proportion of EB up to 4 months was a trend that increased significantly. So it seems, early cessation of EB has increased between 2000 and 2016 in Iran.

In the systematic review performed in 2015 in Iran, the prevalence of EB in 4- to 6-month-olds was estimated to be 49.1% (Mehdi Ranjbaran, Nakhaei, Chizary, & Shamsi, 2016). This proportion was estimated to be 27.7% in a national study by Olang (Olang et al., 2009).

Breastfeeding has been revealed to have a protective role in the development of several chronic diseases and the duration of EB has played a chief role in this issue. In the present study, we tried to identify the optimal duration of EB, but the lack of homogeneous studies for analyzing limited our goals. In this review, the odds of EB until 5 to 6 months among children with respiratory diseases (CI 95% OR = 1.01, 1.47, heterogeneity p -value = 0.046) and anemia (CI 95% OR = 1.1, 2.11, heterogeneity p -value = 0.32) was more than in children up to 4 months who breastfed exclusively (Dalili et al., 2015; Hamidi et al., 2011; Heydarpour et al., 1390; Hosseini et al., 2014; Kadivar, Yarmohammadi, Mirahmadzadeh, Vakili, & Karimi, 2003; Khadivzadeh, 2002; Monajemzadeh et al., 2010; Naserpoor et al., 2011; Poorahmad-Garbandi et al., 2014; Ranjbaran et al., 2017; Saki et al., 2013).

In a systematic review that presented in 2015 (Mathew, Gupta, & Tiwari, 2015), early solids (before 6 months of age) significantly improved hemoglobin levels in developing countries but not in developed countries. On the basis of this meta-analysis, our results had consistency with developing countries.

In a systematic review of evidence from randomized controlled trials, the iron deficiency and anemia in breastfed infants could be positively improved by introduction of solids at 4 months (Qasem, Fenton, & Friel, 2015).

Some studies have proven that early and exclusive breastfeeding plays a critical role in infants' immune systems and considerably lowers the risk of death from infectious diseases such as pneumonia (UNICEF, 2014) Silfverdal et al. (2007) showed infants who were exclusively breastfed over 3 months were likely to have better serological protection against pneumococcal serotypes after vaccination compared to those who were breastfed less (Silfverdal, Ekholm, & Bodin, 2007).

We did not find a significant difference between ≤ 4 month and 5 to 6 months of EB based on atopic syndromes (Ghaderi & Makhmalbaf, 2005) (Valiee et al., 2014). However, clinically atopic syndrome probability was higher in early complementary feeding (OR = 0.77).

Madhok et al. published in a review in 2013 that demonstrated that there is no evidence to suggest that EB for up to 7 months reduced the risk of developing atopic eczema in infants compared with a shorter lactation period (Madhok, Futamura, Thomas, & Barbarot, 2015) A second review by Kramer et al. argued that EB for 6 to 7 months provided no protection against the development of atopic eczema at 5 to 7 years

compared to EB for 3 to 4 months (RR = 0.86, 95% CI 0.47–1.58) (Kramer & Kakuma, 2012) These results support a previously published systematic review (Yang, Tsai, & Lu, 2009) and a large study based on ISAAC study data (Flohr et al., 2011), which showed a lack of evidence for a protective effect of EB on childhood eczema.

We only had one study for reporting of EB's effect on diarrhea, obesity, and SIDS. In this study (Froozani et al., 1999) the odds of getting diarrhea increased with early cessation of EB. The negative relationship between diarrhea and EB duration have been proven several years ago (Patwari, 1999) and epidemiological studies have demonstrated a marked negative relationship between diarrhea and duration of EB.

In this study no significant relationship between EB and SIDS has been found (Fallah et al., 2016). In a meta-analysis from 2017, breastfeeding for at least 2 months was associated with half the risk of SIDS (Thompson et al., 2017). Another review found that both breastfeeding and dummy use reduced the risk of SIDS (Alm, Wennergren, Möllborg, & Lagercrantz, 2016). It is noticeable that breastfeeding did not need to be exclusive to confer this protection (Alm et al., 2016; Thompson et al., 2017).

In this review, EB (to 6 months) had positive effect on the growth of infants. This output was consistent with other review studies (Mathew et al., 2015) although some analyses showed a non-significant effect of earlier cessation EB on growth in both developing and developed countries on weight and length (Qasem et al., 2015).

Limitations

The number of homogenous studies was quite limited so it was not possible to conduct multiple regression analysis.

Practice implications

Monitoring of the implementation of recent guidelines or even modification of the duration period of the iron administration is potentially necessary.

Conclusion

The pooled mean of 4.1 months of EB in Iranian children 2 to 5 years old is within the limits of WHO recommendation (4 to 6 months) albeit on the low end. It seems, in the recent studies, after 2010, early cessation of EB has increased.

According to the results of this study, EB until 5 to 6 months has a positive relationship with anemia. Finally, the duration of EB until 5 to 6 months is appropriate if monitoring of children's iron intake is provided.

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Declaration of Competing Interest

The authors report no conflicts of interest.

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