

Exclusive Breastfeeding Lowers Incidence of Gastroesophageal Reflux in Infants: a 12-months Cohort Study

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Abstract

Introduction: Gastroesophageal reflux (GER) is the involuntary passage of stomach contents to the esophagus with or without regurgitation and vomiting. Studies conducted in Indonesia showed that episodes of regurgitation persisted longer and its incidence was 2 times higher than other ethnics even in 12 months old. In fact, prolonged regurgitation may lead to gastroesophageal reflux disease. This study aims to evaluate exclusive breastfeeding as protective factor toward incidence of GER in infants aged 0-1 month old.

Materials and method: This study was a prospective cohort study involving all infants aged 0-1 month old in several hospitals at Surabaya, Sidoarjo, and Gresik. Subjects were classified into 2 groups: exclusively breastfed groups and non-exclusively breastfed groups. Diagnosis of GER was made from history taking and physical examination, according to Rome IV criteria. Follow-ups were conducted at 3, 6, and 12 months in order to know if subjects showed any symptoms of GER or not.

Results: A total of 222 subjects followed this study until 12 months. Result showed that fewer infants under exclusively breastfed group showed symptoms of GER after 6 months duration or more. Incidence of GER in both exclusively breastfed group and non-exclusively breastfed group did not differ significantly at 3 months.

Conclusion: Exclusive breastfeeding exhibited protective effect toward GER in infants aged 0-1 year. Meanwhile, non-exclusively breastfed infants either bottle-fed with breastmilk, formula-fed, or any combination between breastfed and formula-fed, increased risk for GER by 1.45 times. Therefore, it is highly recommended to give exclusive breastfeeding for infants.

Keywords: exclusive breastfeeding, gastroesophageal reflux, infant, protective effect

1. Introduction

Gastroesophageal reflux (GER) is the involuntary passage of stomach contents to the esophagus that occurs with or without regurgitation and vomiting. Any case of GER that becomes persistent and pathological, causing symptoms or complications that disturb normal daily routine, is called gastroesophageal reflux disease (GERD) [1]. The most common manifestation of GER in infancy is regurgitation, affecting up to half of all infants aged 0–3 months and two-thirds of all infants aged 4–6 months [2].

Regurgitation is usually found in infants aged 0–12 months, as a normal physiologic process in healthy infants. Studies conducted in America, Europe, and Asia found that 60–80% normal infants aged 0–1 month experienced regurgitation at least once a day. Episodes of regurgitation will diminish with age, to 40–60% at 4–6 months of age and to 4–5% after 12 months of age [3–5].

Unfortunately, in contrast to those studies stating that episodes of regurgitation naturally decreases with age, in a study conducted in Indonesia, episodes of regurgitation persisted longer, in which 27.8% children still had regurgitation up to 6 months old, 16.7% up to 9 months old, and 9.2% up to 12 months old. Similarly, another study conducted in Indonesia showed that more than 75% children aged 0–3 months experienced regurgitation more than once a day, and 12% still persisted until 9–12 months old [6,7]. This phenomenon should raise special attention because prolonged regurgitation may lead to GERD [6]. Prevalence of GERD itself is increasing by 8.5% in East Asia and 10–20% in Western Europe and North America [8].

This high prevalence, along with its significant physiological, psychological, and social impacts, of GER indicates the need for risk stratification, early diagnosis, and prompt treatment. One of the risk factors of GER is nutritional history, although results from previous studies were still contradictory [7,9]. This study aims to evaluate exclusive breastfeeding as protective factor toward incidence of GER in infants aged 0–1 month old at Surabaya, Sidoarjo, and Gresik, in Indonesia.

2. Materials and methods

2.1. Study design and population

This study was a prospective cohort study, conducted in November 2019 until January 2021. This study recruited all infants aged 0–1 month old in several hospitals at Surabaya, Sidoarjo, and Gresik. Subjects were excluded if they had

congenital anomalies and/or were diagnosed with life-threatening conditions, such as severe asphyxia, hypoxic ischemic encephalopathy (HIE), or sepsis before follow-up ended.

Sampling was using consecutive sampling method. According to the calculated formula, minimum sample size required was 216 subjects.

2.2. Data collection

Recruited subjects were interviewed for basic information, such as sex, birth weight, gestational age, type of delivery, parity, type of nutrition, history of frequent respiratory symptoms, exposure to smoke, and socio-economic background (mothers' age, mothers' occupation, mothers' education level, and average family income according to local minimum wage). Subjects were classified into 2 groups: exclusively breastfed group and non-exclusively breastfed group. Subjects under exclusively breastfed group were those who were directly breastfed by mothers from birth up to minimum 6 months of age, and never drank formula milk. Subjects who were given pumped and bottled breastmilk, formula-milk, or any combination of breastfeeding with other feeding before follow-up ended were classified as non-exclusively breastfed group.

Diagnosis of GER was made from history taking and physical examination, according to Rome IV criteria: (1) regurgitation occurs twice or more a day for 3 weeks or more; and (2) no hematemesis, aspiration, failure to thrive due to nutrition deficiency, feeding disorder, and infant was not in lying position when regurgitation occurs. Follow-ups were conducted at 3, 6, and 12 months in order to know if subjects showed any symptoms of GER or not.

2.3. Data analysis

Collected data were tabulated. Data analysis was conducted using chi-square in SPSS version 22 (IBM Corp., Armonk, New York). Values were considered significant if $p < 0.05$.

2.4. Ethical clearance

Legal guardians of all recruited subjects had received information about this study and signed an informed consent. Ethical clearance was issued by the Health Research Ethics Committee of Dr. Soetomo General Hospital, Surabaya (No. 1681/KEPK/XI/2019).

3. Results

This study recruited a total of 255 infants aged 0-1 months. However, 33 subjects dropped out (25 subjects were unreachable, 5 subjects has previously unknown congenital disorder, and 3 subjects died). Therefore, only 222 subjects followed this study until 12 months. Those subjects consisted of 54.1% boys and 45.9% girls. Baseline characteristics were shown in Table 1.

Table 1. Baseline characteristics

Characteristics	n (%) (N = 222)
Sex	
Boy	120 (54.1)
Girl	102 (45.9)
Birth weight	
1500 until < 2500 gram	112 (50.5)
≥ 2500 gram	110 (49.5)
Gestational age	
Full term	160 (72.1)
Premature	62 (27.9)
Type of delivery	
Vaginal delivery	75 (33.8)
Caesarean section	147 (66.2)
Parity	
Primiparous	106 (47.7)
Multiparous	116 (52.3)
Type of nutrition	
Exclusively breastfed	104 (46.8)
Non- exclusively breastfed	118 (53.2)
Mothers' age	
<20 years old	24 (10.9)
≥20 years old	198 (89.1)
Mothers' occupation	
Working	72 (32.4)
Housewife	150 (67.6)

This study found that fewer infants under exclusively breastfed group showed symptoms of GER. However, its protective effect could be seen only after 6 months duration or more. Incidence of GER in both exclusively breastfed group and non-exclusively breastfed group did not differ significantly at 3 months (Table 2).

Table 2. Incidence of GER in exclusively breastfed group versus non-exclusively breastfed group

Incidence of GER*	Group		RR [†]	p [‡]
	Exclusively breastfed, n (%)	Non-exclusively breastfed, n (%)		
3 months	94 (90.4)	107 (90.7)	1.03	0.941
6 months	22 (21.2)	54 (45.8)	1.45	<0.001
12 months	3 (2.9)	17 (14.4)	1.13	0.003

*GER: gastroesophageal reflux

†RR: relative risk

‡p is considered significant if < 0.05

4. Discussion

Reflux happens due to the involuntary backflow of gastric contents into the esophagus. In general, reflux can be divided into physiologic, symptomatic, or pathologic. The term GER denotes a functional or physiological process without any involvement of systemic complaints. Hence, this physiological process can be found even in normal infants and children. However, when GER becomes persistent, shows red-flag symptoms, and starts to interfere daily activities, NASPGHAN and ESPGHAN explained that GER could become GERD and cause complications.

Almost 70-85% symptoms of GER are found in the first 2 months of life, especially after feeding. Regurgitation or spitting up is the common manifestation of GER in healthy children aged less than one year old, especially in those children with feeding problems [3,7]. This complaint is more frequently found compared to other symptoms, such as vomiting, diarrhea, constipation, and abdominal colic [10]. Although GER is considered normal by physician, many studies had shown that symptoms of GER were considered significant by parents [1,7,11,12].

In this study, exclusive breastfeeding exhibited significant protective factor affecting incidence of GER in infants. Non-exclusively breastfed infants had 1.45 times higher risk of experiencing GER at 6 months and 1.13 times higher risk of experiencing GER at 12 months of age compared to exclusively breastfed infants. However, this result was different from previous studies. A1-year prospective cohort study involving 145 healthy infants showed no significant difference in the incidence of GER between breastfed and formula-fed groups [13]. A 48-hour observation after birth in 32 formula-fed infants and 31 breastfed infants showed that episodes of regurgitation in those two groups did not differ significantly, both in the first and second 24 hours [14]. Another study conducted in 128 infants assessed by revised infant gastro-esophageal reflux questionnaire (IGERQ-R) showed that there was no difference in the score between breastfed and formula-fed infants [11].

Meanwhile, most studies conducted in Indonesia reported higher incidence of regurgitation in formula-fed infants [15]. This finding was also in line with other studies conducted in Indonesia showing that formula-fed infants were more likely to experience regurgitation compare to breastfed infants [16,17]. In another study involving 313 infants diagnosed with regurgitation according to Rome II criteria, symptoms of GER in breastfed infants subsided faster than formula-fed infants in the first 24 months of age [12]. These studies ultimately highlighted the role of breastfeeding as protective factor toward GER.

There is a wide variability amongst normal infant in their stomach ability and feeding skills [18]. Their gastric emptying time also vary between 1-4 hours or more in one day. Therefore, their desire to drink will also vary at different point of time at the day. By the end of their first week of life, a healthy infant will drink 6-9 times per day, with 60-90 ml volume each. Some infants will be satisfied with feeding every 4 hours, but other infants may prefer feeding every 2-3 hours. In relation to GER, breastfeeding was associated with lower incidence of feeding problems, including regurgitation. pH level in the esophagus of breastfed infants is significantly lower than formula-fed infants, which make gastric emptying faster in breastfed infants because lower esophageal pH stimulates peristalsis and thus limits the duration of reflux [19].

Breastmilk that comes out from the mothers' breast flows slower than bottled milk, thus preventing sudden distention of the stomach [20]. During bedtime, breastfed infants showed significantly shorter duration of GERD than formula-fed infants, which were 3.0 minutes/hour versus 8.3 minutes/hour, respectively [19].

Infants who were partially breastfed tend to receive higher volume of milk, compared to those who were exclusively breastfed or exclusively formula-fed. This excessive drinking volume was considered as one of the factors for regurgitation [20]. Another study reported that breastfed infants were able to control their own drinking volume compared to those who were bottle-fed. One of the detrimental effects of bottled feeding was that caregivers generally ignore signs of fullness in their infants. Caregivers usually tend to give milk until all of its contents are finished. This phenomenon was proven by the fact that bottle-fed infants tend to gain more weight than breastfed infants [21].

5. Conclusion

This study showed that exclusive breastfeeding exhibited protective effect toward GER in infants aged 0-1 year. Meanwhile, non-exclusively breastfed infants either bottle-fed with breastmilk, formula-fed, or any combination between breastfed and formula-fed, increased risk for GER by 1.45 times. Therefore, it is highly recommended to give exclusive breastfeeding for infants.

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