

• CLINICAL RESEARCH •

Investigation of regurgitation and other symptoms of gastroesophageal reflux in Indonesian infants

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Abstract

AIM: To evaluate the incidence of regurgitation and other symptoms of gastroesophageal reflux in Indonesian infants.

METHODS: In a cross-sectional study at the University Outpatient Clinic for vaccination in Jakarta, 138 mothers of healthy infants less than 12-mo old were prospectively asked to report the frequency of regurgitation.

RESULTS: Whatever the age was, some infants did not regurgitate (from 10% during the first month of life to 67% in 1-year-old infants). Regurgitation of at least once a day was reported in 77% of infants younger than 3 mo. Daily regurgitation decreased to 12% in the 9-12 mo old group. Reported peak prevalence was 81%(26/32) during the first month of life. Regurgitation decreased sharply between the 4-6 and 7-9 mo old groups (from 44% to 9%). The longer the regurgitation persisted, the more frequently the mother perceived regurgitation as a problem. Volume and frequency of regurgitation, back arching, irritability, crying and refusal of feeding were the symptoms causing maternal anxiety. The longer the regurgitation persisted, the more frequently the mothers viewed it as a health problem.

CONCLUSION: Regurgitation occurs frequently in Indonesian infants, and is a frequent cause of concern to mothers.

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INTRODUCTION

Regurgitation is the effortless return of gastric contents into the mouth, and the most common symptom of infantile gastroesophageal reflux (GER). Few attempts have been made to determine the prevalence of regurgitation and its natural course in infants. In the Western world, evaluation of the natural progression of symptoms of GER at any age has become virtually impossible because of widespread self-treatment and a lack of medical referral. It is not clear how important genetic, racial and ethnic factors may be in the clinical presentation, the prevalence and the natural history of GER disease. In the Eastern

part of the world, it is commonly thought that regurgitation is less frequent than in the United States and Europe. For these reasons, determining the prevalence of GER in Indonesian infants is of interest.

MATERIALS AND METHODS

Data were collected from mothers bringing their healthy infants to the Outpatient Clinic of the Cipto Mangunkusumo Hospital, Jakarta, for routine immunization. All infants were born at term and in good general health with adequate nutritional status (P50-97 NCHS). Most of the mothers were from the middle-low socioeconomic class and worked as housewives. The data were obtained by prospectively interviewing mothers using a standard questionnaire about the prevalence of regurgitation during the previous two wk and other descriptive information.

The same author (BH) interviewed 138 consecutive mothers, presenting to the outpatient clinic of one of the local authors. Each interview lasted for 15 to 20 min. All mothers agreed to participate in the study. Age distribution of the infants is listed in Table 1. There were 75 male and 63 female infants. Mothers were asked the number of episodes of regurgitation per day, and whether they considered regurgitation as a health problem, whether the frequency or volume of emesis was a health problem and whether the infant had such symptoms as crying, back arching, irritability, or refusal to feed, as well as whether the symptoms had an adverse impact on the baby's quality of life.

The two-tailed unpaired *t*-test was used, statistical significance was set at $P < 0.05$.

Table 1 Age distribution of studied infants

Age (mo)	Infants (n)
0-3	74
4-6	34
7-9	21
10-12	9
Total	138

RESULTS

Table 2 summarizes the prevalence and frequency of regurgitation in the infants by month of age. Up to the age of 3 mo, about half of the infants regurgitated more than two times a day, the number was slightly higher in the first mo of life and smaller at 3 mo. In the group regurgitating 1 to 4 times a day, there was a sharp decrease in the number of episodes of regurgitation to almost zero by the age of 7 to 8 mo. Twenty-five percent of the infants regurgitated more than 4 times a day during the first month of life, but from the age of 6 mo all infants regurgitated less than 4 times a day. Table 3 shows the number of mothers who were concerned about regurgitation. The evolution of concern was inversely related to the persistence of regurgitation. During the first month of life, many infants regurgitated, and few mothers expressed their concerns. However, the mothers of older infants with persistent vomiting became concerned about the symptom. Among infants regurgitating more than once a day, about 40% of the mothers asked for medical advice about

the symptom. The reasons for maternal concern are listed in Table 4, and included the excessive volume and frequency of regurgitation, and symptoms suggesting a decreased quality of life of the infants such as food refusal, crying, back arching and irritability. The volume of regurgitation was less frequently considered as a problem than the frequency of regurgitation (9% vs 66%). Crying and irritability were the second most frequent reasons for concern among the mothers (57%). Food refusal and back arching were reported as reasons for concern in 26% and 20%, respectively. Mothers of regurgitating infants estimated their infants had an impaired quality of life (75 vs 15 %, $P<0.05$). Infants of unconcerned mothers had much less frequent symptoms than infants of concerned mother ($P<0.05$).

Table 2 Daily frequency of regurgitation in 138 healthy infants

Age (mo)	Infants	Daily frequency of regurgitation (%)			
		0	<1	1-4	>4
1	32	3 (10)	3 (10)	18 (55)	8 (25)
2	25	3 (12)	2 (8)	13 (15)	7 (28)
3	17	5 (29)	1 (6)	8 (47)	3 (18)
4	10	6 (60)	1 (10)	3 (30)	0 (0)
5	14	3 (21)	2 (15)	6 (43)	3 (21)
6	10	6 (60)	1 (10)	3 (30)	0 (0)
7	10	6 (60)	2 (20)	2 (20)	0 (0)
8	3	1 (33)	2 (67)	0 (0)	0 (0)
9	8	8 (10)	0 (0)	0 (0)	0 (0)
10	5	4 (80)	0 (0)	1 (20)	0 (0)
11	1	1 (100)	0 (0)	0 (0)	0 (0)
12	3	2 (67)	1 (33)	0 (0)	0 (0)
	138	48(35)	15 (11)	54 (39%)	21 (15%)

Table 3 Number of mothers considering regurgitation as a health problem

	Daily regurgitation frequency (%)		
	<1	1-4	>4
With concern	3	24	8
Without concern	60	30	13

Table 4 Symptoms of gastroesophageal reflux and number of mothers showing concern

Symptom	n (%)
Crying and irritability	20 (57)
Food refusal	9 (26)
Back arching	7 (20)
Excessive frequency of regurgitation	23 (66)
Excessive volume of regurgitation	3 (9)

DISCUSSION

Recent studies have suggested that GER may in part be genetically determined. Thus, its prevalence and severity might be expected to vary according to racial or ethnic background. Radiology is not recommended in the diagnosis of GER. The radiological method of GER evaluation showed a specificity of 50% and a sensitivity of 29%, as compared to 24-h pH monitoring^[1]. A genetic influence on the prevalence of GER was supported by the finding that GER symptoms are more frequently encountered in the relatives of GER disease patients^[2]. Moreover, the concordance for GER is higher in monozygotic than dizygotic twins^[3]. A locus on chromosome 13q, between microsatellite D13S171 and D13S263, has been linked with severe GER in 5 families with multigenerational histories^[4], but the

same abnormal locus was not found in 5 other families, possibly due to the genetic heterogeneity of GER and different clinical presentations among patients studied^[5]. The incidence of hiatal hernia was reported to be much lower in Korea (1.4%) than in Western world (2.3-50%)^[6]. Several studies have confirmed the familial segregation of hiatal hernia, Barrett's esophagus, esophageal carcinoma and GER.

There are only a few studies that have attempted to describe the natural history of GER in children. In some of these studies, infantile GER was excluded^[7]. Orenstein developed a questionnaire to identify infants with GER^[8]. At least regurgitation occurred once a day in half of 0- to 3-mo-old white non-Hispanic infants, and increased up to two thirds at 4 mo and decreased to 5% at 10-12 mo of age^[9]. Daily regurgitation was present in 50% of infants younger than 3 mo, in more than 66% at 4 mo, but only in 5% at 1 year of age^[8-10]. Nelson and coworkers documented the prevalence of regurgitation in a white non-Hispanic infant population in USA^[9]. However, as the authors stated, their findings could not be generalized and investigations of different racial/ethnic and socioeconomic groups are needed to determine differences in prevalence of symptoms in other populations. Also in Japanese infants, regurgitation was common and decreased with age^[11].

Our questionnaire intended to report the incidence of regurgitation, not of symptoms suggesting gastro-esophageal reflux (disease). Regurgitation occurred frequently in our small sample size of Indonesian infants. The sample size was relatively small for an epidemiological survey. In fact, the prevalence of regurgitation in our population was the highest ever reported. In the study by Nelson and coworkers, the prevalence of regurgitation peaked at 4 mo of age^[9], whereas in our population the prevalence was highest during the first month of life. In a study from northern India, the prevalence of regurgitation in 1-6-mo-old infants was 55%^[12]. In our study, 75% of 0-6-mo-old infants regurgitated at least once a day.

Complete resolution of regurgitation was the most common outcome in infant reflux, with a resolution by 10 mo of age in 55%, by 18 mo of age in 60-80% and by 2 years of age in 98%^[13,14]. In the study by Nelson and coworkers, and in our study, regurgitation was almost completely disappeared by 7 mo^[9]. In 6-12-mo old infants, the prevalence of regurgitation was 15% in North India^[12], which was similar to the findings in our population if all infants regurgitating at least once per day were considered. If the infants regurgitating less than once a day were included, then the prevalence of regurgitation among 6-12-mo old Indonesian infants was as high as 30%. In all studies evaluating the natural evolution of infant regurgitation, there was a sharp decline around 6-7 mo towards a disappearance at the age of 12 mo^[9,12,15].

According to epidemiological data from France, Australia and the United States, excessive regurgitation was a cause of concern and medical consult in about 25% of parents^[8-10]. Spilling in infancy was very common, but the majority of children settled by 13 to 14 mo of age. However, those with frequent spilling (>90 d) were more likely to have GER symptoms at 9 years of age^[16]. Esophagitis occurred in one quarter of infants with persistent distress^[17]. There was a subgroup of otherwise healthy infants, presenting with wheeze and/or stridor, who had isolated swallowing dysfunction and silent aspiration as the cause of their respiratory symptoms^[18]. Our findings were similar, 30% of the mothers showed concern over regurgitation. Symptoms causing parental perception that regurgitation might be a problem were comparable in both studies, and included the volume and frequency of regurgitation and symptoms suggesting decreased quality of life such as crying, back-arching and irritability^[9]. Parental reports about reflux-related behaviors were similar in Nelson's study and in ours^[9]. Despite the concern of parents, pediatricians generally stated

that intervention was not needed^[19]. Although a prospective follow-up of 63 regurgitating infants reported a complete disappearance of regurgitation by 12 mo of age, it is interesting that these same infants were reported on a long-term follow-up to have a significant increase in feeding refusal, prolonged eating time, parental distress about feeding and impaired quality of life when compared to non-regurgitating controls^[15].

In conclusion, the severity and incidence of GOR were significantly higher in symptomatic than asymptomatic infants^[20]. Food allergy might be common in regurgitating infants^[21,22]. Recommendations for a diagnostic workup have been published^[23,24]. Hydrolysates might treat regurgitation by improving gastric emptying^[25]. GER frequently caused apnea in infants^[26,27]. GER and regurgitation decreased the quality of life^[28] in infants, and increased hospital stay and cost^[29,30]. Worldwide, racial differences in the prevalence and persistence of infantile regurgitation seem minimal. Regurgitation in Indonesian infants tends to be very frequent, with more than 75% of 0-3-mo-old infants regurgitating at least once a day. Symptoms viewed as being related to GER and causing maternal concern are also similar. For one in three mothers worldwide, the symptom of regurgitation is a cause for concern. Mothers in Indonesia are no exception.

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