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Stool, Cry, Rash: Do Feeding Methods Influence Symptom Patterns in Infants?

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Abstract

Background: Breast milk is the preferred source of infants nutrition; however not all infants can be exclusively breastfed, making formula a necessary alternative. Feeding type may influence general (crying), gastrointestinal (stool consistency), and dermatological symptoms, yet population-based comparisons in Indonesia remain limited. This study aims to compare the prevalence and patterns of gastrointestinal symptoms, crying duration, and dermatological manifestations between exclusively and non-exclusively breastfed infants

Methods: A cross-sectional study was conducted using structured parental questionnaires at an outpatient clinic in Tangerang, Indonesia. A total of 290 presumed healthy infants aged 0–12 months (260 exclusively breastfed, 30 non-exclusively breastfed) were included. Symptoms were assessed using CoMiSS™ (Cow's Milk related Symptom Score™). Chi-square tests and Fisher's Exact Tests were applied to compare symptom prevalence and associations.

Results: No significant differences were observed between groups in abnormal stool consistency (8.5% vs. 10.0%, $p = 0.732$), increased crying (5.4% vs. 3.3%, $p = 1.000$), or skin rash (41.2% vs. 40.0%, $p = 1.000$). No association was found

between stool consistency and crying in either group. No infant exhibited concurrent stool abnormalities and increased crying, with or without skin rash. Skin rash was common (~41%), but not associated with gastrointestinal or behavioural symptoms.

Conclusion: *Feeding method does not significantly influence symptom prevalence or patterns. Stool abnormalities and excessive crying appear to be distinct clinical entities rather than a unified symptoms cluster, providing reassurance to clinicians and parents.*

Keywords: *Exclusive breastfeeding, Feeding methods, Infant, Stool consistency, Crying, Skin rash*

Abstrak

Latar Belakang: *Air susu ibu (ASI) merupakan nutrisi utama bayi; namun tidak semua bayi dapat memperoleh ASI eksklusif sehingga susu formula menjadi alternatif. Jenis pemberian makan diduga dapat memengaruhi gejala saluran cerna dan kulit, tetapi data perbandingan berbasis populasi di Indonesia masih terbatas. Penelitian ini bertujuan membandingkan prevalensi dan pola gejala saluran cerna, durasi menangis, serta manifestasi kulit antara bayi ASI eksklusif dan non-eksklusif.*

Metode: *Penelitian potong lintang dilakukan dengan menggunakan kuesioner terstruktur yang diisi oleh orangtua di sebuah poliklinik rawat jalan Tangerang, Indonesia. Sebanyak 290 bayi “sehat” usia 0–12 bulan (260 dengan ASI eksklusif, 30 dengan non-eksklusif) diikutsertakan. Gejala dinilai berdasarkan konsistensi tinja, ruam kulit, dan tangisan, menggunakan CoMiSS™ (Cow’s Milk-related Symptoms Score). Uji Chi-kuadrat dan uji eksak Fisher digunakan untuk membandingkan prevalensi gejala dan hubungan antar gejala*

Hasil: *Tidak ditemukan perbedaan bermakna antara kedua kelompok pada konsistensi tinja abnormal (8,5% vs 10,0%, $p = 0,732$), peningkatan frekuensi menangis (5,4% vs 3,3%, $p = 1,000$), maupun ruam kulit (41,2% vs 40,0%, $p = 1,000$). Tidak terdapat hubungan antara konsistensi tinja dan frekuensi menangis pada kedua kelompok, serta tidak ada bayi yang menunjukkan kombinasi keduanya, baik dengan maupun tanpa ruam kulit. Ruam kulit cukup sering ditemukan (~41%), namun tidak berhubungan dengan gejala saluran cerna maupun perilaku.*

Simpulan: Metode pemberian makan tidak berpengaruh signifikan terhadap prevalensi maupun pola gejala. Abnormalitas tinja dan tangisan berlebihan tampak sebagai entitas yang berbeda, bukan bagian dari satu kelompok gejala yang sama, sehingga dapat memberikan rasa tenang bagi klinisi dan orangtua

Kata kunci: ASI eksklusif, Metode pemberian makan, Bayi, Konsistensi tinja, Tangisan, Ruam kulit

Introduction

Infant feeding practices, particularly the choice between breastfeeding and formula feeding, have for long been a subject of extensive research due to their profound implications for infant health and development. Breast milk is widely recognized as the optimal source of nutrition for infants, containing a dynamic composition of bioactive compounds, immunoglobulins and prebiotics that support immune function and gastrointestinal maturation.¹ However, several conditions may cause infants to be formula-fed including maternal medical contraindications; insufficient milk production or perceived inadequate supply; maternal return to work or educational commitments; anatomical difficulties with latching; infant conditions such as tongue-tie or cleft palate; and personal choice or cultural preferences.² Despite well-established benefits of breastfeeding for promoting long-term health and reducing infectious morbidity, the relationship between feeding type and common, non-severe infant symptoms such as stool consistency, crying frequency, and skin rash remains incompletely understood.

Gastrointestinal symptoms, particularly variations in stool consistency and frequency, represent one of the most common parental concerns during early infancy. Breastfed infants typically are reported to have distinct stooling patterns characterized by softer, more frequent, and often textured stools compared to their formula-fed counterparts. Concurrently, infant crying behaviour, particularly episodes perceived as excessive or inconsolable, affects approximately one in five infants during the first three months of life and represents a common source of parental anxiety and healthcare utilization.³ The etiology of excessive crying is multifactorial, encompassing gastrointestinal factors such as gastroesophageal reflux, cow's milk protein allergy, or immature gut motility; neurological factors related to infant temperament and self-regulation; and psychosocial factors including parental responsiveness and family stress.⁴ The potential contribution of feeding type to crying patterns has been hypothesized through several

mechanisms, including differential gastrointestinal transit times, variations in gut microbiota composition affecting the gut-brain axis, and exposure to potentially allergenic proteins in formula that may trigger discomfort in susceptible infants.

Dermatological manifestations, particularly skin rash and atopic dermatitis, represent additional common concerns in infancy with significant implications for quality of life and long-term allergic outcomes. Atopic dermatitis affects approximately 15-30% of children in developed countries, with onset frequently occurring during the first six months of life.⁵ The concurrent presentation of gastrointestinal, behavioural, and dermatological symptoms in relation to feeding type during early infancy has received less systematic attention, despite clinical observations suggesting that these symptoms frequently co-occur and may share common underlying mechanisms such as immature barrier function, altered microbiota, or early allergic sensitization.

Understanding whether stool consistency, crying frequency, and skin rash patterns differ between breastfed and formula-fed infants, and whether these symptoms cluster differently within each feeding group, could provide valuable insights into their underlying etiologies and inform evidence-based clinical guidance which would assist healthcare providers in counselling parents about expected symptom trajectories and distinguishing benign variations from pathological presentations. Furthermore, given the increasing recognition of the gut-skin axis and the role of the gut microbiota in modulating both gastrointestinal and dermatological health, exploring symptom co-occurrence patterns may generate hypotheses about shared pathophysiological mechanisms that warrant further investigation through prospective cohort studies or interventional trials.

Methods

This cross-sectional study was conducted at the outpatient clinic of the Private Public Hospital in Tangerang, Indonesia, from September 2022 to September 2023. A consecutive sample of 290 healthy infants who visited the outpatient clinic between the ages of 0-12 months was enrolled in the study. A total of 290 parents of the infants participating in the study provided consent.

Infants were eligible for inclusion if they were aged between 0 and 12 months and were either exclusively or non-exclusively breastfed and if the parents sign a consent form and complete research questionnaire. Infants were excluded if they had congenital abnormalities or visible diseases and if there is an acute illness at the time of examination also if they were receiving medication

for an existing medical condition. Before signing consent, all parents received explanation about study objectives, procedures, and their rights.

The data for this study were collected from parents of infants aged 0-12 months using a structured questionnaire. The questionnaire included information on infant demographics, feeding method, crying frequency, stool consistency, and skin rash. Infant were categorized into three groups based on their age: 0-4 months, 4-8 months, and 8-12 months. Infants were stratified into two feeding group as breastfed and non-exclusively breastfed. The crying frequency was categorized as ≤ 1 -1.5 hours per day, 1.5-2 hours per day, and 2-3 hours per day, also skin rash score was categorized mild, moderate and severe based on atopic eczema up to 1 week duration in head, neck, and trunk based on the Cow's Milk-related Symptom Score (CoMiSS™) questionnaire. All Data were anonymized and stored in a secure database to protect participant confidentiality.

The data were analysed using IBM SPSS Statistics Version 29.0.2.0. A descriptive analysis was conducted, encompassing frequency distribution and cross tabulation of each variable. To assess the relationship between symptoms (stool consistency, frequent crying, and skin rash), analyses were stratified by feeding group (breastfed vs. non-exclusively breastfed). Within each stratum, associations were evaluated using chi-square tests, with Fisher's Exact Test applied where expected cell counts were below 5. A p-value of less than 0.05 was considered statistically significant. This study analysed a subset of data derived from a multicentre study titled "Difference in Cow Milk-Related Symptoms Score", in which one of the authors (BH) participated. The data used in the present analysis are distinct from those reported in the original study. Ethical approval for the multicentre study was obtained from the Ethics Committee of UZ Brussel.

Result

Population Description

This study enrolled 290 infants aged 0 to 12 months, with 260 exclusively breastfed infants (89.7%) and 30 non-exclusively breastfed infants (10.3%) (Table 1). In the youngest age group (0–4 months), exclusive breastfeeding was nearly universal (152 infants (97.4%)); only 4 infants (2.6%) were non-exclusively breastfed. Among infants aged 4–8 months, exclusive breastfeeding remained dominant, with 71 infants (91.0%) compared to 7 infants (9.0%) who were non-exclusively breastfed. A notable shift was observed in the oldest age group (8–

12 months), where breastfeeding with complementary feeding was found in 37 infants (66.1%) and non-breastfeeding with complementary feeding in 19 infants (33.9%).

Table 1. Distribution of Feeding Methods by Age Group

Age Group (months)	Exclusively Breastfed n=260	Non-Exclusively Breastfed n=30	Total, n=290
0-4	152 (97.4%)	4 (2.6%)	156 (100%)
4-8	71 (91%)	7 (9.0%)	78 (100%)
8-12	37 (66.1%)	19 (33.9%)	56 (100%)
Total	260 (89.7%)	30 (10.3%)	290 (100%)

Symptom Pattern Among Exclusively and Non-Exclusively Breastfed Infants

The symptom patterns observed among exclusively and non-exclusively breastfed infants are presented in Figures 1 and 2, respectively. Overall, broadly similar trends were observed across both feeding groups, with some variations according to age and feeding type.

Figure 1 illustrates the symptom frequency including stool consistency, crying frequency, and skin rash among exclusive breastfed infants. Formed stools predominated at all age (91%), while hard stool (7%) were dominantly present at age group 4-8 months along with watery stools (1%) only present at age group 0-4 months. Infants cried frequently for less than an hour per day also predominated (51%) and approximately 5% of infants who cried frequently for 2-3 hours per day. Most of the infant showing normal dermatological condition (58%), skin rash often appear at younger age 0-4 months and having decreasing trend with age.

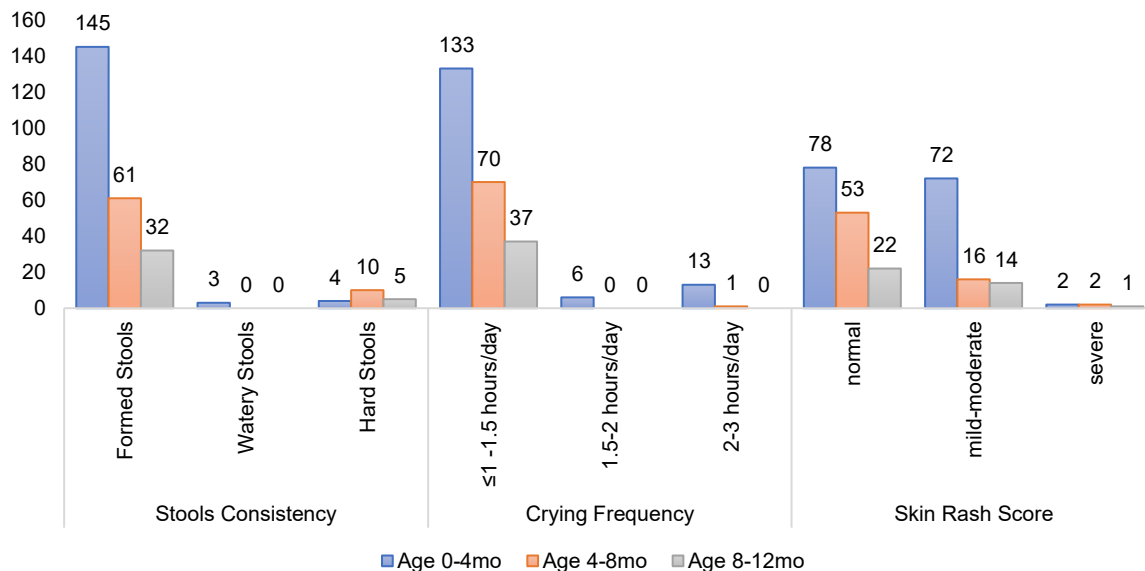


Fig 1. Symptom Pattern in Exclusively Breastfed Infant

As Figure 2 shows similar pattern of the symptom among non-exclusive breastfed infants. Formed stools predominated at all age (90%) with no cases of watery stool; however, hard stools were present in 10% infants. Only 3% of infant cried frequently for 2-3 hours per day, while the majority of infants cried frequently for less than an hour per day (96%). Skin rash appeared mostly in the 8-12 months old group; however normal dermatological condition still predominated at every age (60%).

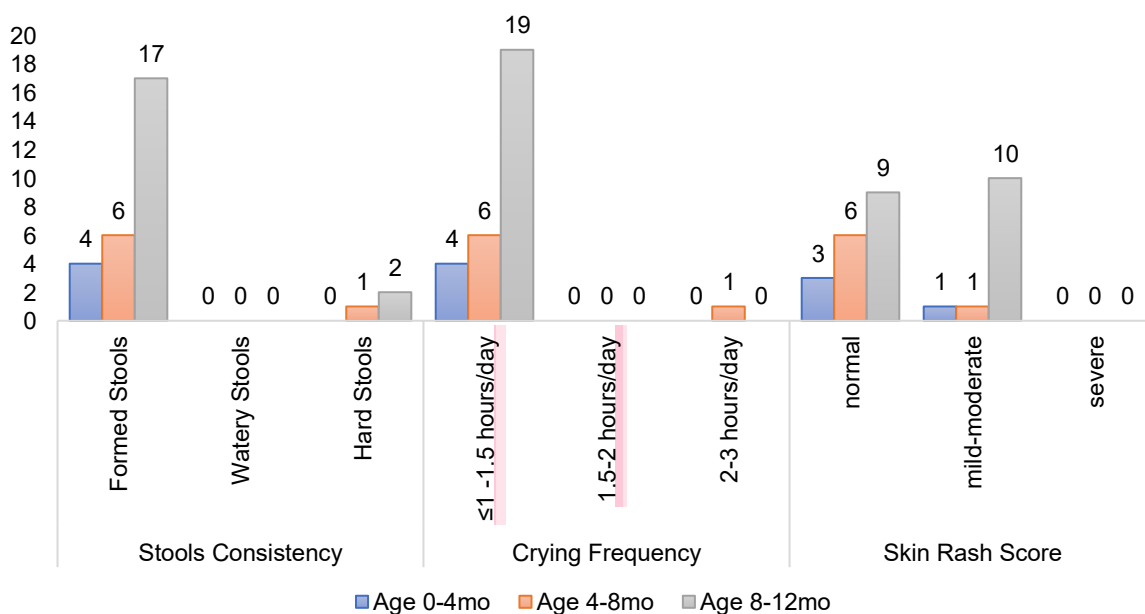


Fig 2. Symptom Pattern in Non-Exclusively Breastfed Infant

Overall, both feeding groups demonstrated predominantly normal stool consistency, low crying duration, and no skin rash. Slight differences were observed between groups: non-exclusively breastfed infants showed a slightly higher proportion of hard stools, while exclusively breastfed infants exhibited occasional watery stools limited to early infancy. Additionally, skin rash patterns appeared to differ by age distribution, with earlier occurrence among exclusively breastfed infants and later occurrence among non-exclusively breastfed infants. These findings suggest that while general symptom patterns are comparable, feeding type may be associated with subtle variations in gastrointestinal and dermatological outcomes across different age groups.

Comparison of Symptom Prevalence Between Exclusively and Non-Exclusively Breastfed Infants

To compare the prevalence of gastrointestinal, behavioural, and dermatological symptoms between feeding methods, we analysed 260 exclusively breastfed infants and 30 non-exclusively breastfed infants. No significant differences were observed for any of the three symptoms (Table 2).

Table 2. Prevalence Of Symptoms by Feeding Methods

Symptoms	Exclusively Breastfed n=260	Non-Exclusively Breastfed n=30	P-value
Abnormal Stool Consistency	22 (8.5%)	3 (10%)	0.732
Increased Crying Frequency	14 (5.4%)	1 (3.3%)	1.000
Skin Rash	107 (41.2%)	12 (40%)	1.000

*note: Fisher's Exact Test (two-sided).

Association Between Symptoms Among Exclusively and Non-Exclusively Breastfed Infants

To evaluate whether gastrointestinal (abnormal stool consistency), behavioural (increased crying frequency), and dermatological (skin rash) symptoms co-occurred differently according to feeding type, stratified analyses were performed. Chi-square tests were used, with Fisher's Exact Test applied when expected cell counts were below 5. Analyses were conducted separately

for exclusively breastfed infants (n = 260) and non-exclusively breastfed infants (n = 30).

No significant associations were found between any pair of symptoms in either feeding group (all $p > 0.05$; Table 2). Notably, no infant in either group presented with the combination of abnormal stool consistency and increased crying frequency, regardless of the presence or absence of skin rash (Table 3).

Table 3. Two-Way Table for Symptoms Associations by Feeding Methods

Group	Association		Normal	Abnormal	Total	P-value
Exclusively Breastfed n=260	Stool Consistency x Frequent Crying	Normal Stool	224 (94.1%)	14 (5.9%)	238	0.616
		Abnormal Stool	22 (100%)	0 (0.0%)	22	
	Stool Consistency x Skin Rash	Normal Stool	144 (60.5%)	94 (39.5%)	238	0.111
		Abnormal Stool	9 (40.9%)	13 (59.1%)	22	
	Frequent Crying x Skin Rash	Normal Crying	146 (59.3%)	100 (40.7%)	246	0.580
		Abnormal Crying	7 (50.0%)	7 (50.0%)	14	
		Normal Stool	26 (96.3%)	1 (3.7%)	27	1.000
		Abnormal Stool	3 (100%)	0 (0.0%)	3	
	Stool Consistency x Skin Rash	Normal Stool	17 (63%)	10 (37.0%)	27	0.548
		Abnormal Stool	1 (33.3%)	2 (66.7%)	3	
Non-Exclusively Breastfed n=30	Frequent Crying x Skin Rash	Normal Crying	17 (58.6%)	12 (41.4%)	29	1.000
		Abnormal Crying	1 (100%)	0 (0.0%)	1	
		Normal Stool	26 (96.3%)	1 (3.7%)	27	1.000
		Abnormal Stool	3 (100%)	0 (0.0%)	3	
	Stool Consistency x Skin Rash	Normal Stool	17 (63%)	10 (37.0%)	27	0.548
		Abnormal Stool	1 (33.3%)	2 (66.7%)	3	

*note: Fisher's Exact Test (two-sided). For the non-exclusively breastfed group, some cells had expected counts less than 5; results should be interpreted with caution.

Discussion

The present study investigated the prevalence and patterns of gastrointestinal (abnormal stool consistency), behavioural (increased crying frequency), and dermatological (skin rash) symptoms in exclusively breastfed versus non-exclusively breastfed infants in an Indonesian outpatient setting. Our findings shows that symptom prevalence did not differ significantly between feeding groups, and within each group, there were no significant associations among the three symptoms. Particularly, no infant in either group exhibited the combination of abnormal stool consistency and increased crying frequency.

11 A cross sectional study by Lestari et al (2023) on functional gastrointestinal disorders (FGIDs) in Indonesian infants reported that crying-related symptoms were observed in 16.8% of 433 infants aged 6 weeks to 4 months, while constipation were present in 5.5% of cases. Notably, the study found no significant association between formula feeding and the occurrence of either crying-related symptoms or constipation. This findings support our observation that feeding type does not significantly influence the prevalence of gastrointestinal or behavioural symptom among infants in Indonesia.⁶

11 4 In this study also found that skin rash was highly prevalent (approximately 41% in both feeding groups) aligns with findings from a recent multinational investigation involving Indonesia and Brazil. In that study, Knockaert et al. (2025) reported a significant difference in median CoMiSS™ scores between Jakarta (1.5) and Sergipe, Brazil (4.0), as it highlights that what define "normal" symptom may vary across populations.⁷ It is potentially explaining the relatively high prevalence of reported skin rash in our sample. The prospective cohort study by Bajeroval et al. (2024) evaluated CoMiSS™ scores in 122 presumed healthy infants without cow's milk protein allergy (CMPA) during first year of life and demonstrated that CoMiSS™ scores showed an inverse relationship with age. Additionally, no significant differences were observed between infants under 6 months who were exclusively breastfed and those who were formula-fed.⁸ Together with previous findings, this study support our observation that feeding method does not significantly influence CoMiSS™-measured symptom burden such as dermatological manifestasion in healthy infants.

21 Another large Italian cross-sectional study conducted by Scarpato et al. (2023) examined 508 infants aged 0–12 months using the Rome IV criteria and reported an overall prevalence of FGIDs of 21.1%. Infant colic was most prevalent

condition (9.3%), followed by functional constipation (5.5%). Notably, formula feeding was identified as a significant risk factor for FGID recurrence (adjusted OR = 1.8, 95% CI: 1.2–2.7), although individual symptoms remained distinct and did not cluster together.⁹ Regurgitation, functional constipation, and colic are common and generally physiological phenomenon during early infancy, and parents can be reassured that these condition are typically benign. The ESPGHAN (European Society for Pediatric Gastroenterology, Hepatology and Nutrition) also states that there is no significant in symptom prevalence between exclusively breastfed and formula-fed infants.¹⁰ Therefore, our findings reinforce that stool abnormalities and excessive crying should be interpreted as distinct clinical manifestations, rather than components of a single symptom complex.

The absence of a significant association between abnormal stool consistency and increased crying frequency in our study is consistent along with Vandenplas et al. (2015), who conducted a large multinational review on functional gastrointestinal symptoms in infants, their analysis showed that while infantile colic, regurgitation, and constipation frequently co-occur, they represent distinct functional entities rather than a unified syndrome.¹¹ Moreover, the authors stated that these symptoms often resolve spontaneously without intervention, which supports our observation that the combination of stool and crying abnormalities was entirely absent in our data, however the combination of gastrointestinal and behavioural symptoms may raise suspicion for conditions such as CMPA, particularly when accompanied by dermatological manifestations.¹²

Regarding the prevalence of functional gastrointestinal symptoms, Hegar et al. (2004) reported that regurgitation occurs in up to 77% of Indonesian infants younger than 3 months, with daily regurgitation decreasing to 12% by 9-12 months of age.¹³ While our study focused on stool consistency rather than regurgitation, these Indonesian data underscores that gastrointestinal symptoms are common in this population and often follow a predictable natural course.

Recent evidence regarding the CoMiSS™ as an awareness tool for CMPA accross different populations provides important context for interpreting our findings. A study by El Farargy et al. (2024) involving 808 presumed healthy Egyptian infants aged 0–12 months reported a median CoMiSS™ score of 5 (interquartile range: 5–6), with the 95th percentile at 7. Notably, the CoMiSS™ score were not dependent on feeding method ($p = 0.603$), and no significant difference were onserved between exclusively breastfed and formula-fed

infants.¹⁴ This finding supports our observation that feeding type does not independently influence the symptom profile measured by CoMiSS™, reinforcing the notion that symptom patterns are more likely shaped by genetic, environmental, and cultural factors rather than feeding method alone.

The high prevalence of skin rash in both feeding groups (approximately 41%) warrants consideration in light of emerging evidence on the gut-skin axis. A recent network meta-analysis by Li et al. (2025) examined 23 randomized controlled trials comparing various formulas and breastfeeding for atopic dermatitis in infants with cow's milk protein allergy.¹⁵ Their findings suggest that breastfeeding may improve growth outcomes compared to certain formulas, but the relationship between feeding methods and dermatological symptoms remains complex. The lack of significant difference in rash prevalence between exclusively breastfed and non-exclusively breastfed infants in our study supports the notion that skin manifestations in healthy infants may be more strongly influenced by genetic predisposition, environmental factors, and skin care practices than by feeding methods alone.

Strengths and Limitation

The strengths of this study include its relatively large sample size for the exclusively breastfed group (n=260) and the systematic stratification of analyses by feeding methods. The use of Fisher's Exact Test for 2×2 tables with low expected cell counts ensured appropriate statistical handling.

The limitations should be acknowledged. First, the non-exclusively breastfed group was considerably smaller (n=30), limiting statistical power to detect associations within this subgroup. Second, the cross-sectional design precludes causal inference regarding the temporal relationship between feeding methods and symptom development. Third, symptom data were collected via parental questionnaire rather than objective clinical assessment, which may introduce recall bias. Fourth, the study was conducted at a single outpatient clinic in Tangerang, Indonesia, which may limit other populations.

Conclusion

In conclusion, this study demonstrates that feeding methods (exclusively breastfed vs. non-exclusively breastfed) does not significantly influence the prevalence or patterns of abnormal stool consistency, increased crying frequency, or skin rash in Indonesian infants. The absence of infants with

29 concurrent stool and crying abnormalities suggests that these symptoms may represent distinct clinical entities rather than a unified symptom cluster. These findings may reassure parents and clinicians that neither feeding method is associated with increased risk of these common infant symptoms, while emphasizing the importance of evaluating symptom combinations that may indicate underlying pathology.

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