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Original Article

Rome IV Clinical Criteria and Management of Functional Constipation: Indonesian Health Care Professionals' Perspective

Andy Darma,[1,2] **Khadijah Rizky Sumitro**,[1,2] **Leilani Muhardi**,[3] **Yvan Vandenplas**,[4] **and Badriul Hegar** [5]

[1]Department of Child Health, Dr. Soetomo General Academic Hospital, Surabaya, Indonesia
[2]Department of Child Health, Faculty of Medicine, Universitas Airlangga, Surabaya, Indonesia
[3]FrieslandCampina AMEA, Singapore, Singapore
[4]Vrije Universiteit Brussel (VUB), UZ Brussel, KidZ Health Castle, Brussels, Belgium
[5]Department of Child Health, Dr. Cipto Mangunkusumo Hospital, Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia

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Correspondence to
Andy Darma
Department of Child Health, Dr. Soetomo General Academic Hospital, Moestopo Street, No 6-8, Surabaya 60286, Indonesia.
Email: andy.darma@fk.unair.ac.id

ORCID iDs
Andy Darma
https://orcid.org/0000-0001-5107-5895
Khadijah Rizky Sumitro
https://orcid.org/0000-0001-8557-2400
Leilani Muhardi
https://orcid.org/0000-0002-5924-1664
Yvan Vandenplas
https://orcid.org/0000-0003-1697-2552
Badriul Hegar
https://orcid.org/0000-0002-1862-8651

ABSTRACT

Purpose: The updated ROME IV criteria for functional constipation (FC) in children were published in 2016. However, information on the use of these criteria is scarce. This study aimed to report the frequency of the use of the ROME IV criteria by Indonesian pediatricians and general practitioners (GPs) in FC management in infants and toddlers.
Methods: An anonymous cross-sectional online survey was conducted between November 2021 and March 2022.
Results: A total of 248 respondents (183 pediatricians and 65 GPs) from 24 Indonesian provinces completed the survey. Most respondents reported an estimated prevalence of FC to be less than 5% both in infants and toddlers. On average, only 64.6% of respondents frequently used the ROME IV criteria. Pediatricians used the ROME IV criteria more often than GPs did (p<0.001). The most frequently used criteria were painful or hard bowel movements (75.0%) and ≤2 defecations/week (71.4%). Lactulose as a laxative was the preferred treatment choice, followed by changing the standard formula to a specific nutritional formula. Most of the respondents carried out parenteral reassurance and education. Normal growth, as a marker of good digestion and absorption function, and normal stool consistency and frequency were the most reported indicators of gut health.
Conclusion: The ROME IV criteria for functional constipation are not extensively used by pediatricians and GPs in Indonesia. Laxatives and specific nutritional formulas were the most used management approaches in infants and toddlers. Medical education, especially for general practitioners, should be updated.

Keywords: Constipation; Infants; Child, preschool; Health personnel; Indonesia

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Conflict of Interest

Leilani Muhardi is an employee of FrieslandCampina.

INTRODUCTION

Functional constipation (FC) is a common problem in children of all ages worldwide, and has become a significant burden on primary and secondary health care [1-3]. General practitioners (GPs) or pediatricians are frequently the first health care professionals (HCPs) consulted by parents or caregivers of children with FC [4-6]. FC cases account for 3% of GP and general pediatrician visits and 30% of pediatric gastroenterologist visits [4,6]. In Canada, constipation-related visits to the pediatric emergency department (ED) represent 2.1% of all visits, 3.4% of which are multiple ED visits [7].

A systematic review and meta-analysis of the worldwide prevalence of FC in children was conducted in 2018. In this review, the diagnosis of FC using Questionnaires on Pediatric Gastrointestinal Symptoms (QPGS) was based on the ROME III criteria (QPGS-RIII). The prevalence ranged 0.5–32.2%, with a pooled prevalence of 9.5% (95% confidence interval [CI], 7.5–12.1%) [8]. A review published in 2022 reported the global prevalence of FC using the ROME IV criteria was estimated to range 1.3–18.7% [9].

While there is good published research on FC in children worldwide, studies on FC in infants and toddlers using the ROME IV criteria in Southeast Asia are still limited. In Indonesia, the prevalence of FC has been reported among school-going and adolescent children (10–17 years) to be 18.3% based on the ROME III criteria [10]. Although the updated ROME IV criteria for the diagnosis of FC in children were published in 2016, information on the utilization of these new criteria in Indonesia is not available. Therefore, the present study aimed to assess the knowledge of GPs and pediatricians and their frequency of use of the ROME IV criteria in the management of FC in Indonesian infants and toddlers.

MATERIALS AND METHODS

An anonymous, closed-ended online survey using SurveyMonkey for Healthcare Professionals (HCPs) was conducted from November 2021 to March 2022 in Indonesia. This initiative is part of a multicountry survey that includes the distribution of prevalence [11]. This cross-sectional survey was distributed randomly to pediatricians and GPs in 24 provinces of Indonesia via email and Whatsapp messaging service. The target respondents were HCPs in public or private practice, and questionnaires with a brief explanation of the study were disseminated based on the network of the investigators. The survey was approved by the Ethics Committee of Dr. Soetomo General Academic Hospital (No. 0921/105/1/IX/2021) and all collected information were kept confidential. All the respondents provided informed consent and agreed to participate before completing the questionnaire.

The survey consisted of 18 questions that included the definition of FC according to the ROME IV criteria, warning signs, nutrition, and pharmacological management. Respondents were also requested to report the most preferred gut health indicators for infants (0–12 months) and toddlers (>1–3 years). There were several types of questions, such as single-choice, multiple-choice, and scale questions (e.g., rate an answer as almost always, sometimes, rarely, and never) (**Supplementary 1**). No personal information was requested, except information on the type of occupation, years of professional practice, and institutional practice.

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The results were reported as numbers and percentages (number for each response as the nominator and the total number of responses as the denominator). Patients with incomplete responses were excluded. The Chi-square test or Fisher's exact test was used to understand the differences between the groups, and Pearson's correlation test was performed to understand the correlation between two categorical variables. Statistical significance was set at $p<0.05$. Data were compiled and analyzed using IBM SPSS Statistics for Windows, Version 26.0 (IBM Co.) (Year 2019).

RESULTS

Geo-demographics characteristics

A total of 546 HCPs participated in the survey, but only 248 (45.4%) completed it, of which, 73.8% (183/248) respondents were pediatricians. The respondents came from 24 provinces in Indonesia, with the majority (65.2%, 161/248) from Java Island. Almost half of the respondents had less than 5 years of professional practice (49.2%, 122/248), and they practiced in both public and private healthcare institutions (44.4%). The geo-demographic and practical characteristics of the respondents are shown in **Fig. 1** and **Table 1**.

Estimated prevalence of functional constipation

Approximately 73.0% of the respondents (181/248) estimated that the prevalence of FC in children who visited them was <5% in infants (**Fig. 2A**); this prevalence peaked at 6–8.9 months (**Fig. 3A**). Approximately 60.1% of the respondents (149/248) estimated the same low prevalence of FC among toddlers (**Fig. 2B**), and this peaked at 2–3 years (**Fig. 3B**).

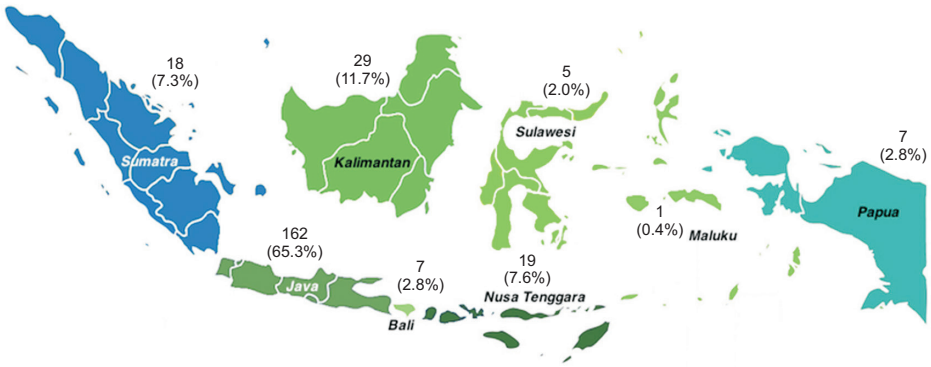

Fig. 1. Geographical distribution of the respondents.

Table 1. Demographic and practice characteristics of respondents

Characteristics	Total (n=248)	Pediatricians (n=183)	General practitioner (n=65)
Years of professional practice			
<5 yr	122 (49.2)	87 (47.5)	35 (53.8)
≥5 yr	126 (50.8)	96 (52.5)	30 (46.2)
Institutional type			
Government/public	54 (21.8)	26 (14.2)	28 (43.1)
Private	84 (33.9)	61 (33.3)	23 (35.4)
Both	110 (44.3)	110 (52.5)	14 (21.5)

Values are presented as number (%).

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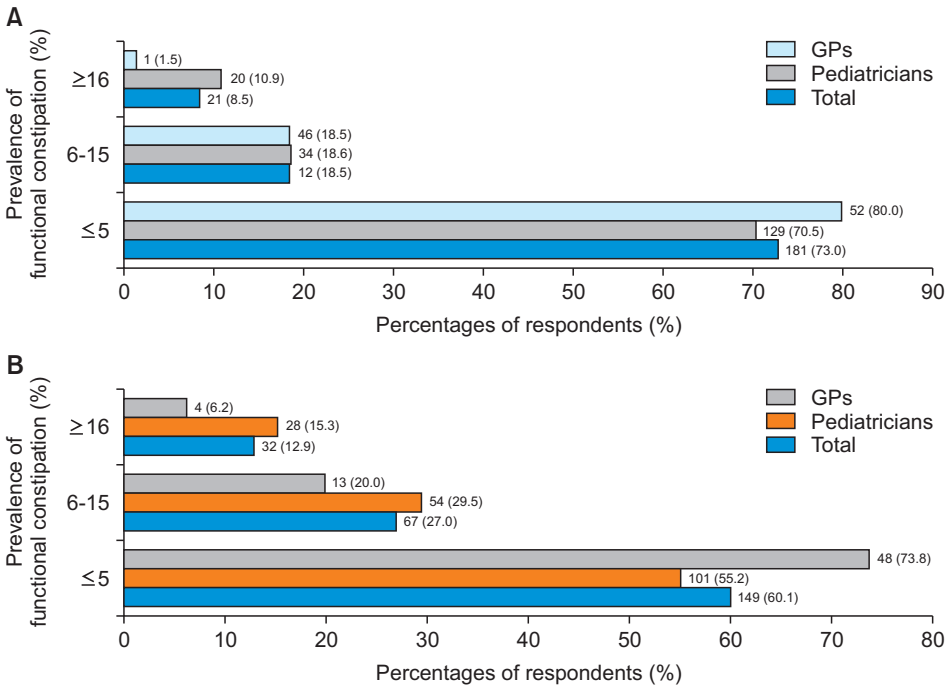

Fig. 2. (A) Estimated prevalence of functional constipation (number, %) in infants (aged 0–12 months). (B) Estimated prevalence of functional constipation (number, %) in toddlers (aged >1–3 years).
GPs: general practitioners.

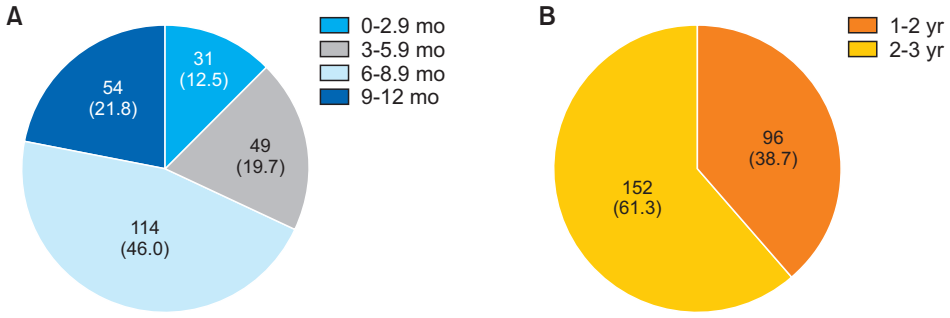

Fig. 3. (A) Age distribution with the highest estimated prevalence of functional constipation (number, %) in infants (aged 0–12 months). (B) Age distribution with the highest estimated prevalence of functional constipation (number, %) in toddlers (aged >1–3 years).

ROME IV clinical criteria and warning sign

On an average 64.5% of respondents (160/248) reported using the ROME IV criteria to diagnose FC in children 'almost always' and 'sometimes'. The percentage of pediatricians using these criteria was significantly higher than that of GPs (p<0.001; **Table 2**). However, 10.9% of the respondents (27/248) reported to have never used the ROME IV criteria. The most frequently used diagnostic criteria were history of painful or hard bowel movements (75.0%) and frequency of defecation ≤2 times/week (71.4%) (**Table 3**). The duration (years) of professional practice did not influence the use of the ROME IV clinical criteria in diagnosing FC in children 0–3 years.

Respondents were asked which of the following criteria were considered the most important warning signs of pathological constipation (abdominal distention, anal/sacral abnormalities, bloody stools, failure to thrive, neurodevelopmental delay, and vomiting). Abdominal

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Table 2. The use of ROME IV clinical criteria for diagnosing constipation among 0–3 years old children based on the healthcare participants profession and years of professional practice

Classification	Almost always (>70%)	Sometimes (30–70%)	Rarely (10–30%)	Never (<10%)	*p*-value
Professions					<0.001*
Pediatricians	69/183 (37.7)	64/183 (35.0)	41/183 (22.4)	9/183 (4.9)	
GPs	11/65 (16.9)	16/65 (20.0)	20/65 (30.8)	18/65 (27.7)	
Years of professional practice					0.238*
<5 yr	46/122 (37.7)	37/122 (30.3)	25/122 (20.5)	14/122 (11.5)	
≥5 yr	34/126 (27.0)	43/126 (34.1)	36/126 (28.6)	13/126 (10.3)	

Values are presented as number (%). GPs: general practitioners.
*Chi-squared test.

Table 3. Survey respondents' responses using the ROME IV clinical criteria to diagnose constipation and warning sign among 0–3 years old children

Clinical criteria	Total (n=248)	Pediatricians (n=183)	GPs (n=65)	*p*-value
ROME IV criteria				
History of painful or hard bowel movement	186 (75.0)	142 (77.6)	44 (67.7)	0.156*
Two or fewer frequency of defecation per week	177 (71.4)	145 (79.2)	32 (49.2)	<0.001*
History of excessive stool retention	101 (40.7)	85 (46.4)	16 (24.6)	0.003*
History of large diameter stool	78 (31.5)	64 (35.0)	14 (21.5)	0.065*
Presence of large fecal mass in the rectum	75 (30.2)	63 (34.4)	12 (18.5)	0.024*
Warning sign				
Abdominal distention	142 (57.3)	94 (51.4)	48 (73.8)	0.003*
Failure to thrive	119 (48.0)	94 (51.4)	25 (38.5)	0.100*
Bloody stool	114 (46.0)	77 (42.1)	37 (56.9)	0.055*
Vomiting	101 (40.7)	70 (38.3)	31 (47.7)	0.236*
Neurodevelopmental delay	78 (31.5)	61 (33.3)	17 (26.2)	0.360*
Anal/sacral abnormality	63 (25.4)	44 (24.0)	19 (29.2)	0.510*

Values are presented as number (%).
GPs: general practitioners.
*Chi-squared test.

distention (57.3%, 142/248) was considered as the most important warning sign reported by the HCPs, with a significantly higher percentage among GPs than pediatricians (73.8% vs. 51.4%, p=0.003). Failure to thrive (48.0%) was considered as the second most important warning sign (**Table 3**).

Management of FC

Lactulose as a laxative (15.7% in infants, 19% in toddlers), followed by changing the standard formula (SF) into a specific nutritional formula (SNF) (12.1% in infants, 8.1% in toddlers), was the first treatment for FC chosen by respondents. In this study, most of the HCPs reassured and educated the parents on managing FC (66.5% of infants and 66.9% of toddlers). The other treatment used to treat FC was enema, as shown in **Table 4**. A significantly higher number of pediatricians compared to GPs reported using enemas as the

Table 4. The first-line of treatment choice to manage constipation in infants (aged 0–12 months) and toddlers (aged >1–3 years)

Methods of management	Infants (0–12 mo)				Toddlers (>1–3 yr)			
	Total (n=248)	Pediatricians (n=183)	GPs (n=65)	*p*-value	Total (n=248)	Pediatricians (n=183)	GPs (n=65)	*p*-value
Parental reassurance and education	165 (66.5)	124 (75.2)	41 (66.5)	0.593*	166 (66.9)	123 (67.2)	43 (66.2)	0.998*
Lactulose as laxative	39 (15.7)	26 (14.2)	13 (20.0)	0.366*	47 (19.0)	32 (17.5)	15 (23.1)	0.422*
Changing the standard formula to specific nutritional formula	31 (12.4)	20 (10.9)	11 (16.9)	0.300*	20 (8.1)	13 (7.1)	7 (19.8)	0.505*
Using enema	13 (5.2)	13 (7.1)	0 (0.0)	0.023†	15 (6.0)	15 (8.2)	0 (0.0)	0.014†

Values are presented as number (%).
*Chi-squared test
†Fisher exact test.

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Table 5. Nutritional solution options for the management of constipation in infants aged 0–6 months (non-exclusive breastfed), infant aged >6–12 months and toddlers aged >1–3 years by professions

Nutritional solution	0–6 mo, non exclusive breastfed infant			>6–12 mo			>1–3 yr		
	Pediatricians (n=183)	GPs (n=65)	*p*-value	Pediatricians (n=183)	GPs (n=65)	*p*-value	Pediatricians (n=183)	GPs (n=65)	*p*-value
Extensive hydrolyzed protein formula	68 (37.2)	13 (20.0)	0.017*	42 (23.0)	8 (12.3)	0.097*	15 (8.2)	7 (10.8)	0.709*
Partial hydrolyzed protein formula	24 (13.1)	3 (4.6)	0.097*	27 (14.8)	3 (4.6)	0.053*	16 (8.7)	3 (4.6)	0.417†
Standard formula supplemented with fiber (inulin or carob bean gum)	23 (12.6)	12 (18.5)	0.335*	35 (19.1)	13 (20.0)	1.000*	54 (29.5)	14 (21.5)	0.282*
Standard formula supplemented with prebiotics	11 (6.0)	2 (3.1)	0.557*	13 (7.1)	6 (9.2)	0.778*	11 (6.0)	3 (4.6)	1.000†
Standard formula supplemented with probiotics	13 (7.1)	5 (7.7)	1.000*	15 (8.2)	10 (15.4)	0.157*	15 (7.7)	10 (15.4)	0.117*
Standard formula supplemented with synbiotics	25 (13.7)	7 (10.8)	0.702*	25 (13.7)	5 (7.7)	0.295*	23 (12.6)	4 (6.2)	0.232*
Standard soy-based formula	3 (1.6)	3 (4.6)	0.383*	3 (1.6)	2 (3.1)	0.846*	5 (2.7)	1 (1.5)	1.000†
Standard cow milk-based formula	3 (1.6)	0 (0.0)	0.705*	1 (0.5)	0 (0.0)	1.000*	2 (1.1)	1 (1.5)	1.000†
No specific nutritional formula	8 (4.4)	7 (10.8)	0.120*	14 (7.7)	7 (10.8)	0.605*	25 (13.7)	8 (12.3)	0.949*

Values are presented as number (%).
GPs: general practitioners.
*Chi-squared test.
†Fisher exact test.

first treatment in infants (7.1% vs. 0%, *p*=0.023) and toddlers (8.2% vs. 0%, *p*=0.014). This practice appeared to be the least preferred approach for managing FC.

A wide variety of SNF was reported for nutritional management of functional FC in children aged 0–3 years. The extensively hydrolyzed protein (EHP) formula is the preferred SNF in non-exclusively breastfed infants of 0–6 months. More pediatricians compared to GPs reported having used EHP (37.2% vs. 20%; *p*=0.017) in non-exclusively breastfed infants of 0–6 months. However, among toddlers, SF with fiber (inulin or carob bean gum) was preferred over other nutritional solutions (**Table 5**). There were non-significant correlations between the frequency of use of the ROME IV criteria and choice of treatment among pediatricians (r=0.13, *p*=0.366 for infants; r=0.095, *p*=0.644 for children >1–3 years) and among GPs (r=0.060. *p*=0.889 for infants; r=0.097, *p*=0.732 for children >1–3 years).

Gut health indicator

The most preferred indicator that was reported by the HCPs as a measure of gut health was normal growth, which was considered as a marker for good digestion and absorption (35.9% for infants, 48.8% for toddlers), followed by normal consistency and frequency of defecation (26.6% for infants, 21.4% for toddlers) (**Fig. 4**).

DISCUSSION

More than 70% of the pediatricians in this survey reported 'sometimes' or 'almost always' in using the ROME IV criteria for diagnosing FC in children. This percentage was much higher than that reported in South Korea (16.6%) [12]. Another study which evaluated pediatrician knowledge and practice regarding diagnosis of FC in Brazil [13], the Mediterranean region [14], Argentina [15], and Saudi Arabia [3] reported that the usage of the Rome III criteria ranged 23.3–61.2%. By contrast, only 37% of GPs in this study reported a similar frequency of the use of these criteria. A cross-cultural and multinational study of the ROME Foundation Working Team conducted in 2014 reported a limited implementation of the knowledge and use of the ROME III criteria for FC diagnosis, especially among GPs [16]. Implementation of

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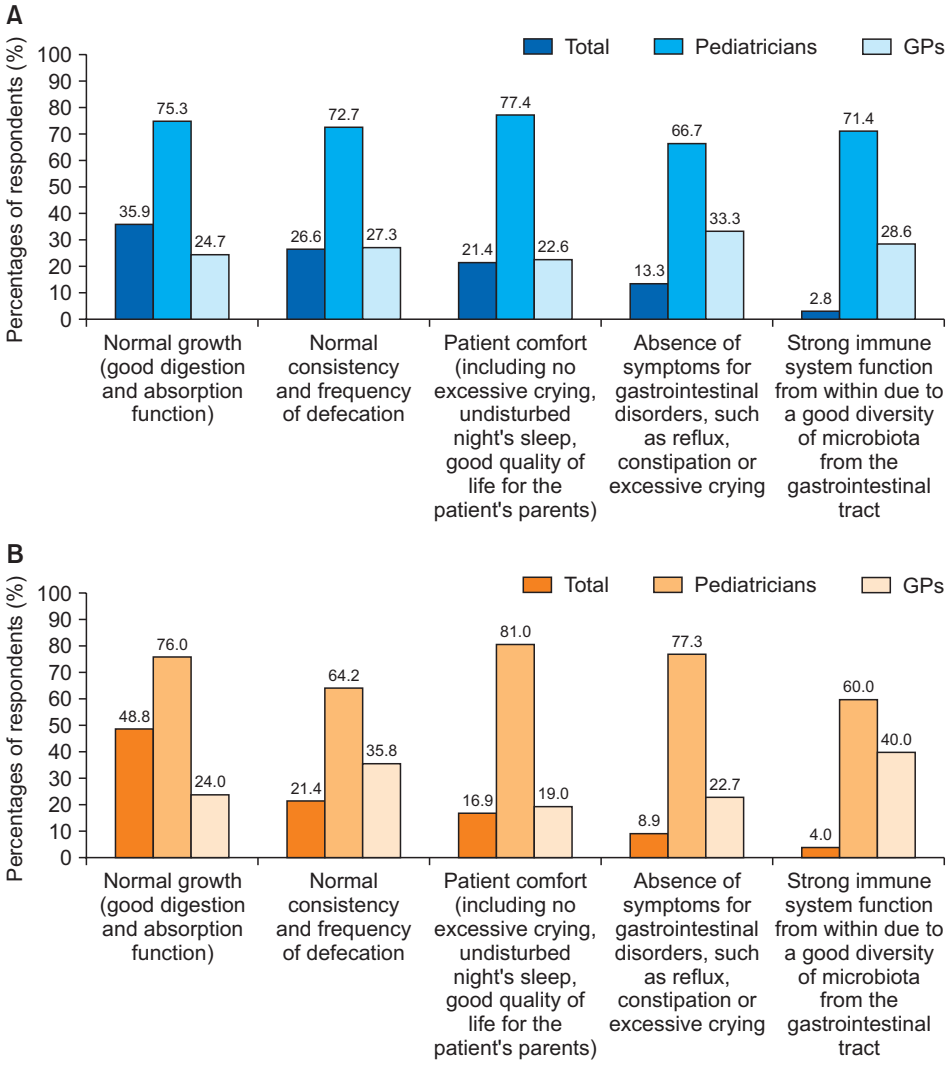

Fig. 4. (A) Preference for gut health indicators among infants (aged 0–12 months). (B) Preference for gut health indicators among toddlers (aged >1–3 years).
GPs: general practitioners.

the latest guidelines for FC using the ROME IV criteria needs to be evaluated, and continuing medical education needs to be updated among HCPs, especially for GPs.

The estimated prevalence of FC in infants was reported to peak at 6–8.9 months and in toddlers at 2–3 years. A retrospective study in children reported that the median age at onset was 2.3 years [17]. In infants, a birth cohort study from Italy showed that the highest prevalence/onset of FC occurred at 6 months (13.7%) [18]. This could be due to the transition from exclusive breastfeeding to solid food. This could also occur because infants were weaned from breastfeeding to a cow milk-based infant formula, which has different fat digestion and absorption [19]. In the toddler phase, poor toilet training, painful defecation, and stool-withholding behavior can lead to a vicious cycle of FC [20].

The ROME IV criteria used most frequently in this survey for diagnosing FC in children (0–3 years) were a history of painful or hard bowel movement and ≤2 times/week frequency of

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defecation. This is in line with a recent report that suggested these two criteria were most commonly used (51.2%) among pediatricians and GPs in Saudi Arabia to diagnose FC [3]. A previous study in Indonesia by Widodo et al. [21] reported a similar result in that most Indonesian pediatricians suspected FC when infants >6 months presented with decreased bowel movements and hard stools.

In accordance with National Institute of Health and Care Excellence [22], European Society for Pediatric Gastroenterology, Hepatology and Nutrition [23] guidelines, and peer-reviewed expert recommendations in 2016 [24], >65% HCPs in this survey were given parental reassurance and education, and approximately 15–20% provided laxatives using lactulose as the first line of treatment method for managing FC. Reassuring and educating parents about the pathophysiology and precipitating factors of FC will help minimize accusations and anxiety and increase parental involvement in management [25]. Pharmacological treatment using laxatives (i.e., lactulose or polyethylene glycol) is required to produce soft stools and achieve painless defecation as an important part of FC treatment. However, this approach may require several months for a resolution [22-24]. The use of enema was reported as the lowest rank for FC management in this study and it was more preferred by pediatricians. No GP reported using enema as the first treatment choice. These results are consistent with a previous study from Indonesia that reported that 85% of the pediatricians prescribed the rectal pharmacological treatment using a microenema with a combination of sodium citrate, sodium lauryl sulfoacetate, and sorbitol [21].

Specific nutritional formulations are available for nutritional management of infants and toddlers. These formulations include different degrees of protein hydrolysate (from partially to extensively hydrolyzed) supplemented with fiber, prebiotics, probiotics, or probiotics [26]. In non-exclusively breastfed infants (aged 0–6 months), the EHP formula was the preferred SNF for FC management. The percentage of preference for this formula was higher among pediatricians than among GPs for infants aged 0–12 months. This is an interesting phenomenon as the cost of the EHP is usually higher than that of the standard formula. The high usage of the EHP formula could be due to the suspicion that FC could be one of the signs related to cow milk protein allergy in early life, in which the EHP formula is the first nutritional management of choice [27,28]. The use of a soy-based formula could be part of nutritional management due to its accessibility, palatability, financial, and cultural considerations [26,29]. Unlike infants, HCPs in this survey preferred to use fiber-enriched formulas as SNF for toddlers with FC. Low consumption of dietary fiber is considered a risk factor for the development of FC [25]. However, there is a scarcity of qualified evidence to corroborate fiber supplementation as a part of childhood FC management [23,30].

Approximately 30% of HCPs in this study considered normal growth as a marker for good digestive and absorptive function in infants and toddlers. Digestion and absorption are the most important functions of the gastrointestinal tract. These two functions are necessary for survival and for meeting the nutritional needs for physical growth and development [31]. Impaired nutrient digestion (maldigestion) and absorption (malabsorption) can lead to malnutrition, weight loss, and poor weight gain [32].

This is the first study to evaluate the use of the ROME IV criteria by Indonesian HCPs to diagnose FC in infants and toddlers. It provides insights into the practices of HCPs in 70% of the provinces in Indonesia. This study provides comprehensive information on the estimated reported prevalence of FC, use of the ROME IV diagnostic criteria, and FC management

among infants and toddlers in Indonesia. However, there were some limitations to the survey, such as the lack of information on the response rate, as the survey was sent randomly via email and Whatsapp applications, a high exclusion rate due to incomplete responses to the survey, no information on the hypothetical association between timing and type of complementary feeding in toddlers, and no information on fiber and water intake in toddlers. Pediatrician participation in the survey could also be taken as a proxy of a higher socioeconomic group, which is usually managed by these HCPs.

In conclusion, the ROME IV diagnostic criteria were reported to be used regularly by only 60% of the respondents, with a significantly higher percentage of pediatricians using the criteria than GPs. Most of the respondents estimated FC prevalence to be <5% in infants and toddlers. Most Indonesian HCPs consistently reassured and educated the parents about managing FC. Lactulose as a laxative and changing the SF into an SNF in infants or growing up milk in toddlers were the most reported FC management approaches. The use of EHP formula was the preferred nutritional solution compared to other nutrition solutions among infants aged 0-6 months. Normal growth as a marker for good digestion and absorption, followed by normal stool consistency/frequency, were the two most preferred gut health indicators for infants and toddlers.

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SUPPLEMENTARY MATERIAL

Supplementary 1
Questionnaire in Indonesia

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