Using the Bristol Stool Scale and Parental Report of Stool Consistency as Part of the Rome III Criteria for Functional Constipation in Infants and Toddlers

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Objectives To evaluate among parents of infants and toddlers the agreement between parental report and the Bristol Stool Scale (BSS) in assessing stool consistency and the effect of both methods on determining the prevalence of functional constipation (FC) according to the Rome III criteria.

Study design Parents of children ≤48 months of age who were seen for a well-child visit completed a questionnaire about their child's bowel habits during the previous month. Cohen kappa coefficient (κ) was used to measure intrarater agreement between parental report of stool consistency ("hard," "normal," "soft/mucous/liquid") and the BSS (types 1-2, hard; types 3-5, normal; types 6-7, loose/liquid). The prevalence of FC was assessed based on the questionnaire according to the Rome III criteria, comparing both methods of stool consistency assessment.

Results Parents of 1095 children (median age, 15 months; range, 1-48) were included. Only fair agreement existed between the 2 methods of stool consistency assessment ($\kappa = 0.335$; $P < .001$). According to the Rome III criteria, using parental report the prevalence of FC was 20.5% and using the BSS the prevalence was 20.9% ($P = .87$). The agreement between these 2 methods for assessing the prevalence of FC was excellent ($\kappa = 0.95$; $P < .001$).

Conclusions Only fair agreement exists between the BSS and parental report of stool consistency among parents of infants and toddlers. Different methods of stool consistency assessment did not result in a difference in the prevalence of FC. *(J Pediatr 2016;177:44-8).*

Functional constipation (FC) is a common defecation disorder in children that is characterized by difficult, painful, and infrequent evacuation of hard stools.[1] The prevalence of FC in the pediatric population ranges between 0.7%-29.6%.[2] Symptoms often occur early in life; a recent study from the US has shown that the median age of onset of FC is 2.3 years.[3] Constipation symptoms are known to have a significant impact on the quality of life of children and on health care costs.[1] Because FC is such a major pediatric health care problem occurring at a young age, it is of great importance that it be evaluated and diagnosed accurately. A correct diagnosis allows early therapeutic intervention, which is of key importance in the management of childhood FC; a delay in presentation is negatively related to recovery.[4] Currently, the diagnosis of FC is based on the Rome III criteria, which include measures of defecation frequency, stool consistency, and other symptoms of FC (**Table I**).[5] In clinical trials of pediatric FC, outcome measures to evaluate treatment efficacy are also often based on the Rome III criteria.[6] Although outcome measures significantly differ among clinical trials, improvement in defecation frequency (ie, more frequent stools) or stool consistency (ie, softer stools) are frequently used to assess treatment success.[6,7] There is currently no gold standard for assessing stool consistency in young children, and various methods are used throughout the literature and in clinical practice, such as the Bristol Stool Scale (BSS), the modified BSS, the Amsterdam Infant Stool Scale, and parental or patient report of stool consistency.[8-10] The BSS is the most commonly used standardized instrument to rate stool consistency in children, both in clinical care and in research. According to the BSS, which classifies stools into 7 types, types 1 and 2 are hard and suggestive of constipation, types 3-5 are considered to be within normal range (type 4 being the most normal), and loose and liquid stools (types 6 and 7) are associated with diarrhea (**Figure 1**; available at www.jpeds.com). In infants and toddlers, assessment of stool consistency is usually based on parental recall of their child's stools, but when children get older, assessment of stool consistency is usually based on self-report. For infants and toddlers, the agreement between the BSS and report of stool consistency as communicated by the parents is unknown. The primary aim of this study was to assess the agreement between parental report of stool consistency and the BSS in children ≤48 months of age. A secondary aim was to assess the prevalence of FC in children ≤48 months of age using both methods

BSS	Bristol Stool Scale
FC	Functional constipation

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Table I. Rome III criteria for FC in children <4 years of age

1. <3 defecations per week
2. ≥1 episode of fecal incontinence per week after the acquisition of toileting skills
3. History of excessive stool retention
4. History of painful or hard bowel movements
5. Presence of a large fecal mass in the rectum
6. History of large diameter stools which may obstruct the toilet

- Must fulfil ≥2 criteria for ≥1 month before diagnosis

of stool consistency assessment as part of the Rome III criteria and to evaluate the agreement between the 2 methods for diagnosing FC.

Methods

Between April and December 2015, we asked parents of children ≤48 months of age who were seen for a well-child visit in pediatric health care clinics in 4 different cities and/or municipalities across Colombia (Cali, Florencia, San Andrés de Sotavento, and Bogotá) to complete a survey. The survey was completed after the well-child visit and was not part of the clinical visit. By using a questionnaire in Spanish, parents were asked to answer questions about their child's bowel habits. This survey included questions on defecation frequency, withholding behavior, painful defecation, stool consistency, and the presence of large diameter stools. Parents were asked to describe the consistency of their child's stools during the previous month, choosing between the terms "hard or very hard," "not too hard, not too soft (normal)," "soft or very soft," "mucous, with undigested food," and "liquid," they also had the opportunity to answer that the stools were "variable" in consistency. In addition, parents were asked to choose the BSS stool type that best represented their children's stools during the previous month on a picture chart. The BSS picture chart was accompanied by descriptors, which had been translated into Spanish. The translation of the descriptors was performed by members of the research team who represented all Colombian regions involved in this study, because dialects and minor language nuances may differ between regions. Eventually, the final translation was considered to be adequate for all regions. The questionnaire also included general questions on the medical history of the children. All children with organic conditions known to cause defecation disorders or other gastrointestinal disorders were excluded from the study. This study was approved by the Ethics Committee of Clinical Investigation at the University del Valle (Cali, Colombia).

A diagnosis of FC was based on the questionnaires according to the Rome III criteria, using either 1 of the 2 methods of stool consistency assessment (**Table I**). In young infants, FC can easily be confused with infant dyschezia, a benign condition in children <6 months of age, who are otherwise healthy and do not suffer from FC, but who strain or cry ≥10 minutes before successful passage of soft stools.[11] Therefore, we also performed a sub-analysis for children <6 months of age to assess the prevalence of infant dyschezia and the association between hard stool consistency and painful defecation in this group. Information obtained during the well-child visit, including the results from physical examinations, was not collected as part of our study, and was not used for assessing the Rome III criteria.

Statistical Analyses

Data were analyzed using IBM SPSS Statistics for Windows v 22.0 (IBM Corporation, Armonk, New York). Results are shown as total numbers and proportions. Comparisons of proportions were performed using Fisher exact test or the χ^2 test. $P < .05$ was considered statistically significant. Cohen kappa coefficient (κ) was used to measure intrarater agreement between parental report of stool consistency (3 categories: "hard," "normal," "soft/mucous/liquid") and the BSS (3 categories: type 1-2: hard; type 3-5: normal; type 6-7: loose/liquid). Parents who had answered that their child's stools were "variable" were excluded from all analyses comparing the BSS with parental report (including the FC prevalence assessments), because they could not be assigned to any of the predefined consistency groups. Subanalyses were performed to investigate if agreement was different for different age categories. The level of agreement was determined based on the κ coefficient: 0.00 = no agreement; 0.01-0.20 = slight agreement; 0.21-0.40 = fair agreement; 0.41-0.60 = moderate agreement; 0.61-0.80 = good agreement; 0.81-0.99 = excellent agreement; and 1.00 = perfect agreement.

Results

Of the 1530 invited parents, 1207 (78.9%) agreed to participate in this study. Eighty-eight parents were excluded because they did not complete the BSS question and another 24 children were excluded because they suffered from organic diseases known to cause defecation disorders or other gastrointestinal disorders. In total, the questionnaires from 1095 parents (71.6%) were included. The median age of the children was 15 months (range, 1-48) and they were balanced in terms of sex (50.8% boys). Families lived in or around Cali (50.6%), Florencia (27.8%), San Andrés de Sotavento (10.9%), and Bogotá (10.8%). The results of the questionnaire on bowel habits are displayed in **Table II**.

Bowel Habits

Eighty-eight parents reported that their child had hard stools; these same parents reported that the BSS that best represented their child's stools over the past month was BSS type 1-2 (hard stools, n = 36, 40.9%), BSS type 3-5 (normal stools, n = 45, 51.1%), and BSS type 6-7 (loose/liquid stools, n = 7, 8.0%; **Figure 2**, A; available at www.jpeds.com). Pain during defecation was reported by 41 of 88 parents (46.6%) and 24 of 88 (27.3%) reported a defecation frequency of <3 times/week.

Among the 114 parents who chose BSS type 1-2 (hard stools) as the most appropriate representation of their child's stools

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