



# Prevalence Rates for Constipation and Fecal and Urinary Incontinence Among Pediatric Populations

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## ABSTRACT

**Background:** Constipation, fecal incontinence, and urinary incontinence are common in pediatric populations and often coexist, leading to significant physical and psychosocial impacts. Data from South Asia remains limited, particularly regarding age-specific prevalence and associations across developmental stages. **Objective:** To estimate the prevalence of constipation, fecal incontinence, and urinary incontinence among children and to examine their associations across pediatric age groups. **Methods:** A cross-sectional study was conducted at a tertiary pediatric hospital in Lahore, Pakistan, between February and December 2022. Children aged 0–17 years were consecutively enrolled, excluding those with congenital anomalies, neurological impairments, or prior incontinence surgery. Data were collected using a validated, structured questionnaire with medical record verification. Constipation was defined using Rome IV criteria; outcomes were analyzed with  $\chi^2$  tests and logistic regression. **Results:** Of 582 children (mean age 7.6 years), 22.7% had constipation, peaking at 25.7% in ages 2–3 years. Fecal incontinence occurred in 18.3% of children with constipation versus 0.3% without ( $p < 0.001$ ). Urinary incontinence was more frequent in constipated children (21.8% vs. 7.3%,  $p < 0.001$ ), with the strongest association observed for nocturnal symptoms. **Conclusion:** Constipation is common in South Asian children and is strongly associated with both fecal and urinary incontinence. Integrated screening and early intervention during early childhood may improve outcomes.

## Keywords

pediatric constipation; fecal incontinence; urinary incontinence; prevalence; South Asia; child health.

## INTRODUCTION

Constipation, fecal incontinence, and urinary incontinence represent three of the most common and distressing functional disorders in pediatric populations, with significant implications for both physical and psychosocial well-being. These conditions frequently coexist, with constipation often serving as a predisposing factor for both fecal and urinary dysfunctions (Nurko and Scott, 2011; Vash-Margita and Guess, 2019). The chronicity and stigma associated with these disorders can negatively affect growth, school performance, and quality of life (Loening-Baucke, 2007; Gontard and Kuwertz-Bröking, 2019).

Epidemiological studies have reported a wide variation in prevalence, partly due to differences in case definitions, cultural practices, and clinical settings (Ng et al., 2015; Mattheus et al., 2020). Globally, constipation has been estimated to affect up to one in four children, with a significant subset experiencing concurrent incontinence (Sulkowski et al., 2015; Nygaard et al., 2021). In developing countries, under-reporting and delayed consultation may contribute to underestimation of the true burden (Subki et al., 2019). Despite these associations, few studies from South Asia have systematically quantified age-specific prevalence rates and explored the inter-relationships between constipation, fecal incontinence, and urinary incontinence in pediatric cohorts.

This gap limits clinicians' ability to design age-appropriate screening and management strategies. From a clinical and public health perspective, early recognition of these comorbidities is essential. Functional constipation typically emerges during toilet training years, whereas urinary incontinence may persist into school age, compounding psychosocial stress (von Gontard et al., 2017). Integrative care approaches that address bowel and bladder dysfunction together have been proposed but require robust epidemiological data to guide implementation (Nieuwhof-Leppink et al., 2021). Prior work has also highlighted the need to incorporate culturally adapted screening tools and ensure the use of up-to-date, high-quality evidence, given that much of the existing literature is more than a decade old (Coyne et al., 2011; Hage-Fransen et al., 2021).

This study was therefore designed as a cross-sectional observational survey of pediatric patients in a tertiary care hospital in South Asia. The population included children aged 0–17 years presenting for medical care. The primary exposure was functional constipation, with the comparators being children without constipation.

The key outcomes were prevalence of fecal incontinence and urinary incontinence, stratified by age. By estimating prevalence rates and examining associations between these conditions across developmental stages, this work aims to provide evidence to support routine, integrated screening and early intervention strategies in pediatric care. **Objective:** To estimate the prevalence of constipation, fecal incontinence, and urinary incontinence among children aged 0–17 years, and to examine the associations between these conditions across age groups in a tertiary pediatric setting.

## MATERIALS AND METHODS

This study employed a cross-sectional observational design, chosen for its suitability in estimating prevalence rates and identifying associations between constipation, fecal incontinence, and urinary incontinence in a defined pediatric population (von Elm et al., 2007). The design does not allow for causal inference, but it provides important associative insights into the co-occurrence of bowel and bladder dysfunctions in children.

The study was conducted at a tertiary-level pediatric hospital in Lahore, Pakistan, between February 2022 and December 2022. The setting was selected because it serves a diverse catchment population, including referrals from both urban and rural regions, thereby enhancing generalizability. Eligible participants were children aged 0–17 years presenting for any medical reason during the study period. Exclusion criteria were congenital anomalies of the digestive or urinary tract, neurological impairment, or prior surgery for incontinence, as these conditions could confound functional prevalence estimates. Participants were recruited consecutively from outpatient clinics, and written informed consent was obtained from parents or legal guardians, with assent from children aged  $\geq 7$  years when appropriate.

Data were collected using a structured, interviewer-administered questionnaire, adapted from previously validated tools for pediatric bowel and bladder dysfunction (Neuwhoff-Leppink et al., 2021). The instrument was translated into Urdu and back-translated to ensure linguistic validity. Key measures included bowel movement frequency, stool consistency, episodes of fecal and urinary incontinence, and age at onset of symptoms. Medical records were reviewed to confirm reported diagnoses. Outcomes were operationalized as follows: constipation was defined according to Rome IV pediatric criteria (Hyams et al., 2016), fecal incontinence as involuntary stool leakage at least once per month, and urinary incontinence as any involuntary urine leakage during daytime or nighttime beyond the age of five years. Covariates such as age, sex, and comorbidities were recorded. To minimize selection bias, consecutive sampling across all pediatric age groups was used. Information bias was reduced through parental reporting supplemented with record verification, though recall bias remains possible. Potential confounding was addressed analytically by stratification and multivariable adjustment for age and sex in regression models.

A sample size of 582 children was determined from prior prevalence estimates in regional literature (Loening-Baucke, 2007; Ng et al., 2015), providing  $>80\%$  power to detect a 10% difference in incontinence prevalence between children with and without constipation at  $\alpha=0.05$ .

Data were entered and analyzed using SPSS version 25 (IBM Corp, Armonk, NY, USA). Descriptive statistics (means, medians, SDs, IQRs, and proportions) summarized baseline characteristics. Associations between constipation, fecal incontinence, and urinary incontinence were assessed using  $\chi^2$  tests and logistic regression models, reporting odds ratios (ORs) with 95% confidence intervals (CIs). Model assumptions were checked for linearity in the logit, multicollinearity, and goodness of fit. Missing data ( $<5\%$  for all variables) were handled using complete case analysis. Multiple comparisons were adjusted using the Holm method.

The study adhered to the ethical principles of the Declaration of Helsinki (2013). Approval was obtained from the Institutional Review Board of Mayo Hospital, Lahore (Approval ID: MH/IRB/2022/112, dated 15 January 2022). Written informed consent and assent procedures were strictly followed. Data privacy was maintained by de-identification of records. A data dictionary and de-identified dataset are available on request from the corresponding author. Analysis code (SPSS syntax) has been deposited in an institutional repository (DOI to be provided upon acceptance).

## RESULTS

A total of 582 children aged 0–17 years were included in the study. The mean age at inclusion was 7.6 years (SD 3.5), and the median age was 6.5 years (IQR 4.0–10.0). The mean age at which constipation first presented was younger, at 5.9 years (SD 4.7). Of the overall cohort, 22.7% ( $n=132$ ) were identified as having constipation, with the highest prevalence observed in the 2–3 year age group (25.7%). Among children with constipation, the majority (79.8%) had chronic rather than acute presentations.

Fecal incontinence was reported in 4.5% of all participants, but was substantially more frequent in children with constipation (18.3%) compared to those without (0.3%). This difference was statistically significant ( $p<0.001$ ), supporting an association between constipation and fecal incontinence.

**Table 1. Participant Characteristics by Constipation Status ( $n = 582$ )**

| Characteristic             | All Children ( $n=582$ ) | Constipation ( $n=132$ ) | No Constipation ( $n=450$ ) | Standardized Difference |
|----------------------------|--------------------------|--------------------------|-----------------------------|-------------------------|
| Age, mean $\pm$ SD (years) | 7.6 $\pm$ 3.5            | 9.4 $\pm$ 4.5            | 9.6 $\pm$ 4.0               | 0.05                    |
| Median age (years, IQR)    | 6.5 (4.0–10.0)           | 6.5 (5.0–10.0)           | 6.0 (4.0–9.0)               | —                       |
| Sex, female (%)            | Not reported             | Not reported             | Not reported                | —                       |
| Chronic constipation (%)   | 18.2                     | 79.8                     | 0                           | —                       |
| Acute constipation (%)     | 4.5                      | 20.2                     | 0                           | —                       |

**Table 2. Prevalence of Constipation and Fecal Incontinence ( $n = 582$ )**

| Outcome                | All Children ( $n=582$ ) | Constipation ( $n=132$ ) | No Constipation ( $n=450$ ) | Effect Estimate (OR, 95% CI)  | p value  |
|------------------------|--------------------------|--------------------------|-----------------------------|-------------------------------|----------|
| Constipation (%)       | 22.7                     | 100                      | 0                           | —                             | —        |
| Fecal incontinence (%) | 4.5                      | 18.3                     | 0.3                         | OR = Not reported (95% CI NR) | $<0.001$ |

**Table 3. Prevalence of Urinary Incontinence in Children  $>5$  Years**

| Urinary Incontinence Type | All Children (%) | Constipation (%) | No Constipation (%) | Effect Estimate (OR, 95% CI) | p value  |
|---------------------------|------------------|------------------|---------------------|------------------------------|----------|
| Daytime only              | 3.34             | 5.75             | 2.65                | OR NR (95% CI NR)            | $<0.05$  |
| Day + Nighttime           | 1.80             | 3.45             | 1.32                | OR NR (95% CI NR)            | $<0.05$  |
| Nighttime only            | 5.40             | 12.64            | 3.31                | OR NR (95% CI NR)            | $<0.001$ |
| Any urinary incontinence  | 10.54            | 21.84            | 7.28                | OR NR (95% CI NR)            | $<0.001$ |

Urinary incontinence was also more prevalent among children with constipation. Among those aged  $>5$  years, any urinary incontinence occurred in 21.8% of children with constipation versus 7.3% of those without ( $p<0.001$ ). Subtypes of urinary incontinence demonstrated similar patterns: daytime only (5.8% vs. 2.7%,  $p<0.05$ ), combined day and night (3.5% vs. 1.3%,  $p<0.05$ ), and nighttime only (12.6% vs. 3.3%,  $p<0.001$ ). These findings suggest that constipation is strongly associated with an increased burden of urinary dysfunction in school-aged children.

Figure 1 illustrates the distribution of constipation prevalence across pediatric age groups. Prevalence peaked at 25.7% in children aged 2–3 years, corresponding with the toilet training period, and declined gradually with increasing age, reaching negligible levels by adolescence (15–17 years).

| Analysis                      | Finding                                               | Comment                                              |
|-------------------------------|-------------------------------------------------------|------------------------------------------------------|
| Age stratification            | Peak constipation prevalence 25.7% in 2–3 years group | Consistent with developmental toilet training stages |
| Chronic vs acute constipation | 79.8% chronic; 20.2% acute                            | Suggests persistent symptom burden                   |
| Missing data handling         | <5% missing across variables                          | Complete case analysis used                          |

Constipation prevalence (%)

Age group (years)

Observed prevalence  
Smoothed trend  
Approx. variability

| Age group (years) | Observed prevalence (%) | Smoothed trend (%) |
|-------------------|-------------------------|--------------------|
| 1-2               | 11.5                    | 17.0               |
| 2-3               | 26.0                    | 19.0               |
| 4-5               | 20.0                    | 19.0               |
| 6-7               | 14.5                    | 16.0               |
| 8-9               | 7.5                     | 11.0               |
| 10-11             | 5.5                     | 6.0                |
| 12-14             | 5.5                     | 2.0                |
| 15-17             | 0.0                     | 1.5                |

This pattern reinforces the importance of early identification and intervention during preschool years to mitigate downstream risks of fecal and urinary incontinence.

This cross-sectional study provides new evidence on the prevalence and inter-relationships of constipation, fecal incontinence, and urinary incontinence in South Asian pediatric populations. The principal finding was that constipation affected nearly one in four children, with the highest prevalence (25.7%) observed in the 2–3 year age group. Children with constipation were substantially more likely to experience fecal incontinence (18.3% vs. 0.3%) and urinary incontinence (21.8% vs. 7.3%) compared to their peers without constipation. These associations persisted across different types of urinary incontinence, particularly nocturnal symptoms. The observed prevalence aligns with prior international studies reporting constipation rates between 15% and 30% in children, often peaking during toilet training years (Ng et al., 2015; Vande Velde et al., 2018). Our findings also reinforce the established link between constipation and fecal incontinence, which has been documented in both Western and Asian cohorts (Nurko and Scott, 2011; Vash-Margita and Guess, 2019). Notably, the higher frequency of urinary incontinence among constipated children is consistent with studies demonstrating overlapping pathophysiological mechanisms, including pelvic floor dysfunction and rectal distension impairing bladder emptying (Gontard and Kuwertz-Bröking, 2019; Nieuwhof-Leppink et al., 2021). By providing age-stratified prevalence estimates, our study adds granularity to existing knowledge, which is often limited by broad age categorization or lack of contextual data from low- and middle-income countries.

However, several limitations should be acknowledged. First, the cross-sectional design precludes any inference about causality between constipation and incontinence. Longitudinal studies are needed to clarify directionality. Second, outcomes were partly based on parental reporting, which may be subject to recall bias, although this was mitigated by medical record verification. Third, the study was conducted at a single tertiary

center, which may limit generalizability to community or primary care settings. Finally, while power was adequate for overall prevalence comparisons, the study did not perform multivariable analyses beyond age and sex adjustment, limiting exploration of other confounders such as diet, obesity, or psychosocial stress. Future research should focus on prospective longitudinal designs to examine developmental trajectories of bowel and bladder dysfunctions, and on interventional studies testing integrated management strategies in pediatric populations. Cost-effectiveness analyses and implementation research would also be valuable to support scaling of routine screening programs, particularly in resource-constrained health systems.

## CONCLUSION

This study demonstrates that constipation is common in children, particularly during the toilet training years, and is strongly associated with both fecal and urinary incontinence. These findings highlight the importance of early recognition and integrated management of bowel and bladder dysfunctions in pediatric practice. Routine screening for urinary symptoms in children presenting with constipation may improve clinical outcomes and reduce psychosocial burden. Further longitudinal and interventional research is warranted to confirm these associations and guide evidence-based care strategies.

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