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Bladder and Bowel Dysfunction in Children Under 14 Years Old with Urinary Tract Infection

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ABSTRACT

Aims Urinary Tract Infection is common in Children. It has reported that Bladder and Bowel Dysfunction lead to progression of urinary tract infection in patients. Thus, early diagnosis and treatment of Bladder and Bowel Dysfunction are essential. Therefore, the present study aimed to investigate the bladder and bowel dysfunction in children less than age 14 with a urinary tract infection admitted to Yasuj hospitals in 2019-2020.

Instruments & Methods The present study employed a cross-sectional, descriptive-analytical research method. The research population consisted of children under age 14 with a urinary tract infection (UTI) hospitalized in Yasuj hospitals in 2019-2020. Data were extracted from the files of hospitalized patients, and collected using a checklist. The data was analyzed using SPSS 21 software at two descriptive (mean, frequency, and percentage) and inferential (chi-squared test) levels.

Findings There was significant difference between the girls and boys in, urinary tract infection (53.4% girls VS 46.4% boys; p=0.032). The mean age of participants was 6±2.3 years. The prevalence of Bladder and Bowel Dysfunction was 41%. The most common symptoms of BBD include Constipation & urinary retention 15 (14.6%), Constipation 13 (12.6%), and Constipation & urinary incontinence & fecal incontinence & urinary retention 13 (12.6%). Urinary incontinence was more common in girls comparison to boys (p<0.05).

Conclusion Bladder and Bowel Dysfunction is common in children with urinary tract infection. Due to the relatively high prevalence of asymptomatic UTIs in children, screening of children for Bladder and Bowel Dysfunction symptoms and treatment, and prevention of infection become more significant.

Keywords Prevalence; Bladder and Bowel Dysfunction Children; Urinary Tract Infection

CITATION LINKS

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Introduction

As the leading causes of medical visits, Urinary Tract Infection (UTI) are the most common infectious diseases. A UTI is one of the most acute problems that millions of people face every year. It occurs in both men and women throughout their lives. Between 8 and 10 million visits to specialists, each year are due to UTI [1]. The prevalence of lower urinary tract dysfunction (LUTD) in children is approximately 20% [2, 3]. Recent studies have shown that LUTD is associated with recurrent UTIs and has adverse effects on family and social relationships, school performance, and children's quality of life [4]. UTIs are both a bothersome disease and can sometimes cause other illnesses. For example, some UTIs can sometimes cause kidney failure. As a result, a kidney infection can spread through the bloodstream and then spread throughout the body. Some infections may lead to kidney stones in patients, all of which indicate the significance of identifying and assessing this disease's prevalence and treatment [5].

There are many causes for a UTI, such as Bladder and Bowel Dysfunction (BBD), which are less commonly diagnosed in children. BBD symptoms consist of several lower urinary tract symptoms, including urinary incontinence and daytime wetting, as well as intestinal complaints such as constipation and fecal incontinence. These symptoms cover 40% of urological consultations in children [6]. BBD is usually associated with vesico ureteral reflux (VUR) and a recurrent UTI, which can eventually lead to kidney scarring and failure. Common urinary symptoms in BBD include dysuria, urgency, frequent urination, urinary incontinence, urine dribbling, and urinary retention. Urologic conditions such as overactive/ underactive bladder and urinary retention are BBD symptoms. BBD has a significant psychological burden on children and their family [6-9]. BBD can negatively affect a child's quality of life and self-esteem. Therefore, early diagnosis and treatment of bladder-intestinal disorders are necessary to prevent secondary morbidities that can affect the child's kidney and bladder function and mental health [7].

Because the presence of BBD in patients with UTI affects long-term outcomes, early diagnosis and treatment are essential [10]. BBD has also been reported to affect the rate of progression of UTI in patients with VUR who are on continuous antibiotic prophylaxis [7].

A review study reported that, prevalence of constipation is almost three times higher in children with or without VUR, suggesting that BBD is an important risk factor for UTI in toilet-trained children [9]. Previous studies in patients with UTIs have reported a variable prevalence of BBD (18-54%). Also, the studies showed that, BBD is more common in girls with VUR, which could explain higher risk of breakthrough UTI in girls [11]. Gaither et al. also reported higher risk of BBD in girls [12]

Considering that the results of previous studies are contradictory according to the studied population and the method of the study, also considering that this issue has not been investigated before in the studied area, the present study aims to investigate the frequency of BBD and related factors in children with UTI in Yasuj teaching hospitals.

Instrument and Methods

In this cross-sectional study, all children under 14 years with urinary tract infections hospitalized in Imam Sajjad Hospital and Shahid Jalil Hospital in Yasuj, Iran during 2018-2019 were participated. Data were extracted from the files of hospitalized patients using a checklist, the validity of which was confirmed by specialists.

Urinalysis (U/A) and urine culture (U/C) tests were used in sterile conditions to confirm urinary tract infection. Sterile conditions for collecting urine samples include superimposed and catheter urine samples or washing the genital area from front to back and then collecting midstream urine (MSU) samples. These children participated in an accurate History and Physical Exam (H&P). Their bladder and bowel habits were recorded in the checklist for a week with the cooperation of the parents and the children themselves. Intake and output of fluid was recorded in the form at different hours. For smaller children, diaper weights were used. For children larger than the container via which the urine volume was calculated, daytime defecation cases were also recorded in the checklist. The Bristo stool chart was used to determine the stool quality and constipation. These scores were useful to examine BBD symptoms before and during treatment both quantitatively and qualitatively [13]. Kidney and bladder ultrasounds are not usually requested in the initial evaluation, except in severe cases such as constipation. Ultrasound can measure post-voiding residual and show us bladder function and the presence of constipation and fecal impaction. Uroflowmetry with electromyography (uroflow-EMG) is commonly employed to evaluate lower urinary tract (LUT) function in children. Urodynamic studies are also not routinely indicated for the diagnosis of BBD, as they do not give us more information about the history and physical eczema and bladder-intestinal habits. A voiding cystourethrography (VCUG) was also recommended to rule out VUR in the presence of recurrent UTI. A lumbar spinal MRI was also performed if there were any neurological disorders.

The data was analyzed using SPSS 21 software at two descriptive (mean, frequency, and percentage) and inferential (chi-squared test) levels. The normality of the mean distribution was investigated using the Kolmogorov-Smirnov test.

Findings

The mean age of participants was 6.0±2.3 years.

Although UTI was more in the affected age group of 6-10 years and the lowest in the age group of 2-5 years (Table 1).

Table 1) Demographic information of the participate

Parameter		Frequency (%)	p Value
Gender	Girl	55 (53.4)	0.032
	Boy	48 (46.6)	
Age (year)	<1	23 (22.3)	0.083
	2-5	35 (34.9)	
	6-10	36 (35)	
	>10	9 (8.8)	

69 subjects (67%) had a fever, 59 (57.3%) of patients with UTI had constipation, 25 (24.3%) had fecal incontinence and 51 (49.5%) had urinary retention, and these variables were not significant between the two sexes. But 29 (28.2%) had urinary incontinence, which was significantly more in girls than boys (7 in boys versus 30 in girls). However, no significant difference was observed between the two genders in the occurrence of fever and UTI recurrence.

The prevalence of BBD was 41%. There were several symptoms of BBD in patients with UTI at the same time. The most common symptoms of BBD include: Constipation & urinary retention 15 (14.6%), Constipation only 13 (12.6%), Constipation & urinary incontinence & fecal incontinence & urinary retention 13 (12.6%), Urinary retention 12 (11.6%). Urinary incontinence + fecal incontinence, and Urinary incontinence significantly more than in girls compare to boys, but the symptoms of Constipation + fecal incontinence + urinary retention in boys was more than the girls significantly. However, there were no significant difference between the girls and boys in others BBD symptom. 13 subjects (12.6%) had constipation There was no significant difference between the girls and boys in terms of constipation frequency (p=0.213). Both groups were not significantly different in the frequency of fecal incontinence (p=0.299). However, Urinary incontinence was higher in girls than boys (p = 0.004). There was no statistically significant difference between boys and girls in terms of urinary retention (p=0.185; Table 2).

Table 2) Comparison of distribution of different types of BBD symptoms by gender (Chi-square test)

Cases	Boys	Girls	Total	p Value
No one	15 (31.2)	12 (21.8)	27 (26.2)	0.066
Constipation	8 (16.7)	5 (9.1)	13 (12.6)	0.213
Constipation + urinary incontinence + fecal incontinence	0 (0)	4 (7.3)	4 (3.8)	0.613
Constipation + urinary incontinence + fecal incontinence + urinary retention	6 (12.5)	7 (12.7)	13 (12.6)	0.213
Constipation + urinary incontinence + urinary retention	0 (0)	6 (10.9)	6 (5.8)	0.054
Constipation + urinary incontinence	1 (2.1)	0 (0)	1 (0.9)	0.804
Constipation + urinary incontinence + fecal incontinence + urinary retention + loose bladder	0 (0)	1 (1.8)	1 (0.9)	0.067
Constipation + urinary retention	6 (12.5)	9 (16.4)	15 (14.6)	0.232
Constipation + fecal incontinence	3 (6.2)	1 (1.8)	4 (3.8)	0.054
Constipation + fecal incontinence + urinary retention	1 (2.1)	0 (0)	1 (0.9)	0.004
Constipation + urinary retention	0 (0)	1 (1.8)	1 (0.9)	0.232
urinary incontinence	0 (0)	2 (3.6)	2 (1.9)	0.004
Urinary incontinence + fecal incontinence	0 (0)	2 (3.6)	2 (1.9)	0.004
Urinary retention	8 (16.7)	4 (7.3)	12 (11.6)	0.185
fecal incontinence	0 (0)	1 (1.8)	1 (0.9)	0.299
Total	48 (100)	55 (100)	103 (100)	-

Constipation is more common in 2-5 and 6-10 years age group (p=0.003). There was a statistically significant difference of different age groups with constipation (p=0.003) and fecal incontinence (p=0.003). Urinary incontinence is more common in the age range of 6-10 years. So, there is a significant relationship between urinary incontinence and age (p=0.003). There was no statistically significant difference between an atonic bladder (p=0.586) and urinary retention (p=0.986) with age (Table 3).

Table 3) Comparison of distribution of different types of BBD symptoms by age (Chi-square test)

Cases	< 1	2-5	6-10	> 10	Total	p Value
No one	11 (40.7)	7 (25.9)	7 (25.9)	2 (7.5)	27 (26.2)	0.255
Constipation	1 (7.7)	6 (46.1)	4 (30.7)	2 (15.5)	13 (12.6)	0.003
Constipation & urinary incontinence & fecal incontinence	-	2 (50)	2 (50)	-	4 (3.9)	0.903
Constipation & urinary incontinence & fecal incontinence & urinary retention	-	4 (30.7)	9 (69.3)	-	13 (12.7)	0.056
Constipation & urinary incontinence & urinary retention	-	1 (16.6)	3 (50)	2 (33.4)	6 (5.9)	0.132
Constipation & urinary incontinence	-	1 (100)	-	-	1 (0.9)	0.157
Constipation & urinary incontinence & fecal incontinence & urinary retention & loose bladder	-	-	1 (100)	-	1 (0.9)	0.460
Constipation & urinary retention	4 (26.7)	8 (53.3)	2 (13.3)	1 (6.7)	15 (14.6)	0.861
Constipation & fecal incontinence	-	2 (50)	2 (50)	-	4 (3.9)	0.073
Constipation & fecal incontinence & urinary retention	-	-	-	1 (100)	1 (0.9)	0.086
urinary incontinence	-	-	1 (50)	1 (50)	2 (1.9)	0.003
Urinary incontinence & fecal incontinence	1 (50)	-	1 (50)	-	2 (1.9)	0.306
Urinary retention	6 (50)	4 (33.3)	2 (16.7)	-	12 (11.8)	0.986
Fecal incontinence	-	-	2 (100)	-	2 (1.9)	0.003
Total	23 (100)	35 (100)	36 (100)	9 (100)	103 (100)	-

There was no statistically significant difference between the frequency of BBD symptoms and place of residence (p=0.07), the frequency of BBD symptoms and fever (45.6%) had a record of recurrent UTI. There was a statistically significant difference between the recurrence of infection and BBD symptoms (F=47; p=0.003; Table 4).

Table 4) Distribution of different types of BBD symptoms by infection recurrence

Cases	Infection Recurrence	
	Yes	No
No one	4 (8.5)	23 (41.1)
Constipation	5 (10.6)	8 (14.3)
Constipation & urinary incontinence & fecal incontinence	3 (6.4)	1 (1.8)
Constipation & urinary incontinence & fecal incontinence & urinary retention	10 (21.3)	3 (5.4)
Constipation & urinary incontinence & urinary retention	5 (10.6)	1 (1.8)
Constipation & urinary incontinence	1 (2.1)	-
Constipation & urinary incontinence & fecal incontinence & urinary retention & loose bladder	1 (2.1)	-
Constipation & urinary retention	7 (14.9)	8 (14.3)
Constipation & fecal incontinence	2 (4.3)	2 (3.6)
Constipation & fecal incontinence + urinary retention	1(2.1)	-
urinary incontinence	2 (4.3)	-
Urinary incontinence & fecal incontinence	2 (4.3)	-
Urinary retention	3 (6.4)	9 (16)
Fecal incontinence	-	2 (1.8)
Total	47 (100)	56 (100)

Discussion

The present study aimed to investigate the Prevalence of bladder and bowel dysfunction and its related factors in children less than 14 with a urinary tract infection admitted to Yasuj hospitals in 2019-2020. The results of the present study showed that, the prevalence of BBD was 41%. BBD plays an essential role in causing recurrent UTIs. LUTD with incomplete bladder emptying is a significant risk factor for UTI development and recurrence in children [14]. A comprehensive medical record is essential once a UTI is approved. This issue should include prematurity, prenatal hydronephrosis, birth history, toilet training, drainage, and defecation pattern [15]. The frequency of defecation, the time of any urinary incontinence, and the symptoms associated with daytime urinary incontinence should be documented. Sensory or muscular weakness and atrophy of the lower extremities should be considered as critical neurological conditions that may be reasons for recurrent UTIs [16].

BBD has been cited as an important risk factor for UTI in children. The results of a meta-analysis study showed that the presence of BBD significantly delays the resolution of VUR management. Previous studies support the idea that BBD predisposes patients to UTI recurrence [17]. In the meta-analysis study conducted by Meena *et al.* in 2020 pooled prevalence of BBD was 41% and the prevalence of BBD was higher in prospective studies (51%) as compared with retrospective studies (35%) [9], that this result is exactly similar to the prevalence of BBD in the present study (41%).

Moreover, in the study by Thomas *et al.*, 35% of children with UTI had BBD [12]. Also, In a prospective study by Sjöström among children hospitalized with pyelonephritis in the first year of life, 38% had BBD at preschool time and there was a strong correlation between UTI and BBD [18]. It seems that the reason for the difference in the results of different studies is the type of population of study, and different demographic factors. A significant increase in the prevalence of BBD was observed in girls compared to boys. Also, results showed that, there was significant difference between the girls and boys in the prevalence of BBD. Zivkovic *et al.* [19], reported a high prevalence of BBD in girls, which is consistent with other studies that enrolled children with severe bladder and bowel dysfunction. Moreover, in Chrzan *et al.* [16], which included 50 patients with recurrent UTIs caused by dysfunctional voiding, 44 were girls. Also, Lucanto et al. [20] investigated 10 children with severe chronic constipation and LUTS, of whom 9 were girls.

In the present study the mean age of participants was 6±2.3 years, although UTI was more in the affected age group of 6-10 and the lowest in the age group of 2-5 years. In the study of Sumboonnanonda *et al.*, the average age of BBD in children was 6.9±2.2 years [21]. In the present study, constipation was common in children with UTI. Approximately 90% of those with stool retention suffer from functional constipation without a cause [22]. As in the present study, there is a coincidence of these symptoms in patients with UTI [21]. the prevalence of functional constipation was reported to be 9.5% in healthy children in a recent systematic review [22]. Moreover, in the study of Axelgaard *et al.*, in children with pyelonephritis, 47% had constipation, which, like the present study, was diagnosed based on Rome 3 criteria [23]. In Meena *et al.*, review, prevalence of constipation was 27% in 7 studies and it was almost three times higher in children with or without VUR, suggesting that BBD is an important risk factor for UTI in toilet-trained children [9]. Constipation significantly affects the quality of life and physical and emotional health of children and families. Therefore, proper evaluation and management are recommended [22].

The present study indicated that, In addition to constipation, constipation & urinary retention, and constipation & urinary incontinence & fecal incontinence & urinary retention and urinary retention were the most common BBD symptoms in the children with UTI. Also, in the study of Sumboonnanonda *et al.*, the most common symptoms included frequent defecation (80%), defecation problem (80%), and urinary incontinence (32.2%) [21]. Watanabe *et al.*, indicated that occurrence of fecal impaction in children with UTI is more than without

UTI, and the recurrence of UTI was also higher in the children with fecal impaction, and fecal impact was a risk factor for the recurrence of urinary infection [24]. As in the present study, constipation was common. Besides, in the study by Burgers et al. About 50% of children with LUTI had diagnostic criteria for functional defecation disorders. 46 of 113 children with lower urinary tract infection had dysfunctional voiding and 38 patients had urge incontinence/overactive bladder [25]. Moreover, in the study by Bahatt *et al.*, it showed that in patients with autism with BBD, functional constipation was 90%, frequent urinary tract infection was 38%, and nocturia was 56% [26]. The higher prevalence of these disorders in the above study compared to the current study could be because patients with autism have a potential background for the occurrence of BBD symptoms compared to non-autistic patients.

The results showed that having BBD can predispose the child to UTI. As, in the study by Borch *et al.* with the treatment of BBD, 96% of the patients' excretion problems were improved, and in children with urinary incontinence, about 96% of the patients had a 50% reduction in the frequency of incontinence per day due to the improvement of the bowel disorder, and 27% gained full urinary control. Only 17% of children with nocturnal enuresis reduced the number of wet nights after the stool problem was resolved.

Considering the high prevalence of BBD in children with UTI, timely diagnosis and treatment of BBD is important to prevent secondary diseases that can affect children's kidney and bladder function and their psychosocial health. Therefore, this issue should be taken into consideration in the retraining of doctors and the education of medical students and at the bedside of patients.

Although there was a significant difference in some BBD symptoms between the two sexes or different age groups of patients, but due to the small number of samples, these results should be interpreted with caution. Therefore, the limitations of the present study was small number of the samples that it can reduce the generalizability of the results of the present study.

Conclusion

The symptoms of BBD are high in children with UTI and it also causes the recurrence of UTI. In addition, the prevalence of some BBD symptoms is related to gender. Therefore, these issues should be considered in the diagnosis and treatment of UTI. Due to the relatively high prevalence of asymptomatic UTIs in children, treatment, and prevention of infection and screening in children become more significant. It is suggested that similar research should be conducted on more samples in future studies and the effect of BBD therapeutic interventions on recovery and recurrence of UTI should be investigated.

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Ethical Permissions: The research followed the tents of the Declaration of Helsinki. The Ethics Committee of Yasuj University of Medical Sciences approved this study (Code IR.YUMS.REC.1399.092). Written informed consent taken from all the parents of the children and in some cases from the patients in addition to family before any intervention.

Conflicts of Interests: The authors declare that they have no competing interests.

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