

The Relationship between Chronic Constipation and Urinary Tract Infection in Children: A Case-Control Clinical Study

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Abstract

Background

Urinary tract infection (UTI) is one of the most common bacterial infections in children, if not diagnosed leads to serious complications such as hypertension, chronic renal failure and renal scar. Constipation is one of the main risk factors for recurrent UTI. The aim of present study was to investigate the relationship between chronic constipation and urinary tract infection in children.

Materials and Methods

In this case-control study 105 patients with functional chronic constipation as case group, compared with 104 children without chronic constipation as control. The control group was matched according to gender and age. The prevalence of UTI in children with and without constipation as well as their improvement was compared after treatment.

Results

The prevalence of UTI in case and control groups was 13.3% and 6.7%, respectively ($P=0.17$). The prevalence of UTI in case group decreased to 3.8% after treatment of constipation. Escherichia coli (E coli) was the most commonly isolated organism in both groups.

Conclusion

Results of present study showed that despite of no significant urinary tract infection incidence between children with constipation and those without constipation, the constipation should still be considered as a predisposing risk factor for the UTI occurrence.

Key Words: Children, Constipation, Urinary tract infection.

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1- INTRODUCTION

Urinary tract system is a common site for infection especially in children and infants. Urinary tract infection (UTI), can cause destructive effect and long-term complications. Therefore, early diagnosis and appropriate treatment are very important. UTI is one of the most common bacterial pediatrics infection (1) as well as one of the infections with ascending pattern (2). Clinically, UTI manifests as pyelonephritis, cystitis or asymptomatic bacteriuria and may be complicated with urinary tract obstruction or vesicoureteral reflux (VUR) (3). Voiding dysfunction such as urinary incontinence and urinary retention also can be associated in a significant number of constipated children. Constipation is a common pediatric problem which remains under diagnosed and often weakly treated. In constipation, the distended rectum pressure on the bladder wall causes obstruction to urine flow as well as the bladder detrusor muscle impairment (1).

There is a strong correlation between urinary incontinence, VUR and UTI in the constipated children. Several studies reported that treatment of constipation reduces pyuria, bacteriuria and enuresis (1). It has been reported that in patients with no major anatomical abnormalities, eliminating constipation prevents recurrent UTI occurrence. In USA constipation leads to 2.5 million clinic visits yearly (4, 5). Generally, the most common age of constipation in children is preschool (4, 5).

Organic causes cannot be found in more than 90% of patients (6). Regular pattern of bowel movements in children is considered as a sign of health (7). In a study by Neumann et al., it was observed that the incidence of urinary and fecal incontinence in constipated children is significantly more than normal children (8). Oregon et al., reported that recurrent UTI is associated with constipation. He also reported that constipation often is

associated with enuresis or encopresis (9). To further a new insight into relationship between UTI and constipation, this study was conducted to evaluate the relationship between chronic UTI and chronic constipation in children.

2- MATERIALS AND METHODS

2-1. Method

This case-control study was conducted on 105 children aged 1-15 years with chronic constipation as case group and 104 healthy subjects as control group. The study was done between 2013 until 2015 in the Qaem hospital affiliated in Mashhad University of Medical Sciences. The control group was included children who have been referred to Qaem hospital for a reason other than constipation. The control group was matched according to gender and age. All patients fulfilled Rome III criteria for chronic constipation (10).

The sample size was calculated by non-probability and convenient method. Data collection tools were a demographic questionnaire, abdominal and genital exam, digital rectal exam, urine culture; complete urine tests and follow up after treatment. The nutritional status according to fiber content was divided to low-fiber, high fiber and natural nutrition. Stool consistency was considered in three forms including soft, hard with difficult passing and hard with sharp edges damaged the anus when passing (very hard).

The complaint of urination were expressed as dysuria, frequency and refusing to urinate. Complete urinalysis and urine culture were conducted from all enrolled children. Urine sample obtained from mid-stream catch void in continent children and urine bag in others. UTI was considered as more than 100,000 colony count for one single pathogen or 10,000 colony counts in the symptomatic child with active urinalysis (11). Case group were treated for 3-6 months. The treatment protocol

includes special foods with high fiber content, lifestyle changes, child's family life style modification, increased physical activity, and pharmacotherapy. Pharmacotherapy was included paraffin oil and lactulose 1-3 cc/kg/day divided in 1-2 doses. Routine treatment protocol was continued and there was no additional intervention during study. Children with UTI were referred to nephrology clinic for treatment and follow-up. Kidneys and bladder ultrasound was requested for all patients. Children with symptomatic UTI were treated with appropriate antibiotics for 10-14 days.

Constipation treatment also was conducted concurrently. Urinalyses and urine cultures were repeated at the end of treatment and every 3 months thereafter. Voiding cystourethrogram (VCUG) was performed on selected cases as indicated 2-3 weeks after the treatment onset. When constipation subsided the pharmacotherapy ceased in patients with no anatomical abnormalities of the urinary tract. This study was approved by Mashhad University Research Board.

Inclusion criteria included the children who had at least 2 weeks with these followings: 1) functional constipation described as following symptoms: a) usually difficult defecation and stone like stool. b) Weekly or at least two time a week difficult defecation. c) Absence of anatomical disorder in gastrointestinal, endocrine and metabolic systems. 2) All the patients should have stool retention in digital rectum examination. Patients with anatomical urinary system abnormality were excluded.

2-2. Statistical analysis

Statistical analysis was performed using SPSS windows program version 19.0 (SPSS Institute, Inc., Chicago, IL, USA). All experimental values are presented as Means \pm standard deviation (SD). The Student's *t*-test was used for parametric

data and chi-square analysis was used for categorical measures. Difference was considered to be significant if $P < 0.05$.

3- RESULTS

In the case group, 25 males (23.8%) and 80 females (76.2%) completed the study. The control group consisted of 27 males (26%) with 77 females (74%). The gender difference of the two groups was not statistically significant ($P = 0.42$). The mean age of patients in the case group and in the control group was 4.38 ± 2.38 and 4.43 ± 2.44 years old, respectively ($P = 0.93$). The most prevalent manifestation for UTI was included fever, dysuria and frequency (57%), and then urinary incontinency (50%). Positive urinary culture with the standard sampling was seen in 14 (13.3 %) cases in the case group and 7 (6.7%) patients in the control group, respectively ($P = 0.17$). *Escherichia coli* (*E. coli*) was the most common isolated organism constipated patients with UTI (100%). In the control group *E. coli* was isolated in 6 cases (85.7%), and *Proteus* was reported in one case (14.3%).

The prevalence of UTI was more in girls in contrast to boys in both groups, but the statistical difference was not significant ($P = 0.23$). The history of UTI was seen in 78.5% of case group, while only 3 children experienced UTI for the first time in the case group. There was no any significant difference for nightly and daily urinary incontinence in both groups ($P = 0.18$). Prevalence of UTI was 50% and 14% in 1-5 and 10-15 years old group, respectively.

In present study kidney and urinary system ultrasound and VCUG was conducted for all patients with UTI. According to results 83.4% showed normal ultrasound and only 16.6% had abnormalities. Ten patients required VCUG procedure. Of these 7 (70%) had demonstrable vesicoureteral reflux. In addition to urinary markers, constipation parameters were also evaluated in both groups. The most

common reason for constipation was type of diet as low fiber diet in both groups. Psychological problems and excessive consumption of cow milk were the other common factors for constipation respectively. Nutrition during infancy was evaluated in all patients. Results showed that only 36.4% in case group have been breastfed and the others fed with formula and cow milk, while in control group 76.5% have been breastfed.

Duration of constipation was at least one month and maximum 96 months in the case group. Encopresis was reported in 25.7% of 105 children with functional constipation. 82% of patients in case group had a history of previous medical treatment for constipation. The most common age for constipation was between 1 to 5 years old with the prevalence of 66% comparing to 3.5% in 10 -15 years old group. It was interesting that none of all children in case control had soft defecation. Genital examination showed 98.9 % normal result and just one case of

hypospadias was seen. According to Digital Rectum Examination (DRE), 100% of children in case group had stool retention with a lot of hard stool in rectum. For more evaluation in 17 constipated patients with indication of contrast, imaging barium enema was done which 13 (76.5%) of them had abnormal result with megacolon and colon distention filed with a lot of fecal impaction.

Specific diet and constipation treatment was prescribed for case group. UTI was controlled after constipation treatment in 7 cases with no anatomical abnormalities (64%) and UTI recurrence was not observed during the next follow-up. In the remaining cases (36%), UTI remained unknown. As a result, the prevalence of UTI after treatment of constipation decreased to 3.8%. In most patients with UTI and chronic constipation (85.7%), consumption of foods low in fiber was associated with higher UTI incidence (**Table.1**).

Table-1: Frequency of fiber contact of food at case and control groups

Group	Low Fiber	Normal	High Fiber	Total
	Number (Percent)	Number (Percent)	Number (Percent)	
Case	58(55.2)	46(43.8)	1(1)	105
Control	3(5.2)	55(94.8)	0	58
P-value	< 0.001	> 0.05	> 0.05	

4- DISCUSSION

Functional constipation (FC) is a prominent and common health problem in children which can make many side effects. Rome criteria III is used for evaluating constipation (10). FC in children has a high prevalence (0.7%-29%) in worldwide, both in developed and developing countries (6). Constipated children were 6.8 times more likely to have Lower Urinary Tract Infection (LUTI) than those not constipated (1). The

present study is consistent with the study published by Hoque et al. who also reported that UTI incidence in constipated children is higher than non-constipated showing impact of constipation on pediatrics UTI (11). Children with more severe constipation may have more prominent urinary symptoms (1). In the present study the prevalence of pediatrics UTI in case and control groups was 13.3% and 6.7%, respectively that are in agreement with other studies (8). In a study by Loening-Baucke on 234

constipated children, UTI incidence was reported about 11% (12). In another study on 38 constipated patients aged 6-192 months and 31 children aged 4-180 months as control reported that the prevalence of UTI was 42% and 19%, respectively ($P < 0.05$) (13). Association between constipation and UTI was also reported in other studies (14, 15). In our study the prevalence of UTI in constipated boys and girls was 14% and 12%, respectively. Whereas in the control group 9% of girls were constipated, but difference wasn't significant ($P = 0.23$) indicating constipation is one of important risk factors of UTI regardless of gender. According to present study and in agreement with other studies the most common age of UTI related constipation in children is 1-5 and 5-10 years old, that are toilet training and school age. In the present study the most isolated organism in urinary culture was E-coli in both case and control group that are in agreement with other reports (1, 16).

The infection presence in perineum and urethra due to fecal incontinence is another risk factor of UTI. In present study 87% of studied patients had a history of UTI. But in Leoning et al. study, the rate of recurrent UTI reported about 56% that are not in agreement with our study (12). That difference may be due to poor treatment of constipation and UTI, inadequate follow-up and other predisposing factors for recurrent UTI. Biopsychosocial risk factors such as psychological stress, poor dietary habits, obesity and child maltreatment are commonly identified predisposing factors for functional constipation (2). Our study also showed that the most common reason for constipation was type of diet as low fiber diet in both groups. Psychological problems and excess use of cow milk were the other common factors for constipation, respectively. According to Sampaio et al. study, infrequent voiding and holding

maneuvers are independent factors of urinary expressions in constipated children (1). Our study revealed that the most prevalent manifestation for urinary tract infection (UTI) included fever, dysuria and frequency (57%) and then urinary incontinence (50%). Sampaio et al. study showed that presence of enuresis was not associated with constipation (1) as seemed in our study, there was not any significant difference between nightly and daily urinary incontinence and constipation in both groups ($P = 0.18$).

In a study by Kasigra et al., the urinary residues in 12% of constipated patients have been reported (13). According to ultrasound results in this study, the prevalence of urinary residues in UTI patients was 37.5% that are in difference with other studies. Dohil et al. reported that urine residues and renal tract dilatation in constipated children is more than other peoples (17). In an Iranian study nocturnal enuresis was found in a significant number of children who had chronic functional constipation, but UTI was not so common in the present study (18). In contrast to our study, there is not any significant difference for nightly and daily urinary incontinence in both groups ($P = 0.18$).

In the present study, the special diet and pharmacotherapy for constipation was performed for case group with no anatomical abnormalities in urinary tract. According to results UTI was controlled after treatment of constipation and UTI recurrence in subsequent follow-up was not observed. However, the improvement was not observed in 36% of patients with UTI. The prevalence of UTI after treatment of constipation decreased to %3.8. In Oregon report, 93% of studied patients with normal urinary system structure didn't show recurrent UTI (9). The cause of difference in our study maybe due to differences in inappropriate treatment of constipation, poor working parents and patients in visit and follow-up

treatment program, there are other risk factors, limited opportunity to study and racial and family conditions. According to the present study 85.7% of children with UTI had low diet fiber content indicating the diet fiber content involvement in constipation and subsequent UTI. According to results, there was a significant difference in infancy nutrition between case and control group; also 36.4% of case group had breastfeeding during infancy, while 76.5% of control group were breastfeeding indicating the probable role of breastfeeding on the incidence of constipation ($P < 0.001$).

In this study, 68 constipated patients (65%) were improved after treatment and 38 patients (35%) were resistant to treatment that are in agreement with another studies (12). The high percentage of improvement in our study can be related to racial, nutritional, environmental or treatment modalities.

4-1. Limitations of the study

We could not evaluate all constipation related variables due to time and cost limitation.

5- CONCLUSION

In conclusion, it seems that there is an association between constipation and urinary tract complications such as UTI in children. According to present study, physicians should pay more attention the bowel habits in constipated children, and try to solve that if there is not normal.

6- CONFLICT OF INTEREST: None.

7- ACKNOWLEDGMENT

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