

Original Article

Risk Factors of urinary tract infection in preschool children in Dhaka, Bangladesh

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Abstract

Urinary Tract Infection (UTI) is the leading cause of death in children below five years of age in Bangladesh. Identification of modifiable risk factors of UTI may reduce the chances of the disease. This hospital based case-control study was conducted from January 2008 to December 2008 in Bangabandhu Sheikh Mujib Medical University, Dhaka to determine risk factors associated with UTI in preschool children. A group of 201 children with UTI on the basis of urgency and frequency in micturition & lower abdominal pain with or without fever were considered as case subjects under this study. Analysis was conducted comparing data from case group against a control group of 311 healthy children who were reported to have no fever and abdominal pain. Wiping (from back to front), circumcision status, nappy use, obstructive uropathy, neurogenic bladder, poor personal hygiene and constipation were found to be potential factors for UTI under logistic regression. Among them, nappy use was the main contributing factor and circumcision status and constipation were the second and third largest contributing factors for UTI. Age and sex had no statistically significant association.

Key words : UTI, children, risk factor

Introduction

Urinary Tract Infection (UTI) is a leading cause of mortality in children below five years of age in the developing countries. Many recent studies^{1, 2, 3, 4} focused on the UTI effect on the children. Durbin⁵ in a review of epidemiology of UTI in developing countries identified obstructive uropathy & immuno-compromised child as risk factors for UTI. Recent studies have added to the list other risk factors for urinary tract infection in children in developing countries including poor personal hygiene, circumcised child, thread worm infection, constipation, wiping from back to front catheterization.⁶⁻¹⁰ Many of the factors mentioned are amenable to corrective measures and may help in reducing the alarmingly high global burden of UTI.

Many studies^{8,9,10} have been recently conducted in Bangladesh for UTI in children, however, those studies are either conduct a review or diagnosis of UTI from medical perspective. This study however, undertook to identify and measure magnitude of the potential risk factors of UTI in hospitalized children less than 5 years of age in Bangladesh using observational and statistical approach comparing cases against control groups. Previously pre-school children aged from 1-5 were found most vulnerable to UTI.¹¹ Thus, it can be expected that proper identification of the factors of UTI will reduce associated morbidity such as septicemia, failure to thrive, hypertension and chronic kidney disease among children and thus lower the future health cost burden of the government.

Methods

This hospital based case-control study was done from January 2008 to December 2008 in the department of Paediatrics, Bangabandhu Sheikh Mujib Medical University, Dhaka. Children admitted with Urinary tract infection in the absence of under-lying chronic illnesses during the study period were enrolled in the study as cases. Urinary tract infection was defined as presence of dysuria, urgency, frequency of micturition, abdominal pain with or without fever for less than two weeks. For both cases and controls, clinical review including history and physical examination were obtained to elicit various potential risk factors and these were recorded in a pre-designed questionnaire. The questionnaire was designed following a

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specific process. The potential risk factors for UTI around the world were selected from different studies.¹⁻¹² Then, a sample of 20 questionnaire were conducted in early January as field test to only keep ten effective variables related to the study area (Dhaka). The questionnaire was designed with both open-ended (e.g. age) and closed ended questions with nominal options (e.g. gender). Data including age, sex, and history of medical conditions were collected by a pediatrician with written consent from the guardian of the patients. Cases of UTI and other medical condition were confirmed by the different urine sample and health tests. Urine was collected by a clean catch midstream urine bag specimen collector and urethral catheterization. Subsequently, urine routine microscopic examination, urine culture with colony count and ultrasonogram of KUB region were conducted for both groups. Special investigations i.e. DMSA (Dimercapto succinic Acid), MCU (Micturitioncystourethrogram) and IVU (Intravenous Urogram) were done for the children who had sonographic evidence of obstructive uropathy. Finally 201 children as cases and 311 children as control were included in this study.

In order to carry out the analysis, statistical approaches such as Fishers Exact test and multiple logistic regression model were applied. Association of each of the potential variables with UTI (outcome variables) under this study was assessed with Fisher exact test and the strength of their association was computed by unadjusted odds ratio (OR) and its 95% confidence interval (CI). Unadjusted Odds Ratio presents the odds of having UTI without considering the effect of the other variables. Variables showing statistically significant association with the UTI up to $p < 0.01$ were considered as potential risk factors of UTI. Subsequently, these variables were simultaneously subjected to stepwise multiple logistic regression model. The selected variables under a regression model show the combined effect of the variables for predicting the outcome variable which is UTI in this case. However, without presenting the logistic regression model,

only a list of adjusted odds ratios has been presented in this study because of relevancy with the research to show the magnitude of the strength of the individual variable in presence of the other potentially selected variables that might cause UTI together to a child.

Results

In this study 512 children including 201 cases and 311 controls were enrolled. In respect to risk factors, case group displayed significantly higher rates of p value than control group. There were significantly higher numbers of uncircumcised patient in UTI group as compared to controls and only this variable is statistically significant at $p < .01$. (Table-I)

Regarding relationship between environmental variables and UTI, the impact of nappy use was found to be most significant. Other environmental variables considered in this study are lack of personal hygiene, wiping from back to front (B2F) and constipation were significantly associated with UTI. (Table-II)

Regarding relationship between health related conditions and UTI, obstructive uropathy and neurogenic bladder were significantly associated with UTI. (Table III)

Variables having significant association at $p < 0.01$ were simultaneously entered into a stepwise logistic regression model with UTI as a binary outcome. It was observed that a child uses nappy for the first five years of life was 8 times more at risk of developing UTI. With the odds ratio statistically significant, the confidence interval of nappy use suggests that the magnitude of the effect could be anywhere from a 7.8-fold increase to a 14.4-fold increase. The risk of UTI increased by six times for circumcision (OR : 6.35; 95% CI 2.73-12.61), whereas constipation was as much as 5 times (OR: 5.15; 95% CI 3.00-8.20). Children with obstructive uropathy had one and half times (OR: 1.64) greater risk of developing UTI. Other risk factors were poor personal hygiene, wiping (B2F) and obstructive uropathy. (Table-IV)

Table -I: Bivariate relationship between various socio-demographic variables and urinary tract infection.

Variables		Yes	(%)	No	(%)	Unadjusted Odds ratio	95% CI	p-value
Age (Month)	Below and 12	125	62.19	208	66.88	0.81	0.56-1.17	0.27
	Above 12	76	37.81	103	33.12	1		
Sex	Male	147	73.13	199	63.99	1.53	1.02-2.24	0.03
	Female	54	26.87	112	36.01	1		
Circumcision status	Yes	6	3.00	200	64.1	0.02	.003-1.26	0.006
	No	194	97.00	112	35.9	1		

Table II: Bivariate Relationship Between environmental variables and Urinary Tract Infections.

Variables		Yes	(%)	No	(%)	Unadjusted Odds ratio	95%CI	p-value
Nappy use	Yes	117	76.47	107	29.81	7.65	2.57-15.89	0
	No	36	23.53	252	70.19	1		
Poor personal hygiene	Yes	37	24.50	67	21.54	2.77	1.88-4.09	0
	No	114	75.50	244	78.46	1		
Wiping(B2F)	Yes	115	59.90	124	40.00	2.24	1.55-3.23	0
	No	77	40.10	186	60.00	1		
Constipation	Yes	110	56.41	122	40.13	2.11	1.05-2.9	0
	No	85	43.59	182	59.87	1		

Table III: Bivariate Relationship between health condition and Urinary Tract Infections.

Variables		Yes	(%)	No	(%)	Unadjusted Odds ratio	95%CI	p-value
Obstructive Uropathy	Yes	35	21.08	42	17.80	1.23	0.52-1.26	0
	No	131	78.92	194	82.20	1		
Neurogenic bladder	Yes	115	59.90	124	40.00	2.24	1.55-3.23	0
	No	77	40.10	186	60.00	1		
Immunocompromised condition	Yes	81	95.29	73	91.25	1.92	1.24-2.96	0
	No	4	4.71	7	8.75	1		

Table IV: Risk Factors of Urinary Tract Infection Using Stepwise Multivariate Logistic Regression Analysis.

No.	Risk factors	Adjusted Odds ratio	95% CI	p-value
1	Wiping (B2F)	2.51	1.51-4.16	0
2	Circumcision	6.35	2.73-12.61	0
3	Nappy use	8.07	7.81-14.40	0
4	Obstructive Uropathy	1.64	1.23-2.17	0.001
5	Neurogenic Bladder	1.85	1.14-3.02	0.01
6	Poor personal Hygiene	2.85	1.59-5.34	0
7	Constipation	5.15	3.00-8.20	0

Discussion

In this study, the objectives were to identify the risk factors for UTI and to determine the magnitude of their strength. In the present study circumcision emerge as the second significant risk factor in bivariate analysis which has a long history of criticism.^{2, 14, 15} The number of uncircumcision child was relatively greater in the cases as compared to controls, which were statistically significant (0.2-0.4%, vs. 5-20%).^{14,15} Nappy use was found to be the most significant factor associated with UTI in bivariate analysis

but it was also significant factor on multivariate analysis. Causes of this dominant factor which might be attributed to the lack of expertise of nappy use in Bangladesh and can be further supported by the fact that nappy use was not a part of historical practice in Bangladesh before. The frequency of nappy change and quality of nappy might be a crucial factor for reducing the UTI. Further study might be needed here.

Lack of personal hygiene and constipation were other risk factor found in this study and was reported previously.¹⁶ Both factors can be prevented by proper health education.

Obstructive uropathy and neurogenic bladder were found to have lowest impact among the selected seven variables determined by the logistic regression model. Obstructive Uropathy was previously also reported in the Hellerstein.¹⁷ Neurogenic bladder may occur in all acute illnesses but longer duration may result in repeated UTI & it was also a factor contributing to UTI under the 5 years preschool children in Bangladesh.

We observed that children who were wiped from front to back were less likely to suffer from UTI as compared to those who were wiped from back to front. Findings from nappy use and wiping suggests that mothers having knowledge of proper health tips and better information will less likely have sick children.

The study was designed to determine the risk factors of UTI of preschool children. Nappy use, constipation, wiping from back to front came out to be the most modifiable major risk factors for urinary tract infection. Circumcision is also a major factor; however this is heavily influenced by religion and is very gender specific. Appropriate measures related most risk factors may help to reduce UTI. If measures for prevention such as circumcision, proper toilet training, avoid constipation, maintain personal hygiene and occasional nappy use etc. can be taken, a greater prevention of UTI can be ensued without any medical cost.

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