

# URINARY TRACT INFECTION IN SEVERELY MALNOURISHED CHILDREN

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## Abstract

Urinary tract infection is a well recognized complication in malnourished children. The association between malnutrition and urinary tract infection has been well studied in developing countries except in Bangladesh. This cross-sectional study was undertaken to see the occurrence of UTI in severely malnourished children of 6 months to 5 years. Consecutive 50 severely malnourished children were taken as cases and 50 normally nourished children (age and sex matched) were taken as controls in Sir Salimullah Medical College & Mitford Hospital, Dhaka, from May, 2008 to April, 2009. There were male preponderance among the cases (male: female = 1.94:1) and UTI was observed among 36% of the cases and 6% of the controls. Higher risk of UTI was observed in severely malnourished children than normally nourished controls (odds ratios 8.8). Among the cases 83.3% of children with UTI were symptomatic and in control group, all culture proven UTI patients had symptoms suggestive of UTI. *E. Coli* was the predominant organism in both groups (in cases it was 66.6% and in controls it was 100%) and it was more sensitive to Gentamycin, Ceftriaxone and Ciprofloxacin, than Cotrimoxazole, Amoxicillin, Cephradine, and Nalidixic Acid. This study emphasizes that urinary tract infection in malnutrition is common and should be routinely investigated.

**Key words:** Urinary tract infection, malnutrition, children.

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## Introduction:

Urinary tract infection is a well recognized complication in malnourished children<sup>1</sup>. The association between malnutrition and urinary tract infection has been well studied in developing countries. Incidence rate of UTI in malnourished children in well-conducted studies have ranged from 5% to 35%<sup>2</sup>. Like other developing countries, malnutrition is a prevailing burning problem in Bangladesh and only a few studies on UTI in malnourished children were conducted so far here. In a study, prevalence of UTI in malnourished and well nourished control children of 1 to 5 years age were 15.62% and 3.33% respectively<sup>3</sup>; however, this study did not include malnourished infant.

Hence this study was undertaken to ascertain the occurrence of UTI in severely malnourished children 6 months to 5 years of age, to compare the occurrence of UTI between severely malnourished and normally nourished children, to see the clinical features of UTI in severely malnourished children and to know organisms responsible for UTI & their antibiotic sensitivity pattern.

## Methods:

This cross-sectional study was undertaken in Sir Salimullah Medical College & Mitford Hospital, Dhaka, from May, 2008 to April, 2009. Consecutive 50 severely malnourished children were taken as cases and 50 normally

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nourished children (age and sex matched) were taken as controls. Both types of severe malnutrition, oedematous and severe wasting (weight for height Z score < -3SD) were included but the patients who received antibiotics for at least 24 hours before enrollment and edema due to other than malnutrition were excluded from the study. In every studied children, detailed history and clinical examination relating to urinary tract infection were undertaken & were noted in the preformed structured questionnaire. After measuring the weight and height/length, the genital area of every studied child was cleaned with soap and clean water. For children more than 3 years of age, clean catch midstream urine samples were collected in sterilized test tubes. For children less than 3 years of age, urine was collected by sterilized paediatric urine collection (PUC) bag. After noting the physical character, urine samples were transferred to laboratory and were subjected to microscopy and culture within half to one hour of collection. Presence of pus cells >5/HPF in a centrifuged urine sample was considered as pyuria<sup>4</sup>. Colony count was done by loop method. A colony count of >10<sup>5</sup>/ml of urine (clean catch midstream urine or urine collected in pre-sterilized paediatric urine collection bag) was taken as UTI<sup>5</sup>. Bacterial isolates were tested for antibiotic sensitivity by disc diffusion method<sup>6</sup>. The results were analyzed by computer using SPSS version 11.0. Risk factor analysis was done using odds ratio (OR).

### Results:

Out of 50 children in each group (case & control) 33 children (66%) were male and 17 children (34%) were female with male female ratio of 1.94:1. Mean age of case and control group were 21.3 months & 21.2 months respectively. Of the 50 severely malnourished children 28(56%) were severely wasted and 22 (44%) were oedematous. UTI was detected in 18 (36%) children among the cases and in 3 (6%) children among the controls. Risk of UTI was higher in cases than controls (odds ratios 8.8) (Table-I).

Symptoms of UTI in cases were frequency of micturation (27.8%), screaming at micturation (27.8%) and dysuria (11.1%). Systemic symptoms were fever (55.6%), irritability (66.7%), vomiting (16.7%) and lethargy (5.6%). Sixteen percent children were asymptomatic (Table-II).

Risk of UTI in cases between 6 months to less than 1 year was 1.1 times higher than that of 1 to 5 year age group but statistically not significant (95% CI 0.79-1.53). Risk of UTI in controls between 6 months to less than 1 year was 1.4 times higher than that of 1 to 5 year age group but was not statistically significant (95% CI 0.76-2.58) (Table-III).

**Table-I**  
*Occurrence of UTI in studied children*

Nutritional status	UTI present		UTI absent		Odds Ratios
	No	%	No	%	
Cases (n=50)	18	36	32	64	8.8*
Controls (n=50)	3	6	47	94	
Total	21	21	79	79	

\* 95% CI: 7.32-10.59

**Table-II**  
*Symptoms of UTI in studied children*

Symptoms	Case (n=18)		Control (n=3)	
	No	%	No	%
1. Urinary				
Frequency of micturation	5	27.8	1	33.3
Screaming at micturation	5	27.8	0	00
Dysuria	2	11.1	1	33.3
2. Systemic				
Fever	10	55.6	3	100
Irritability	12	66.7	2	66.7
Vomiting	3	16.7	0	00
Lethargy	1	5.6	0	00
3. None				
	3	16.7	0	00

**Table-III**  
*Distribution of UTI cases by age group*

Group	Age	UTI present	UTI absent	Odds Ratios
Case	6 month - <1year (n=13)	5	8	1.1*
	1 year – 5 year (n=37)	13	24	
	Total	50	18	
Control	6 month - <1year (n=13)	1	12	1.4**
	1 year – 5 year (n=37)	2	35	
	Total	50	3	

\* 95% CI 0.79-1.53

\*\* 95% CI 0.76-2.58

In cases risk of UTI in both sexes were same (odds ratios 1.04, 95% CI 0.79-1.36). Risk of UTI in male controls were less than that of female controls (odds ratios 0.23) and it was statistically significant (95% CI 0.14-0.38).

**Table-IV**  
*Distribution of UTI cases by sex:*

Group	Sex	UTI present	UTI absent	Odds Ratios
Case	Male (n=33)	12	21	1.04*
	Female (n=17)	6	11	
	Total	50	18	
Control	Male (n=33)	1	32	0.23**
	Female (n=17)	2	15	
	Total	50	3	

\* 95% CI 0.79-1.36

\*\* 95% CI 0.14-0.38

Out of 21 culture positive UTIs of both groups (case and control), 14 (66.7%) had pyuria and 7 (33.3%) had no pyuria. Sensitivity and specificity of pyuria in detecting UTI were 66.6% and 89.8% respectively.

**Table-V**  
*Validity and Predictive accuracy in detection of UTI by Pyuria (N=100):*

Pyuria	UTI present No (%)	UTI absent No (%)	Total	Statistics
Positive	14 (66.7)	8 (10.1)	22	Sensitivity = 66.6% Specificity = 89.8%
Negative	7 (33.3)	71 (89.9)	78	
Total	21 (100)	79 (100)	100	Positive predictive value = 63.6% Negative predictive value = 91%

**Table-VI**  
*Organisms cultured in studied children:*

In cases, out of 18 culture positive UTIs, 12 (66.6%) were due to E.Coli, 3 (16.6%) due to Pseudomonas, 2 (11.1%) due to Proteus and 1 (5.5%) due to Citrobacter. In control group, 3 were found to be culture positive and all (100%) were due to E.Coli.

Group	Name of organism	No	%
Case (n=18)	E.Coli	12	66.6
	Pseudomonas	3	16.6
	Proteus	2	11.1
	Citrobacter	1	5.5
Control (n=3)	E.Coli	3	100

**Table-VII**  
Sensitivity pattern of cultured organism in studied children:

Organism	% of sensitivity							
	Amx	Cfx	Ceph	Cpr	Ctx	Gm	Nal	Nf
E. Coli (n=15)	26.6	53.3	26.6	53.3	40	73.3	20	60
Pseudomonas (n=3)	0	33.3	0	66.6	0	33.3	0	0
Proteus (n=2)	50	100	0	100	0	100	0	0
Citrobacter (n=1)	0	0	0	100	0	100	0	0

Amx = Amoxycillin Ctx = Cotrimoxazole Cfx = Ceftriaxone Gm = Gentamycin  
Ceph = Cephadrine Nal = Nalidixic acid Cpr = Ciprofloxacin Nf = Nitrofurantoin

E.Coli was sensitive to Gentamycin (73.3%), Nitrofurantoin (60%), Ciprofloxacin (53.3%), Ceftriaxone (53.3%), Cotrimoxazole (40%), Cephadrine (26.6%), Amoxycillin (26.6%), Nalidixic Acid (20%) in both cases and controls. Pseudomonas was sensitive to Ciprofloxacin (66.6%), Gentamycin (33.3%) and Ceftriaxone (33.3%) but 100% resistant to Amoxycillin, Cephadrine, Cotrimoxazole, Nalidixic Acid and Nitrofurantoin.

#### Discussion:

There were male preponderance among the cases (male: female = 1.94:1). The exact cause is unknown but it may be due to purposive sampling and non representative sample size. The present study observed UTI among 36% of the cases and 6% of the controls. Higher risk of UTI was observed in severely malnourished children than normally nourished controls (odds ratios 8.8). A series of similar studies have been done in Bangladesh & abroad .UTI was detected in 8%-35% of malnourished children<sup>1-3,7,8</sup>. The wide range of UTI cases noted in these studies might be due to varying degrees of PEM or differences in study design. In the present study, among the cases 83.3% of children with UTI were symptomatic and 16.7% were asymptomatic. In control group, all culture proven UTI patients had symptoms suggestive of UTI. Asymptomatic UTI in malnutrition has also been reported by other workers<sup>1,7</sup>. Lack of symptoms might be due to the failure to show the features of infection in immunocompromised malnourished children. Age and sex were not the risk factors for the occurrence of UTI in severely malnourished children (odd

ratios were 1.1 and 1.04 respectively), which is similar to WHO statement<sup>9</sup>. This is probably due to the fact of adversely affected immune status, which is responsible for higher occurrence of UTI and other infectious diseases in malnourished children rather than the influence of age and sex of the individuals. Determination of pyuria is a helpful rapid investigation in a child suspected of having symptomatic UTI. However, the presence of leucocytes in the urine is not diagnostic of UTI<sup>10</sup>. In this study, pyuria was found in 66.6% of culture proven UTIs of both groups (case and control). Sensitivity and specificity of pyuria in detecting UTI were 66.6% and 89.8% respectively. In the present study, all isolated organisms in both groups were gram negative organisms (E.Coli, Pseudomonas, Proteus and Citrobacte) & E.Coli was the predominant, in cases it was 66.6% and in controls it was 100%. E.Coli was more sensitive to Gentamycin, Ceftriaxone and Ciprofloxacin, than Cotrimoxazole, Amoxycillin, Cephadrine, Nalidixic Acid. Pseudomonas was sensitive to Ciprofloxacin, Gentamycin and Cotrimoxazole but 100% resistant to Amoxycillin, Cephadrine, Cotrimoxazole, Nalidixic Acid and Nitrofurantoin. The findings of the present study were consistent with the findings of a series of studies in respect of causative organism, but there is difference in antibiotic sensitivity pattern<sup>2-3,8,11,12</sup>. So far as Ceftriaxone and Ciprofloxacin concern, results of this study differ from those of Hossain et al.<sup>12</sup> & Nath<sup>3</sup> both of whom found E.Coli to be 100% sensitive to these drugs. The reduced sensitivity pattern in our isolates to the above mentioned antibiotics could be due

to the facts that over the past few years these organisms have developed resistance to these drugs, because of their indiscrepent use in various diseases and due to the availability of over the counter drug.

### Conclusion:

Malnourished children should be actively investigated for UTI. Routine urinalysis alone is not diagnostic. So, attentions need to be paid for urine culture and sensitivity test of all malnourished children for proper diagnosis & treatment of UTI, along with the management of malnutrition. Risk of UTI was 8.8 times higher in severely malnourished children than in normally nourished children. *E.Coli* was found to be the predominant organism causing UTI.

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