

Original Research Article

Prevalence and bacterial spectrum of urinary tract infection in nephrotic syndrome: a cross sectional study from a tertiary care centre

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ABSTRACT

Background: Nephrotic syndrome is a common renal disorder in paediatric population, which predisposes to various systemic infections. Out of these UTI remains most important as it can be easily missed, if active search is not made. The present study was conducted to find out the prevalence of UTI in these children and to uncover the bacterial spectrum and their sensitivity pattern.

Methods: It was a cross sectional descriptive study which included all children less than 18 years of age admitted with nephrotic syndrome. All the relevant data pertaining to history, examination and investigations were recorded in a pre-designed performa. A clean-catch midstream urine specimen was obtained in all at admission for bacterial culture besides routine investigations.

Results: Among all the seventy six children of nephrotic syndrome studied, boys were affected more than the girls with a male to female ratio of 3.47:1. Their mean age at presentation was 6.4 ± 3.74 years. Urinary tract infection was detected in twenty children (26.32%). The commonest micro-organism isolated was *Escherichia coli* (45%), followed by *Klebsiella* (20%), *Proteus* (20%), *Staphylococcus aureus* (10%) and *Enterococcus* (05%). Most of the micro-organisms were sensitive to fluoroquinolones and cefepime.

Conclusions: About one fourth of nephrotic syndrome children have UTI at admission and relapse episode serves as an additional risk factor for it. Gram negative enteric bacilli remain the most common agent. For empirical coverage fluoroquinolones and cefepime show the best sensitivity pattern.

Keywords: Antibiotic, Micro-organisms, Nephrotic syndrome, Urinary tract infection

INTRODUCTION

Nephrotic syndrome characterized by the presence of heavy proteinuria, hypoalbuminemia, edema and hyperlipidemia, is a common renal disorder in pediatric population.¹ In developed countries, its incidence is 20 to 40 and 20 to 70 per million populations in UK and USA respectively, whereas in Asian countries it is 90 to 160 per million populations.² These patients have an increased risk of developing bacterial infections due to

defective cell mediated immunity, immunosuppressive therapy, malnutrition and urinary losses of immunoglobulins, properdin factor B and complement factors.³

Among all infections UTI remains the most important because it may be asymptomatic and thus may be missed if active search is not made. UTI if left untreated in a patient of nephrotic syndrome who has been started on steroid therapy will complicate the course of both the

UTI and nephrotic syndrome.⁴ Assessment of magnitude of problem would add to the existing figures of UTI prevalence which varies from study to study. Delineation of bacterial spectrum in UTI will help in selecting the empirical antibiotic therapy till the results of culture are awaited.

The primary objective was to find out the prevalence of UTI in nephrotic syndrome. Uncovering the bacterial spectrum and their susceptibility pattern were secondary objectives.

METHODS

It was a cross sectional descriptive study conducted over a period of one year after approval from the Institutional ethics committee. All children less than 18 years of age admitted with nephrotic syndrome were included. Children with urogenital malformations and those who were already on antibiotics were excluded.

All the relevant data pertaining to history, examination and laboratory work up were recorded in a predesigned proforma. Besides routine investigations like complete blood cell count, liver function tests, renal function tests, lipid profile, serum electrolytes, blood sugar, urine routine and microscopic examination, all the patients were subjected to urine culture. For culture, after thoroughly washing the genitalia, a clean-catch

midstream urine specimen was directly collected in a sterile container. The samples were plated on Macconkey agar, Nutrient agar and Chrome agar within one hour of collection. Urinary tract infection (UTI) was labelled when single bacterial colony count was >10⁵ organisms/ml along with pyuria (urine pus cells >5 per high power field).

Considering prevalence of UTI 18.91% (mean value based on previous studies 5,6,7,8), precision error of 10% and confidence interval 95%, sample size was calculated to be 59. We enrolled total 76 children. Qualitative data were presented as proportion or frequency and were compared using chi square test. P-value less than 0.05 were considered significant.

RESULTS

During this period 76 children were admitted and all were included. Majority of cases (50%) belonged to 2-6 years of age group, followed by 42.11% to more than 6 years and 7.89% to <2 years age group with a mean age of 6.4 ± 3.74 years. Boys were affected more than girls with a ratio of 3.47:1. Among the total cases, 32.89% were newly diagnosed and 67.11% were admitted because of relapse. Among the 51 relapse cases, infrequent relapse were 78.43% and frequent relapse were 21.57%. The most common presentation was facial puffiness (Figure 1).

Table 1: Urine culture sensitivity pattern.

	<i>E. coli</i>	<i>Klebsiella</i>	<i>Proteus</i>	Gram negative	<i>Staph aureus</i>	<i>Enterococcus</i>	Gram positive	Total
Ofloxacin	7/9	—	4/4	11/13	2/2	1/1	03/03	14/16
Levofloxacin	4/9	4/4	4/4	12/17	-	1/1	01/01	13/18
Norfloxacin	7/9	4/4	-	11/13	2/2	-	02/02	13/15
Amikacin	4/9	2/4	-	06/13	-	1/1	01/01	07/14
Gentamycin	8/9	-	-	08/09	-	-	00/00	08/09
Cefixime	-	-	4/4	04/04	-	-	00/00	04/04
Cephalexin	-	-	2/4	02/04	2/2	-	02/02	04/06
Ceftriaxone	1/9	-	4/4	05/13	-	1/1	01/01	06/14
Cefoperazone	9/9	2/4	-	11/13	-	-	00/00	11/13
Cefepime	2/9	4/4	4/4	10/17	2/2	1/1	03/03	13/20
Aztreonam	8/9	-	-	08/09	-	1/1	01/01	09/10
Oxacillin	-	-	-	00/00	2/2	-	02/02	02/02
Pip+tazobactam	-	4/4	-	04/04	2/2	-	02/02	06/06
Linezolid	-	-	-	00/00	2/2	-	02/02	02/02

Table 2: Evaluation of risk factors for UTI.

Risk factor	UTI group	Non-UTI group	Total	P-value	Odds ratio
Age more than 6 years	10	22	32	0.40	0.64
Male sex	15	44	59	0.74	0.81
Relapse	18	33	51	0.01	6.27
Serum cholesterol more than 400 mg/dl	10	25	35	0.67	1.25
Serum albumin less than 2 gm/dl	12	35	47	0.84	1.11

Urine culture was positive in 20 (26.32%) cases and the commonest micro-organism isolated was *Escherichia coli* (45%), followed by *Klebsiella* (20%), *Proteus* (20%), *Staphylococcus aureus* (10%) and *Enterococcus* (5%). Most of the micro-organisms were sensitive to Fluoroquinolones (especially ofloxacin), and fourth generation cephalosporins (cefepime) (Table 1). Amongst the different variables evaluated, relapse was found to be a risk factor for UTI with an odds ratio of 6.27 (Table 2).

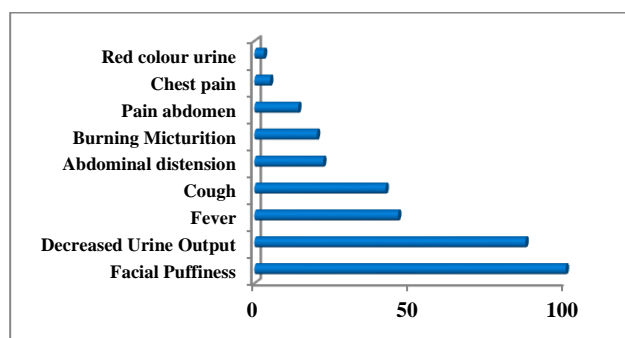


Figure 1: Clinical presentation of enrolled cases.

DISCUSSION

In the present study conducted over 76 nephrotic syndrome patients, UTI was found in 26.32% of cases, which is consistent with the findings of Moorani et al (25% prevalence among nephrotic syndrome).⁵ In comparison to present study Akl et al and Paul et al noted lower (9.5% and 7.14% respectively) and Kumar et al found higher (34%) prevalence of UTI.⁶⁻⁸ Paul et al included only fresh cases (first attack), which could be the reason of lower prevalence of UTI in their study. Senguttuvan et al demonstrated UTI to be the most common (46%) among all infections in these patients.⁹ Nephrotic syndrome predisposes to various systemic infections leading to overall higher prevalence of UTI in comparison to general population (1-3%).

Among the microorganisms isolated; *E coli* was the most common followed by *Klebsiella* and *Proteus* in the current study, which is similar to the observations of Moorani et al, Gulati et al, Senguttuvan et al and Paul et al.^{5,7,9,10} In a striking contrast Adeleke and Odedoyin found *staphylococcus aureus* to be the commonest pathogen of UTI.^{11,12}

In the present study, most of the micro-organisms isolated from urine were sensitive to Fluoroquinolone and 4th generation cephalosporins and among these groups; ofloxacin, and cefepime showed the best sensitivity pattern. Kumar et al found cephalosporins to be the most sensitive antibiotic for UTI.⁸ In present study conventionally recommended ceftriaxone and amikacin showed higher resistance among these organisms. Comments on rest of the antibiotics are difficult to make as these were tested only on limited organisms.

Amongst the 51 cases of relapse, UTI was noted in 18 (32.72%) in present study with an odds ratio of 6.27 ($p < 0.01$). In the study by Gulati et al all cases of UTI occurred only in steroid non-responders and relapse patients.¹⁰ UTI has been considered as an important cause of relapse of nephrotic syndrome also. When UTI and relapse are concomitantly present, it is difficult to infer about the primary event. In Gulati et al study serum albumin was found to be lower and cholesterol was found to be higher in UTI in comparison to non-UTI group.¹⁰ In contrast in our study these factors did not show relation with UTI ($p > 0.05$). Similar to us Senguttuvan et al also found no relation between serum albumin level and infections.⁹

The major strength of present study was adequate sample size and stringent criteria used to define UTI. Lack of follow up and detailed evaluation of UTI were our weakness.

CONCLUSION

About one fourth of nephrotic syndrome children have UTI at admission and relapse episode serves as an additional risk factor for it. Therefore UTI should be ruled out in every case of nephrotic syndrome before instituting specific therapy to attenuate associated morbidity and mortality. Gram negative enteric bacilli remain the most common agent. For empirical coverage fluoroquinolones and cefepime show the best sensitivity pattern.

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