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Original Research Article

Clinical profile and infection burden among children with nephrotic syndrome

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ABSTRACT

Background: Nephrotic syndrome is a common chronic kidney disorder in children and is frequently complicated by infections, which contribute significantly to morbidity and hospitalization. Understanding the clinical profile and infection burden is essential for improving management and outcomes.
Methods: This cross-sectional study was conducted in the Department of Pediatric Nephrology at Dhaka Shishu (Children) Hospital from January 2010 to November 2010. This study included 115 children aged 1-13 years diagnosed with nephrotic syndrome. Detailed clinical evaluation and relevant laboratory investigations were performed. Sociodemographic characteristics, presenting features and infectious complications were recorded and analyzed using appropriate statistical methods.
Results: The majority of children were between 2-6 years of age, with a mean age of 5.29±2.7 years. Male predominance was observed, with 70.43% (81) males and 29.57% (34) females (male-female ratio 2.3:1). Most patients were from rural areas (73.91%) and 52.17% belonged to poor socioeconomic backgrounds. Almost all patients presented with generalized edema, proteinuria and oliguria. Fever was present in 26.10% of cases and abdominal pain in 1.70%. Infection was a major complication. Urinary tract infection (UTI) was the most common infection, affecting 44.35% of patients, followed by pneumonia (6.09%), septicemia (4.35%), cellulitis (3.48%) and peritonitis (1.74%).
Conclusions: Nephrotic syndrome predominantly affects young male children and is associated with a considerable infection burden, particularly UTI. Early recognition and prompt management of infections are crucial to reduce morbidity and improve clinical outcomes.

Keywords: Nephrotic syndrome, Children, Clinical profile, Infection burden, Urinary tract infection

INTRODUCTION

Nephrotic syndrome is one of the most common chronic kidney disorders in children and represents a significant cause of pediatric hospital admissions. It is characterized by massive proteinuria, hypoalbuminemia, edema and hyperlipidemia.[1] The condition results primarily from increased glomerular permeability, leading to substantial urinary protein loss and subsequent reduction in plasma oncotic pressure.[2] Clinically, children often present with periorbital puffiness, generalized edema, ascites and varying degrees of systemic symptoms.[3] Although the majority of cases in childhood are idiopathic and steroid responsive, the disease course is frequently marked by relapses and complications that contribute to considerable morbidity.

Infections are among the most serious and frequent complications of nephrotic syndrome in children.[4] Multiple factors predispose these patients to infections, including urinary loss of immunoglobulins and complement factors, edema fluid acting as a culture medium, malnutrition and the immunosuppressive effects of corticosteroids and other therapeutic agents. Both common and severe infections may occur, such as UTIs, pneumonia, septicemia, peritonitis and cellulitis.[5] These infections not only prolong hospital stay but may also precipitate relapses, increase healthcare costs and in severe cases, lead to life-threatening outcomes.[6]

The clinical presentation of nephrotic syndrome can vary depending on age, nutritional status, socioeconomic background and access to healthcare services.[7] In resource-limited settings, delayed presentation and higher rates of infectious complications are frequently observed. Overcrowding, poor hygiene practices, limited awareness and inadequate early treatment of minor infections may further increase susceptibility.[8] Additionally, recurrent hospitalizations and prolonged steroid therapy may compound the infection burden in affected children.

Understanding the clinical profile and pattern of infections among children with nephrotic syndrome is essential for early detection, prompt management and prevention of complications.[9] Identifying the most common infections and associated risk factors can guide empirical therapy, improve patient counseling and support the development of preventive strategies.[10]

Therefore, this study aimed to evaluate the clinical characteristics and infection burden among children with nephrotic syndrome, highlighting the spectrum of presenting features and the pattern of infectious complications in hospitalized pediatric patients.

METHODS

This cross-sectional study was conducted in the Department of Pediatric Nephrology at Dhaka Shishu (Children) Hospital from January 2010 to November 2010. A total of 115 children aged 1 to 13 years diagnosed with nephrotic syndrome were enrolled according to the inclusion criteria. All admitted patients with nephrotic syndrome, including those presenting with ascites, were included. Critically ill children with respiratory distress or shock, those with acute or chronic renal failure, urogenital anomalies and surgical conditions were excluded. Ethical approval was obtained from the institutional ethical review committee and written informed consent was secured from parents or legal guardians after explaining the study objectives, procedures, risks and benefits in understandable language.

Detailed history and thorough clinical examinations were performed using a structured questionnaire. Routine investigations included urine microscopy, urine culture and sensitivity, spot urine protein-creatinine ratio, lipid profile, complete blood count with peripheral smear, platelet count, ESR, serum total protein, serum albumin, serum electrolytes, blood urea, serum creatinine and ultrasonography of the kidney-ureter-bladder region. Renal biopsy was performed when indicated, such as in cases of persistent hematuria, hypertension, hypocomplementemia, impaired renal function, frequently relapsing nephrotic syndrome with steroid toxicity or dependence and steroid resistance. Screening for infections included urine culture, blood culture, throat swab culture, peritoneal fluid and cerebrospinal fluid examination when indicated, chest X-ray, Mantoux test and ELISA for HBsAg and anti-HCV.

Five milliliters of venous blood were collected aseptically and processed promptly. Clean-catch midstream urine samples were collected under supervision, cultured on blood and MacConkey agar and analyzed using standard microbiological techniques. Data were analyzed using SPSS version 12 and Epi Info version 6.

RESULTS

A total of 115 nephrotic syndrome children included in this study. Majority of children lies between 2-6 years and mean age were 5.29±2.7 years (ranges 1 to 13 years) (Table 1).

Table 1: Age distribution of nephrotic syndrome patients, (n=115).

Age (in years)	N	Percentage (%)
<2	4	3.48
2-6	61	53.04
>6	50	43.48

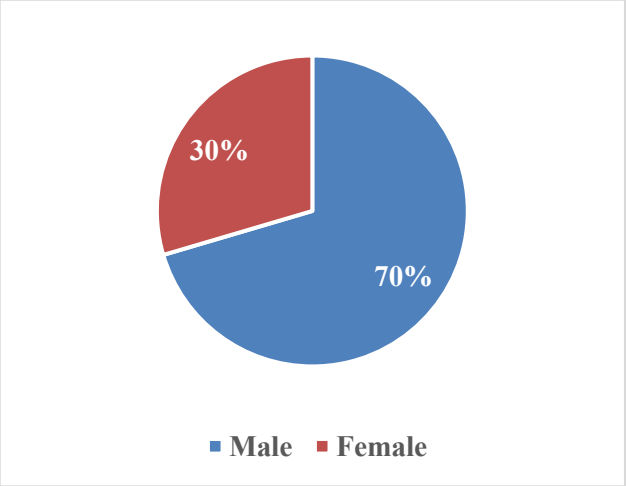

Figure 1: Distribution of sex of nephrotic patients, (n=115).

Among the children with nephrotic syndrome, 70.43% (81) were male and 29.57% (34) were female with a male female ratio is 2.3: 1 (Figure 1).

Most of patients of nephrotic syndrome came from rural area 73.91% (85) having poor socioeconomic background 52.17% (60) (Table 2).

Table 2: Sociodemographic data of nephrotic syndrome patients, (n=115).

Socio demographic data		N	Percentage (%)
Residence	Urban	30	26.09
	Rural	85	73.91
Socioeconomic status	Poor	60	52.17
	Average	49	42.61
	Well to do	6	5.22
Immunization status	Immunized	81	70.43
	Not immunized	34	29.57
Mother's education	No education	53	46.09
	Primary	40	34.78
	>Primary	22	19.3

Table 3: Presenting features of nephrotic syndrome (Multiple response).

Presenting features	N	Percentage (%)
Generalized swelling	94	81.74
Proteinuria	115	100
Oliguria	110	95.70
Hematuria	9	7.80
Fever	30	26.10
Abdominal pain	7	6.10
Sore throat	2	1.70

At a glance from this table-iv, we can see that almost all patients were presented with generalized swelling, proteinuria and oliguria. Out of 115 patients, 30 patients (26.10%) were presented with fever and 7 patients (1.70%) with abdominal pain (Table 3).

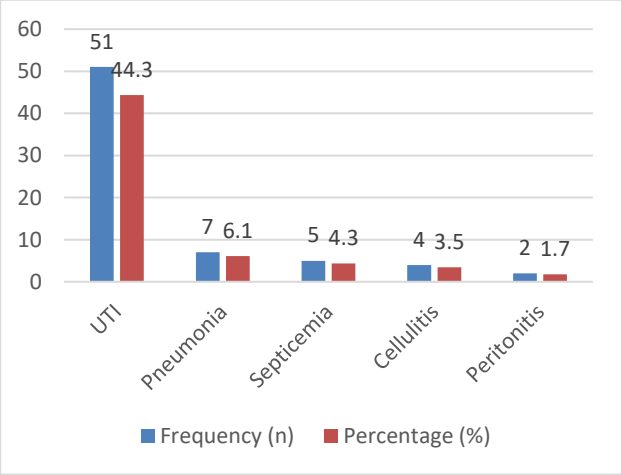

Figure 2: Pattern of infections in nephrotic syndrome.

Most common infection in nephrotic syndrome is UTI. Out of 115 patients 51 had UTI which is equivalent to 44.35%, followed by pneumonia 7(6.09%) and septicemia 5(4.35%), cellulitis 4(3.48%), peritonitis 2 (1.74%) (Figure 2).

DISCUSSION

This study highlights the clinical characteristics and infection burden among children with nephrotic syndrome. The majority of our patients were between 2-6 years of age, with a mean age of 5.29±2.7 years, which is consistent with the known peak incidence of childhood nephrotic syndrome in early childhood. Schachter et al described the clinical homogeneity of pediatric nephrotic syndrome despite molecular heterogeneity, emphasizing its common presentation in younger children.[11] Similarly, Lande et al reported comparable age distribution patterns in children receiving steroid therapy.[12]

A clear male predominance was observed in our study (70.43% male; male-female ratio 2.3:1), which aligns with previous literature. Doe et al also documented a higher frequency among boys in their cohort of African children, supporting the gender distribution seen in our findings.[13] This consistent male preponderance may reflect genetic and immunological factors influencing disease susceptibility.

Most of our patients came from rural areas (73.91%) and poor socioeconomic backgrounds (52.17%). Socioeconomic determinants are known to influence disease outcome and complication rates. Warady et al highlighted the global disparities in childhood kidney diseases, noting that limited healthcare access and poor living conditions may worsen outcomes.[14] Furthermore, Breman JG emphasized how environmental and socioeconomic determinants contribute to infection burden in children, which may similarly increase vulnerability among nephrotic patients.[15]

Clinically, almost all children in our series presented with generalized swelling, proteinuria and oliguria, reflecting classical features of nephrotic syndrome. Brogan et al described edema and heavy proteinuria as hallmark presentations in idiopathic nephrotic syndrome, consistent with our observations.[16] Fever was present in 26.10% of cases, suggesting concurrent infection in a significant proportion.

Infections were a major complication in this study. UTI was the most common infection, affecting 44.35% of patients, followed by pneumonia (6.09%), septicemia (4.35%), cellulitis (3.48%) and peritonitis (1.74%). The high prevalence of UTI may be attributed to urinary immunoglobulin loss and impaired host defense. Bagga A emphasized that infections, particularly UTI and peritonitis, are frequent complications in steroid-treated nephrotic children.[17] Likewise, Madhi et al demonstrated increased susceptibility to bacterial infections in immunocompromised pediatric populations, which supports the infection trends observed in our cohort.[18]

Immunosuppressive therapy further increases infection risk. Prasad et al reported infection as a notable complication in children receiving cyclophosphamide for steroid-dependent nephrotic syndrome.[19] Similarly, Iyengar et al observed infectious morbidity among children treated with cyclosporine.[20] The immunosuppressive effect of prolonged steroid therapy may partly explain the infection burden seen in our patients.

Peritonitis, though less frequent (1.74%) in our study, remains a serious complication. Abeyagunawardena et al highlighted infection-related relapses and complications in nephrotic children, reinforcing the need for preventive strategies.[21]

Limitations

This study was conducted in a single tertiary care hospital with a relatively small sample size of 115 patients, which may limit the generalizability of the findings to the wider population. As it was a cross-sectional study, causal relationships between risk factors and infections could not be established. Additionally, long-term outcomes and relapse patterns were not assessed, which might have provided a more comprehensive understanding of infection burden in nephrotic syndrome.

CONCLUSION

Nephrotic syndrome in children predominantly affected younger age groups with a clear male predominance in this study. Infection was a major complication, with UTI being the most common, followed by pneumonia and septicemia. Early identification of infections, careful monitoring and prompt management are essential to reduce morbidity and improve clinical outcomes in children with nephrotic syndrome.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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