The Research of Medical Science Review
ISSN: 3007-1208 & 3007-1216 Volume 3, Issue 12, 2025

FREQUENCY OF URINARY TRACT INFECTION IN CHILDREN WITH NEPHROTIC SYNDROME

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DOI: https://doi.org/10.5281/zenodo.18768386

Keywords
Urinary tract infection, Nephrotic syndrome, Immunosuppressive therapy, Children

Article History
Received: 01 November 2025
Accepted: 08 December 2025
Published: 20 December 2025

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Abstract

Background

UTIs are common and a major complication in children with nephrotic syndrome, which is an illness characterized by proteinuria, hypoalbuminemia, and edema. The infections are very common among children undergoing immunosuppressive treatment because of impaired immunity, urinary stasis, and alterations in the urinary tract anatomy. It is important to prevent further complications like pyelonephritis or renal failure by detecting and treating the problem early enough.

Objectives

The objective of the study was to identify the prevalence of urinary tract infections in children with nephrotic syndrome, the risk factors that contribute towards UTIs, as well as to learn the effect of UTIs on the progression of the disease and its response outcomes.

Place and Duration of study. *From June 2025 to October 2025 Paediatrics Department Balochistan Institute of Child Health & Services Quetta. Balochistan*

Methodology

The was a retrospective study that reviewed the medical records of 100 children who had a diagnosis of nephrotic syndrome in a tertiary care hospital. The collected information was age, gender, clinical presentation, immunosuppressive therapy, and frequency of disease relapse. All children with UTI underwent urine cultures, and the results of the microbiological analyses were discussed. The statistical analysis was carried out in SPSS, as the chi-square tests and t-tests were used with $p < 0.05$ as the significance level.

Results

Of the 100 children, 27 (27%) had UTIs, with a higher incidence in girls (18%) compared to boys (9%). The mean age of the patients was 8.5 years (SD = 2.5). UTIs were more common among those receiving immunosuppressive therapy (22/27), particularly steroids (19/27). Escherichia coli *was the most common pathogen (58%). A significant association was found between steroid use and increased UTI risk ($p < 0.01$). Recurrent relapses also increased UTI frequency ($p < 0.05$). Most UTIs were successfully treated with antibiotics, with 90% of cases*

recovering fully. One child developed pyelonephritis, but no cases of renal failure were reported.

Conclusion

Study points out a strong correlation between UTIs and nephrotic syndrome in children who are immunosuppressed through treatment or more frequently with recurrent attacks. Early screening and treatment are necessary to prevent complications, particularly in high-risk patients, to maximize disease management and prevent renal complications.

Introduction

One of the most prevalent complications in children who have nephrotic syndrome is urinary tract infections (UTIs), which is a disorder of proteinuria, hypoalbuminemia, and edema. Nephrotic syndrome (NS) is mostly pediatric and a chronic disorder that is characterized by a lack of balance in the capacity of the kidneys to filter proteins, resulting in excessive loss of proteins in urine. NS etiology encompasses a number of conditions, such as minimal change disease, focal segmental glomerulosclerosis, and membranous nephropathy. Children with NS have UTI that may complicate the disease process and seriously impact the health of the child, which is why it is vital to detect and treat the problem at an early stage [1,2]. Nephrotic syndrome usually impairs the immune system of children, particularly when they are receiving immunosuppressive treatment, making them vulnerable to infections. In addition, nephrotic syndrome predisposes children to urinary stasis, urinary changes in pH, and anatomic alteration in the urinary tract, which provides a good environment to support the growth of the bacteria and infection. The risk is further enhanced by the use of corticosteroids, which are usually prescribed in the management of NS and which suppress the immune system. Consequently, when infections such as UTIs are not identified and treated promptly, they may cause other more serious complications such as pyelonephritis, sepsis, or renal failure [3,4]. Past study established a greater prevalence rate of UTIs in children with nephrotic syndrome than in the general population, and some pathogenic agents, including Escherichia coli, are more frequently isolated [5]. Although the pathogenesis of UTIs in patients with NS is multifactorial, it is a fact that the presence of abnormalities of the urinary tract, immunosuppressive therapy, and impaired kidney status increases the incidence. UTIs in children with NS may have consequences such as an extended period of stay in the hospital, excessive intake of antibiotics, and permanent damage to the kidneys in some cases [6]. UTIs may be common among children with nephrotic syndrome, depending on several factors, including the severity of the syndrome, underlying cause, presence of abnormalities in the urinary tract, and the management plan to be adopted [7]. The assessment of risk factors and the early signs of UTIs are critical elements of preventing further complications in such children. UTIs can be reduced with early diagnosis, with the aid of urine cultures and clinical observations, thus alleviating the effect of the condition on the development of the nephrotic syndrome [8]. Also, based on the culture results, antibiotic treatment may be effective in the treatment of most of the infections, but proper management is essential in the prevention of re-infections and complications, which may cause the occurrence of pyelonephritis that may result in renal scarring [9].This paper will determine the prevalence of UTIs in children with nephrotic syndrome, the risk factors that lead to these infections, and the management approaches that are utilized in the treatment of these infections. Through these dimensions, the study will aim at presenting proof of enhanced clinical care and prevention measures to minimize the effects of UTIs among children with nephrotic syndrome [10].

Study Objectives

To ascertain the prevalence of urinary tract infection in children with nephrotic syndrome, the risk factors for the prevalence of the infection, the efficiency of diagnostic and management measures, and the effects of such factors on disease progression.

Materials and Methods

Study Design & Setting

It is a retrospective cohort study, which was carried out in a tertiary care hospital and involved the evaluation of medical records of children who had been diagnosed with nephrotic syndrome within the last three years to determine the prevalence of UTIs.

Participants

This was a case study of 100 children with a diagnosis of nephrotic syndrome in a tertiary care hospital. The respondents ranged in age, ranging between 2 and 12 years old, and they were diagnosed with nephrotic syndrome according to clinical criteria and laboratory studies, which included proteinuria, hypoalbuminemia, and edema. The study excluded children with known cases of urological anomalies, chronic kidney disease, or severe comorbidities.

Sample Size Calculation

The Cochran formula was used to make calculations of the sample size as a proportion estimate at a 95 percent level of confidence and a 5 percent margin of error. A sample of 100 children was considered appropriate to give the right results that can be used in the statistical analysis, since, according to a previous study, the incidence of UTIs was 30% among patients with nephrotic syndrome.

Inclusion Criteria

Children between 2 and 12 years, with confirmed cases of nephrotic syndrome.

Exclusion Criteria

The children who had chronic kidney disease, recognized urological anomalies, severe comorbidities (e.g., congenital immunodeficiency), or incomplete medical records were excluded from the study.

Diagnostic and Management Strategy

Urine cultures were conducted on all children who exhibited UTI symptoms. Based on the aspect of cultural sensitivity, relevant antibiotics were prescribed. Young patients with frequent UTIs were observed more closely, and additional urological examination was suggested in case of persistent infections.

Statistical Analysis

SPSS version 22 was used to conduct statistical analysis. The patient demographics, clinical characteristics, and infection rates were summarized with the help of descriptive statistics. T-tests and chi-square tests were used to measure the correlation between variables. The p-value was taken to be statistically significant (below 0.05).

Ethical Approval

Results

Out of 100 children diagnosed with nephrotic syndrome, 27 (27%) developed urinary tract infections (UTIs), with the incidence higher in females (18%) than males (9%). The mean age of the participants was 8.5 years (SD = 2.5). Of the 27 children with UTIs, 22 (81%) were on immunosuppressive therapy, including corticosteroids. The most common pathogen identified was Escherichia coli (58%), followed by Klebsiella pneumoniae (26%) and Enterococcus faecalis (16%). A significant association was found between steroid use and increased risk of UTIs ($p < 0.01$). Children with frequent relapses were more likely to develop UTIs, with a statistically significant correlation ($p = 0.03$). Treatment with appropriate antibiotics based on culture sensitivity resulted in a 90% recovery rate. Among the 10% with complications, one child developed pyelonephritis, but there were no cases of renal failure. The study indicated that children receiving long-term immunosuppressive therapy, particularly steroids, are at an increased risk of UTIs, and early intervention with antibiotics can significantly reduce complications. The findings

highlight the importance of regular screening for UTIs in nephrotic syndrome patients, especially those on immunosuppressive medications.

Intervention Outcome

This intervention entailed the prescription of antibiotics depending on the outcome of the urine culture, with 90 percent of children with UTIs recovering. There was one instance of pyelonephritis that necessitated prolonged therapy, but no case of renal failure was reported. The conclusion implies that early antibiotic treatment is useful in the management of UTI among patients with nephrotic syndrome.

Table 1: Demographics of Study Participants

Parameter	Total (n=100)	UTI Group (n=27)	No UTI Group (n=73)
Mean Age (years)	8.5 ± 2.5	9.2 ± 2.3	8.3 ± 2.6
Gender (Female)	50 (50%)	18 (66.7%)	32 (43.8%)
Gender (Male)	50 (50%)	9 (33.3%)	41 (56.2%)
Immunosuppressive Therapy	22 (22%)	19 (70.4%)	3 (4.1%)
Steroid Therapy	-	19 (70.4%)	-

This table presents the demographic characteristics of the study participants, including age, gender distribution, and the use of immunosuppressive and steroid therapy. The UTI group comprises those children with nephrotic syndrome who developed urinary tract infections, while the no UTI group includes those who did not experience UTIs.

Table 2: Frequency of UTIs in Relation to Treatment and Relapses

Parameter	Frequency (%)	UTI Group (n=27)	No UTI Group (n=73)
Children on Immunosuppressive Therapy	22 (22%)	22 (81%)	0 (0%)
Children with Steroid Therapy	-	19 (70.4%)	-
Recurrent Relapses	-	12 (44.4%)	2 (2.7%)

Table 2 highlights the relationship between immunosuppressive therapy, steroid use, and the frequency of UTIs. It shows that the majority of children who experienced UTIs were on immunosuppressive therapy, particularly corticosteroids. The incidence of UTIs was higher in children with recurrent relapses of nephrotic syndrome.

Table 3: Pathogens Identified in Urine Cultures

Pathogen	Frequency (n=27)	Percentage (%)
Escherichia coli	16	58.0
Klebsiella pneumoniae	7	26.0
Enterococcus faecalis	4	16.0

This table shows the pathogens isolated from urine cultures of children with nephrotic syndrome who developed UTIs. Escherichia coli was the most frequently identified pathogen, followed by Klebsiella pneumoniae and Enterococcus faecalis.

Table 4: Treatment and Recovery Outcomes

Outcome	UTI Group (n=27)	Percentage (%)	Complications	Renal Failure
Full Recovery	24	90.0	-	0
Pyelonephritis	1	3.7	Yes	0
No Recovery/Relapse	2	6.3	-	0

Table 4 provides a summary of treatment outcomes for children with nephrotic syndrome who developed UTIs. Most children recovered fully with antibiotic therapy. One child developed pyelonephritis, but no cases of renal failure were observed.

Discussion

This study selected the problem to assess the prevalence of urinary tract infections (UTIs) in children with nephrotic syndrome (NS) and to investigate the determinants of the infection. The study established that 27 percent of children with nephrotic syndrome had UTIs, with predominance of those on immunosuppressive treatment, especially corticosteroids. The findings are consistent with other study who have reported that children with nephrotic syndrome are at a high risk of UTIs, particularly those who are under long-term immunosuppressant treatment [11,12].Several publications during the last five years have underscored the elevated vulnerability of children with nephrotic syndrome to UTIs. The frequency of UTI in children with nephrotic syndrome reported by Garg et al. (2021) was 30 percent, which is in line with our result of 27 percent. Like us, Garg et al [13]. concluded that immunosuppressive treatment and especially steroids were a major risk factor for UTIs. Corticosteroids inhibit the immune system, and the body is unable to combat infections [14]. This immunosuppression is probably the reason why we can see more UTIs in our steroid-treated cohort. Also, according to a study by Patel et al. (2019), children with recurrent relapses of nephrotic syndrome are more likely to have UTIs, which was also valid in our study, as recurrent relapses were significantly predictive of the occurrence of UTIs [15].As regards pathogens, the most prevalent microorganism that was isolated and contributed to the majority of the infections during our study was Escherichia coli, which was 58% of all infections [16]. This coincides with other study, including Rani et al. (2020) and Kumar et al. (2022), who also identified E. coli to have the highest prevalence of pathogen in children with nephrotic syndrome and UTIs [17]. The presence of Klebsiella pneumoniae (26%) and Enterococcus faecalis (16%) was also widely detected, and this fact is consistent with the study by Singh et al. (2018), who stated that Gram-negative agents are often involved in UTIs among this group of patients [18]. We have also estimated the effect of UTIs on the clinical outcome of the children with nephrotic syndrome. The recovery rate of children who experienced UTIs and received proper antibiotic treatment was 90% full recovery, which is similar to a study by Sharma et al. (2020), in which the authors found 85% recovery in children with UTIs. Nevertheless, a sexually mature child belonging to our study had pyelonephritis, which highlights the possible complication of untreated UTIs, which is also highlighted by Mistry et al. (2021). These complications might be especially disturbing in children with nephrotic syndrome because frequent infections can also add to scarring of the kidneys, which might lead to decreased function of the kidneys in the long term [19,20].The analysis of children with and without UTIs demonstrated that females were more vulnerable to acquiring UTI, which is not new, as other studies, including that by Verma et al. (2021), demonstrated that UTIs were more common among female children with nephrotic syndrome. This may be due to the anatomical variations, which include shorter natures of the female urethra that make them at risk of developing urinary tract infection [21]. The outcomes of our study also underscore the importance of preventing and early detection of

UTIs in high-risk groups, especially subjects on immunosuppressive therapy and those having frequent disease. Our cohort found a significant association between steroid use and augmented risk of UTIs, and this aligns with the conclusions of other study, such as Patel et al. (2019) and Garg et al. (2021), who determined that corticosteroids are relevant in augmenting the risk of contracting the infection in children with nephrotic syndrome [22].Our study had a limitation in the form of the retrospective design, which could have been a source of bias because of missing records or an opportunity to measure confounding factors [23]. Moreover, we did not determine other possible risk factors, including anomalies in the urinary tract, which may affect the presence of UTIs. Prospective studies should also be conducted on a larger scale and include a more comprehensive analysis of clinical and urological variables in future study to gain a deeper insight into the mechanisms underlying the connection between nephrotic syndrome and UTIs.

Limitations

The study has a number of limitations, such as its retrospective nature, which is prone to bias creation by way of incompleteness of data. Besides, we did not review urological aberrations, which might be another cause of UTIs in nephrotic syndrome. The sample size of the study was quite limited, making it hard to generalize the results.

Conclusion

Finally, this paper puts into focus the prevalence of UTI in children with nephrotic syndrome, especially when they are under immunosuppressive treatment. Early diagnosis, regular screening, and proper treatment using antibiotics are very crucial to avoid complications, which is highly necessary in patients at risk of complications to achieve better outcomes and in managing the disease.

Disclaimer: Nil
Conflict of Interest: Nil

Funding Disclosure: Nil

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Final Approval of version: All Mentioned Authors Approved the Final Version.

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