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Pattern of Infections in the Children Suffering with Nephrotic Syndrome

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ABSTRACT:

Background: Children with nephrotic syndrome are more susceptible to infection due to both the illness itself and the use of several immunosuppressive drugs. Most frequently, infections result in relapses that increase the risk of morbidity and death, require hospitalization, and require treatment. Due to infections, children with nephrotic syndrome (NS) have a high rate of morbidity and death. The reported forms of infections differ widely, and little is known about how patient features or therapy may impact the likelihood of infection. Considering this, our aim was to look into the pattern and frequency of infections in children with nephrotic syndrome. Due to infections, children with nephrotic syndrome still experience high rates of morbidity and death. It might also be the reason for a bad reaction to steroid treatment, the onset of illness, or relapses.

Aim: The purpose of this study was to ascertain the kind and incidence of severe infections in children with nephrotic syndrome.

Material and Method: This cross-sectional study was descriptive in nature and was conducted by the Department of Pediatrics. All children aged 2 to 12 who fulfilled the criteria for nephrotic syndrome as defined by the Study of Kidney Disease in Children (ISKDC) were included, regardless of whether they were infected. This covered every case of relapse that was brought into the hospital's pediatric unit while the trial was underway. Acute or chronic renal insufficiency, as well as urogenital anomalies, were excluded from the study. During this time, ninety children were eligible for the study; however, ten of them either ran out of the hospital or refused to take part. Thus, a total of eighty children participated in the study. After obtaining signed informed consent, we started enrolling people in the ongoing trial. Written, informed consent was provided by patients or their guardians who wished to take part in the trial.

Results: There were 51 (63.75%) episodes of major infections in 48 children with nephrotic syndrome. Three children had multiple infections. Thirty-Seven (46.25%) episodes of major infections occurred during relapses and 14 (17.5%) during the initial episode of nephrotic syndrome.

Conclusion: Children with NS are prone to infections; peritonitis, pneumonia, urinary tract infections, and diarrhea are the most common ailments. When an infection arises, these children's hospital stays are far longer than those of nephrotic children who do not have an infection. Given the prevalence of pneumococcal infection in our study, we advise more widespread pneumococcal vaccination coverage in such youngsters. In conclusion, major infections—especially during relapses—remain a major risk factor for kids with nephrotic syndrome. Drug-resistant organisms should be taken into account while treating infections in children with nephrotic syndrome.

Keywords: Major infections, Peritonitis, Nephrotic syndrome and Septicemia.

Introduction:

Nephrotic syndrome (NS), which is characterized by edema, hyperlipidemia, hypoalbuminemia, and selective proteinuria, is one of the most common chronic renal disorders in children. The majority of instances with nephrotic syndrome without an underlying secondary etiology are referred to as idiopathic nephrotic syndrome (INS). Based on how effectively the patients respond to treatment, these cases are further classified as steroid-sensitive (SSNS) and steroid-resistant nephrotic syndrome (SRNS). More than half of SSNS cases experience recurring episodes or develop a steroid dependence that requires repeated rounds of asteroid-sparing medicines as well as other immunosuppressive treatments.[1] Although this condition can affect people of any age, it primarily affects youngsters. Treatment for this illness frequently consists of a cycle that involves drug-free remission, medication lowering and cessation gradually, and relapse(s) that cause the body to expand once more. Some children experience these cycles of recovery and return for months or even years at a time, which worries both the family and the child. When there isn't an inflammatory lesion or glomerular deposit, the effacing of podocyte foot processes is typically the main pathogenetic mechanism involved.[2] However, the majority of kids with primary nephrotic syndrome continue to have normal glomerular function, which refers to the ability to filter waste products or the overall glomerular filtration rate.[3] Infections remain an important cause of morbidity and mortality in children with nephrotic syndrome. [4,5] Pneumococcal infections are the most common invasive bacterial infections in these children. Infections can lead to prolonged hospital admissions, poor response to steroid therapy, and recurrent relapses.[6] Urinary tract infections and acute respiratory infections are the most frequent infectious factors causing relapses. Immunosuppression in nephrotic syndrome patients may mask the typical clinical presentation of infections, postponing necessary medical intervention. Understanding the infection pattern is essential to providing these children with the proper care and putting preventative measures in place. The range of infectious agents and the pattern of infections in these children differ throughout different regions of India.[7,8]

In western countries, 2 to 7 out of every 10,000 people under the age of 16 have nephrotic syndrome; these cases account for around 1% of hospital admissions.[9,10] However, Asians have a higher annual incidence of nephrotic syndrome than Caucasians. In 2011, the prevalence of nephrotic syndrome was 6.61 percent higher in South Asians than in Europeans.[11] Nephrotic syndrome patients have weakened immune systems, which makes them more susceptible to infection.[12] Numerous factors, such as tissue edema, immunoglobulin loss, urine complement, and adverse effects of corticosteroids and cytotoxic medication, might weaken the host's immune system.[13] In order to reduce morbidity and death, increased susceptibility to infection requires early identification and treatment.[14] It is already widely known that infections significantly contribute to morbidity and mortality in children with NS. Infections can lead to prolonged hospital admissions, poor response to steroid therapy, and recurrent relapses.[15] Before the development of corticosteroids and antibiotics, forty percent of children with NS died, and fifty percent of these deaths were due to infection, many of which were preventable.[16] Recent research has demonstrated that at least 50% of cases of NS with a juvenile start are preceded by a viral upper respiratory tract infection. This can be explained by either a non-specific host response to infection or a cross-reacting antibody response.[17]

Material and Methods

This cross-sectional study was descriptive in nature and was conducted by the Department of Pediatrics. All children aged 2 to 12 who satisfied the criteria for nephrotic syndrome as defined by the Study of Kidney Disease in Children (ISKDC) were included, regardless of whether they were infected. All relapse patients admitted to the hospital's pediatric ward during the study period were included in this. Acute or chronic renal insufficiency, as well as urogenital anomalies, were excluded from the study.

During this time, ninety children were eligible for the study; however, ten of them either ran out of the hospital or refused to take part. Thus, a total of eighty children participated in the study. Along with completing a comprehensive demographic and clinical history, the principal investigator conducted a thorough physical examination. The information was entered onto a data collection sheet. After obtaining signed informed consent, we started enrolling people in the ongoing trial.

Inclusion criteria:

In the present study, we included children between 2-12 years of age with a diagnosis of NS who were brought to either OPD or admitted to the IPD of the hospital.

Exclusion criteria:

Children who were solely admitted for diagnostic renal biopsy or immunosuppressive medication infusion (cyclophosphamide, pulse dexamethasone), or who had symptoms of nephritis or secondary NS, were excluded.

Statistical Analysis

After collection, data were checked meticulously, then entered and analyzed using SPSS (Statistical Package for Social Science, IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.). Proportions were compared with the Chi-square test or Fisher's Exact test where appropriate. When comparing baseline patient characteristics, a p-value <0.05 was considered significant. Descriptive statistics were presented with frequency and percentages.

Result: -

Table 1: Pattern of infections in nephrotic syndrome

Major infections	Total n (%)	Initial episode n (%)	Relapses n (%)
Pneumonia	21 (26.25%)	6 (7.5%)	15 (18.75%)
Urinary tract infections	13 (16.25%)	2 (2.5%)	11(13.75%)
Septicemia	9 (11.25%)	2 (2.5%)	7(8.75%)
SBP	4 (5%)	0	4 (5%)
Cellulitis	2 (2.5%)	2 (2.5%)	0
Perinephric abscess	1 (1.25%)	1 (1.25%)	0
Pulmonary tuberculosis	1 (1.25%)	1 (1.25%)	0
Total infections	**51 (63.75%)**	**14 (17.5%)**	**37 (46.25%)**

There were 51 (63.75%) episodes of major infections in 48 children with nephrotic syndrome. Three children had multiple infections. Thirty-Seven (46.25%) episodes of major infections occurred during relapses and 14 (17.5%) during the initial episode of nephrotic syndrome.

Discussion

Children with nephrotic syndrome have a high mortality and morbidity rate because of serious infections. There is a dearth of research on major infections in children with nephrotic syndrome in India. This is quite comparable to the findings of **Manish et al2019**[18] who in their Indian study found the incidence of major infection in hospitalized nephrotic children to be 43.8%. Even while the bulk of Indian research have revealed major infection occurrences in the range of 20–35%, referral bias and a high level of clinical suspicion for infections in these children may be to blame for the relatively greater frequency of infection in our study cohort. The most common infections in our study were peritonitis, pneumonia, UTIs, and diarrhea.

Senguttuvan et al2004[19] observed E. coli and Klebsiella as predominant organisms in peritonitis. Similar to our finding that UTI was the commonest infection in such children, one of the largest retrospective analyses in children with NS to determine the incidence of UTI found that 15% of children had UTI, with more than 50% being asymptomatic and diagnosed as a part of screening investigations for relapse and

non-response. This highlights the importance of screening for UTI in all children with NS who do not respond to corticosteroids or relapse, as the anti-inflammatory qualities of medications might mask symptoms. In our study, there were three deaths (2.9%). All of the deaths occurred in nephrotic children with severe diseases, and the cause of death was sepsis-induced multiorgan failure. However, **Srivastava et al1987**[20] reported a higher death rate (13% of children died of infection) and mortality were highest within the first 24 hours of admission which indicates a fulminant nature of infections associated with NS. Nonetheless, early presentation, a high index of suspicion for infections, and fast treatment initiation can account for the reduced death rate in our investigation.

Peritonitis is one potentially deadly side effect of nephrotic syndrome. We suspect that 16 (18%) of our patients developed peritonitis based on the presence of ascites, vomiting, fever, and abdominal pain. The results of the culture sensitivity test have verified the diagnosis in nine of these patients.

A major consequence of nephrotic syndrome, spontaneous bacterial peritonitis occurs in 2-6% of cases, and an overwhelming infection has a 1.5 percent chance of fatality. It typically happens within the first two years following a nephrotic syndrome diagnosis. Ascites, low serum albumin, and weakened immunity are risk factors for peritonitis, which is typically multifactorial in nature. Although gram-negative germs can also cause peritonitis, encapsulated gram-positive pathogens—especially streptococcus pneumonia—cause the majority of cases.[21]

Both children with multiple infections presented with pneumonia and UTI was detected incidentally. **Gulati et al1995**[5] also reported multiple infections. There were no deaths in our investigation. Death rates fell from 40% in the pre-antibiotic era to 16% once antibiotics were widely used. Because of the high literacy rate in this part of the country and increased awareness about the condition, early treatment initiation made possible by proactive health-seeking behavior may have contributed to the study's zero mortality. In contrast, **Eddy et al.2003**[10], reported that pneumonia was more prevalent in children younger than 10 years of age, while UTI was most prevalent in children older than 10 years of age.

There was a high culture yield in our study. This may be the case because most children with follow-up nephrotic syndrome arrived at our clinic directly, exhibiting severe symptoms and no prior use of antibiotics.

The concurrent development of resistance in various bacterial species to antimicrobials of distinct structural classes can complicate therapeutic management of illnesses. Significant multidrug resistance was shown by the isolates in this study, especially the uropathogens. The development of MDR bacteria is primarily due to inappropriate use, insufficient antibiotic courses, and empirical antibiotic therapy.[22]

Conclusion:

Children with NS are prone to infections; peritonitis, pneumonia, urinary tract infections, and diarrhea are the most common ailments. When an infection arises, these children's hospital stays are far longer than those of nephrotic children who do not have an infection. Given the prevalence of pneumococcal infection in our study, we advise more widespread pneumococcal vaccination coverage in such youngsters. In conclusion, major infections—especially during relapses—remain a major risk factor for kids with nephrotic syndrome. Drug-resistant organisms should be taken into account while treating infections in children with nephrotic syndrome. Parental counseling is essential to providing these children with prompt care.

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