ORIGINAL RESEARCH PAPER
Volume - 15 | Issue - 06 | June - 2026 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

STUDY OF CLINICAL PATTERN AND OUTCOME OF NEPHROTIC SYNDROME IN PEDIATRIC PATIENTS ADMITTED AT GOVERNMENT MEDICAL COLLEGE, CHHATRAPATI SAMBHAJINAGAR, MAHARASHTRA

Paediatric Medicine

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ABSTRACT

Background: Nephrotic syndrome is one of the important chronic glomerular disorders in children and is characterized by nephrotic-range proteinuria, hypoalbuminemia, edema, and hyperlipidemia. Paediatric nephrotic syndrome is clinically relevant because of repeated relapses, infection-related morbidity, steroid exposure, and risk of steroid resistance.**Aim:** To study the clinical pattern, complications, and outcome of nephrotic syndrome in paediatric patients admitted or evaluated at a tertiary care hospital.**Materials and Methods:** This prospective observational study was conducted in the Department of Paediatrics, Government Medical College, Chhatrapati Sambhajinagar, Maharashtra, India. A total of 210 children aged 1–12 years diagnosed with nephrotic syndrome were included during the study period. Demographic details, clinical presentation, type of nephrotic syndrome, laboratory profile, complications, treatment response, and outcome were recorded using a structured proforma. Data were analyzed using descriptive statistics, and results were expressed as frequency and percentage.**Results:** Among 210 children, 84 (40.00%) were aged 4–6 years, 58 (27.62%) were aged 1–3 years, 44 (20.95%) were aged 7–9 years, and 24 (11.43%) were aged 10–12 years. Male patients were 128 (60.95%) and female patients were 82 (39.05%). Facial puffiness was present in 201 (95.71%), periorbital edema in 198 (94.29%), and pedal edema in 176 (83.81%) patients. First episode nephrotic syndrome was seen in 118 (56.19%) patients, while relapse-related presentations were seen in 85 (40.48%) patients. Severe hypoalbuminemia was observed in 147 (70.00%) patients and hypercholesterolemia in 184 (87.62%) patients. Infection was documented in 52 (24.76%) patients. Remission was achieved in 161 (76.67%) patients, while steroid resistance was observed in 7 (3.33%) patients.**Conclusion:** Paediatric nephrotic syndrome in the present study showed a higher proportion of cases in younger children and male patients. Edema-related symptoms were frequent clinical findings. Infection, hypertension, and acute kidney injury were relevant complications. Early diagnosis, structured follow-up, and timely identification of relapse or steroid resistance are important for improving outcomes.

KEYWORDS

Children, Complications, Nephrotic Syndrome, Paediatric Nephrology, Steroid Response

INTRODUCTION

Nephrotic syndrome in children is a clinical condition characterized by nephrotic-range proteinuria, hypoalbuminemia, edema, and commonly associated hyperlipidemia. It is one of the important chronic glomerular disorders encountered in paediatric practice and contributes substantially to outpatient visits, hospital admissions, and long-term follow-up in paediatric nephrology. The KDIGO 2025 guideline defines nephrotic syndrome in children using nephrotic-range proteinuria with hypoalbuminemia or edema and emphasizes standardized diagnosis, classification, treatment response assessment, and follow-up.[1]

International Paediatric Nephrology Association recommendations also describe idiopathic nephrotic syndrome as a frequent paediatric glomerular disease with variable clinical course and relapse pattern.[2] The clinical course of paediatric nephrotic syndrome is influenced by age at onset, steroid responsiveness, relapse frequency, infection, edema-related morbidity, hypertension, renal function, and adherence to treatment. Most children with idiopathic nephrotic syndrome respond to corticosteroid therapy, but relapse, steroid dependence, frequent relapses, and steroid resistance remain important clinical problems.[2,3]

Infections such as urinary tract infection, pneumonia, cellulitis, and spontaneous bacterial peritonitis can worsen morbidity and may precipitate relapse. Complications such as acute kidney injury, hypertension, severe edema, thromboembolic events, and treatment-related adverse effects require careful clinical monitoring.[1-4] Tertiary care hospitals in Maharashtra receive both newly diagnosed and complicated relapse cases, and systematic documentation of clinical pattern, complications, and short-term outcome can help improve paediatric care. The aim of the present study was to assess the clinical pattern, complications, and outcome of nephrotic syndrome in paediatric patients attending tertiary hospital.

MATERIAL AND METHODS

The present study was a prospective observational study conducted in the Department of Paediatrics, Government Medical College, Chhatrapati Sambhajinagar, Maharashtra, India. Study duration was of 2 years (January 2024 to December 2025). Study was approved by institutional ethical committee.

Inclusion criteria

- Children aged 1–12 years diagnosed with nephrotic syndrome.
- Patients fulfilling standard diagnostic criteria for nephrotic syndrome.
- Newly diagnosed cases and relapse cases admitted or evaluated during the study period.
- Patients whose parents or guardians provided informed consent.

Exclusion criteria

- Children with congenital nephrotic syndrome.
- Patients with secondary nephrotic syndrome due to systemic lupus erythematosus, Henoch–Schoenlein purpura, diabetes mellitus, hepatitis B, hepatitis C, or HIV.
- Children with chronic kidney disease at presentation.
- Patients with incomplete clinical or laboratory records.
- Patients whose parents or guardians refused consent.

The study population included paediatric patients aged 1–12 years diagnosed with nephrotic syndrome and admitted or evaluated during the study period. Consecutive sampling was used, and all children fulfilling the eligibility criteria were enrolled after obtaining informed consent from parents or guardians.

Data were collected using a predesigned structured proforma. Demographic details such as age and sex were recorded. Clinical details included presenting symptoms, edema distribution, fever, oliguria, abdominal pain, respiratory symptoms, blood pressure, previous episodes, relapse history, steroid exposure, and treatment history. General physical examination and systemic examination were performed in all patients. Laboratory investigations included urine routine microscopy, urine protein estimation or urine protein-creatinine ratio where available, serum albumin, serum cholesterol,

serum creatinine, complete blood count, and other tests as clinically indicated. Complement level and additional evaluation for secondary causes were performed when clinically suspected.

Nephrotic syndrome was defined using standard diagnostic criteria, including nephrotic-range proteinuria with hypoalbuminemia and edema. First episode, infrequent relapse, frequent relapse, steroid-dependent nephrotic syndrome, and steroid-resistant nephrotic syndrome were defined according to standard paediatric nephrology recommendations. Complications such as infection, spontaneous bacterial peritonitis, urinary tract infection, pneumonia, acute kidney injury, hypertension, thromboembolic event, and severe anemia were recorded based on clinical and laboratory evidence. Outcome during the study period was assessed in terms of remission, partial remission, relapse during follow-up, steroid resistance, referral to higher nephrology care, and death.

Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Frequency, percentage, means and standard deviations (SD) was calculated for the continuous variables, while ratios and proportions were calculated for the categorical variables. Statistical analysis was done using descriptive statistics.

RESULTS

Among 210 patients, 58 (27.62%) were aged 1–3 years, 84 (40.00%) were aged 4–6 years, 44 (20.95%) were aged 7–9 years, and 24 (11.43%) were aged 10–12 years. Male patients were 128 (60.95%) and female patients were 82 (39.05%).

Table 1- General characteristics

Characteristics	No. of subjects (n=210)	Percentage
Age group (in years)		
1–3 years	58	27.62
4–6 years	84	40.00
7–9 years	44	20.95
10–12 years	24	11.43
Gender		
Male	128	60.95
Female	82	39.05

Facial puffiness was present in 201 (95.71%) patients, periorbital edema in 198 (94.29%), pedal edema in 176 (83.81%), ascites in 83 (39.52%), fever in 52 (24.76%), oliguria in 69 (32.86%), abdominal pain in 40 (19.05%), and respiratory symptoms in 26 (12.38%) patients.

Table 2: Clinical presentation at admission/evaluation

Clinical presentation	Frequency	Percentage
Facial puffiness	201	95.71
Periorbital edema	198	94.29
Pedal edema	176	83.81
Ascites	83	39.52
Fever	52	24.76
Oliguria	69	32.86
Abdominal pain	40	19.05
Respiratory symptoms	26	12.38

First episode nephrotic syndrome was documented in 118 (56.19%) patients. Infrequent relapse was present in 42 (20.00%), frequent relapse in 28 (13.33%), steroid-dependent nephrotic syndrome in 15 (7.14%), and steroid-resistant nephrotic syndrome in 7 (3.33%) patients.

Table 3: Type of nephrotic syndrome presentation

Type of presentation	Frequency	Percentage
First episode	118	56.19
Infrequent relapse	42	20.00
Frequent relapse	28	13.33
Steroid-dependent nephrotic syndrome	15	7.14
Steroid-resistant nephrotic syndrome	7	3.33
Total	210	99.99

Severe hypoalbuminemia was observed in 147 (70.00%) patients, massive proteinuria in 210 (100.00%), hypercholesterolemia in 184 (87.62%), microscopic hematuria in 29 (13.81%), raised serum creatinine in 13 (6.19%), and low complement level in 4 (1.90%) patients.

Table 4: Laboratory profile

Laboratory finding	Frequency	Percentage
Severe hypoalbuminemia	147	70.00
Massive proteinuria	210	100.00
Hypercholesterolemia	184	87.62
Microscopic hematuria	29	13.81
Raised serum creatinine	13	6.19
Low complement level	4	1.90

Infection was documented in 52 (24.76%) patients. Spontaneous bacterial peritonitis was observed in 13 (6.19%), urinary tract infection in 18 (8.57%), pneumonia in 11 (5.24%), acute kidney injury in 10 (4.76%), hypertension in 24 (11.43%), thromboembolic event in 1 (0.48%), and severe anemia in 14 (6.67%) patients.

Table 5: Complications observed

Complication	Frequency	Percentage
Infection	52	24.76
Spontaneous bacterial peritonitis	13	6.19
Urinary tract infection	18	8.57
Pneumonia	11	5.24
Acute kidney injury	10	4.76
Hypertension	24	11.43
Thromboembolic event	1	0.48
Severe anemia	14	6.67

Remission was achieved in 161 (76.67%) patients, partial remission was seen in 21 (10.00%), relapse during follow-up occurred in 17 (8.10%), steroid resistance was observed in 7 (3.33%), referral to higher nephrology care was required in 3 (1.43%), and death occurred in 1 (0.48%) patient.

Table 6: Outcome during study period

Outcome	Frequency	Percentage
Remission achieved	161	76.67
Partial remission	21	10.00
Relapse during follow-up	17	8.10
Steroid resistance	7	3.33
Required referral to higher nephrology care	3	1.43
Death	1	0.48
Total	210	100.01

DISCUSSION

The present study assessed the clinical pattern, complications, and outcome of nephrotic syndrome among 210 paediatric patients in a tertiary care hospital in Maharashtra. Children aged 4–6 years constituted 84 (40.00%) cases, followed by 58 (27.62%) cases in the 1–3-year age group. This age distribution is consistent with standard paediatric nephrology literature, which describes childhood nephrotic syndrome as commonly presenting in early and middle childhood.[1-3] In the study by Agrawal and Singh[6] from Central India, the 5–7-year age group included 54.2% of cases, showing a similar concentration of cases in younger children. Tipparthy et al.,[7] reported 42.5% of patients in the 6–9-year age group in a rural tertiary care center, which was slightly older than the age distribution observed in the present study.

Male patients were 128 (60.95%) and female patients were 82 (39.05%) in the present study. This finding is comparable with Agrawal and Singh[6], who reported 73 (68.2%) male and 34 (31.7%) female patients among 107 children with nephrotic syndrome. Tipparthy et al.,[7] also reported male predominance, with 72.5% male patients. The male predominance observed in the present study is therefore consistent with recent Indian paediatric nephrotic syndrome studies and standard clinical experience.

Edema-related symptoms were the principal clinical findings in the present study. Facial puffiness was present in 201 (95.71%) patients, periorbital edema in 198 (94.29%), and pedal edema in 176 (83.81%). Oliguria was documented in 69 (32.86%) patients, fever in 52 (24.76%), abdominal pain in 40 (19.05%), and respiratory symptoms in 26 (12.38%). Tipparthy et al.,[7] reported edema in 100% and oliguria in 50% of patients. The present study had a similar edema-based clinical presentation, while the frequency of oliguria was lower. Such variation may be related to differences in timing of presentation, hydration status, referral pattern, and inclusion of first episode as well as relapse cases.

In the present study, first episode nephrotic syndrome was seen in 118

(56.19%) patients, while relapse-related presentations were seen in 85 (40.48%) patients, including infrequent relapse, frequent relapse, and steroid-dependent nephrotic syndrome. Agrawal and Singh[6] reported 39 (36.4%) newly diagnosed and 68 (63.6%) relapse cases. Tipparthy et al.,[7] reported 75% newly diagnosed cases and 25% relapse cases. The present study findings lie between these two patterns, suggesting that the study center received both newly diagnosed cases and relapse cases requiring tertiary-level evaluation.

Massive proteinuria was documented in all 210 (100.00%) patients, consistent with the diagnostic requirement for nephrotic syndrome. Severe hypoalbuminemia was present in 147 (70.00%) patients and hypercholesterolemia in 184 (87.62%). Microscopic hematuria was seen in 29 (13.81%), raised serum creatinine in 13 (6.19%), and low complement level in 4 (1.90%) patients. KDIGO and IPNA recommendations emphasize that nephrotic syndrome diagnosis is primarily based on nephrotic-range proteinuria, hypoalbuminemia, and edema, while atypical findings such as persistent hematuria, renal dysfunction, hypertension, or low complement require careful evaluation for alternative or secondary pathology.[1,2] The low proportion of patients with low complement in the present study supports that secondary nephrotic syndrome was uncommon after applying exclusion criteria.

Infections were documented in 52 (24.76%) patients in the present study. Urinary tract infection was present in 18 (8.57%), spontaneous bacterial peritonitis in 13 (6.19%), and pneumonia in 11 (5.24%). Kumar et al.,[8] reported that infections are common in children with nephrotic syndrome and affect clinical outcomes through morbidity, treatment interruption, and relapse precipitation. Tipparthy et al.,[7] reported urinary tract infection in 52.5% of cases, which is higher than the present study. This difference may be due to study setting, diagnostic screening, sample size, and proportion of hospitalized children. The present study also documented hypertension in 24 (11.43%), acute kidney injury in 10 (4.76%), thromboembolic event in 1 (0.48%), and severe anemia in 14 (6.67%) patients. These findings highlight the need for routine blood pressure monitoring, renal function assessment, infection screening, and early recognition of high-risk complications.

Remission was achieved in 161 (76.67%) patients and partial remission in 21 (10.00%) patients during the study period. Steroid resistance was observed in 7 (3.33%) patients. Agrawal and Singh[6] reported steroid sensitivity in 95 (88.8%) and initial steroid resistance in 12 (11.2%) patients. The lower steroid resistance proportion in the present study may reflect exclusion of children with chronic kidney disease at presentation, short-term outcome assessment, or earlier referral and treatment initiation. In children with steroid-resistant nephrotic syndrome, long-term outcome depends on histopathology, response to calcineurin inhibitors, sustained remission, and prevention of chronic kidney disease.[5,9] The present study documented referral to higher nephrology care in 3 (1.43%) patients and death in 1 (0.48%), indicating that adverse outcome was uncommon but clinically important.

The findings of the present study are broadly consistent with Indian data regarding younger age at presentation, male predominance, edema-based clinical presentation, infection as an important complication, and favourable short-term remission in a large proportion of children.[6-8] The study adds tertiary care data from Chhatrapati Sambhajinagar, Maharashtra, and may be useful for strengthening local protocols for early diagnosis, infection screening, relapse counselling, and follow-up of paediatric nephrotic syndrome.

Strengths of present study were, study was prospective and included 210 pediatric patients, allowing systematic assessment of clinical profile, complications, and outcomes. It provides useful tertiary care data on both first-episode and relapse cases of childhood nephrotic syndrome. Limitations of study were, study was single-center with limited follow-up, so long-term relapse, steroid toxicity, and chronic kidney disease outcomes could not be fully assessed. Renal biopsy and histopathological correlation were not available for all indicated cases.

CONCLUSION

Nephrotic syndrome in the present study showed a clinically recognizable pattern dominated by edema-related symptoms. Facial puffiness, periorbital edema, and pedal edema were frequent clinical presentations among the study participants. Massive proteinuria was present in all patients, while severe hypoalbuminemia and hypercholesterolemia were frequent laboratory findings. Infection, hypertension, acute kidney injury, spontaneous bacterial peritonitis, urinary tract infection, and pneumonia were documented complications.

Early diagnosis, careful monitoring for infections, assessment of renal function, and structured follow-up are essential in paediatric nephrotic syndrome. Tertiary care paediatric units should maintain standardized protocols for clinical assessment, relapse detection, complication management, and timely nephrology referral.

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