Journal of Pathology of Nepal (2024) Vol. **14**, 2150 -2155

Journal of
PATHOLOGY
of Nepal
www.acpnepal.com

Original Article

Spectrum of renal diseases in the pediatric population of Nepal

Nirajan Mainali[1], Barsha Acharya[2], Ganesh Phulara[2]

[1]*Department of Pathology, Kathmandu Medical College, Kathmandu, Nepal*
[2]*Department of Pathology, Pratham Pathology Laboratory, Lazimpat, Kathmandu, Nepal*

Keywords:

Chronic kidney disease, Glomerular diseases, Immunofluorescence, Light microscopy, Pediatric renal disease, Post-infectious glomerulonephritis, Rapidly progressive glomerulonephritis

ABSTRACT

Background: The spectrum of renal diseases varies with different ethnic populations, geographical locations and environmental factors. In children, many signs of kidney disease are either hidden or mimic other systemic diseases. There is a need of identifying renal disorders at an early stage to retard the rapid progression. This study aims to identify the different histopathological spectrum of glomerular diseases in pediatric renal biopsies.

Materials and Methods: This was a cross-sectional prospective study undertaken at the Pathology Department at Pratham Pathology Laboratory, Lazimpat for 17 months duration (May 1st 2022 - December 31st 2023). The final diagnosis was made by a pathologist after correlating the histopathological findings with immunofluorescence and other clinical and laboratory findings.

Results: A total of 97 pediatric patients' renal biopsy specimens were evaluated. Patients' age ranged from 0-16 years. The majority of patients were in the age group of 11-16 years (62.8%). The study showed slight female predominance with male to female ratio of 0.8:1. The most common glomerular disease was Lupus Nephritis with a frequency of 19 (19.6%). The most common cause for Rapid progressive Glomerulonephritis in the pediatric population was Post Infectious Glomerulonephritis with a frequency of 5 (50%).

Conclusions: The most commonly diagnosed glomerular disease in pediatric renal biopsies was Lupus Nephritis. The leading cause of Rapid Progressive Glomerulonephritis was Post Infectious Glomerulonephritis and Lupus was one of the leading causes of chronic kidney disease.

Correspondence:
Dr Nirajan Mainali, MD
Associate Professor,
Department of Pathology,
Kathmandu Medical College Teaching Hospital
ORCID ID: 0000-0002-6648-1914
Email: mainali_nirajan@hotmail.com

Received : January 27, 2024; **Accepted :** March 6, 2024

Citation: Mainali N, Acharya B, Phulara G. Spectrum of renal diseases in the pediatric population of Nepal. J Pathol Nep 2024;14(1): 2150-5. DOI: 10.3126/jpn.v14i1.65917

INTRODUCTION

Renal disease has been recognized as an important cause of mortality and morbidity in developing countries.[1] Spectrum of renal diseases varies among different ethnic populations, geographical locations and environmental factors.[2] There exists a difference in the pattern of renal diseases among various pediatric age groups and variation in the manifestation of the same disease at different phases of childhood.[3]

Kidney biopsy in the pediatric age groups as in the adult population is one of the most important investigations in

renal medicine.[4] It can provide diagnostic precision and prognostic value and guide therapeutic options for many renal diseases.[5]

Definition of some renal diseases:

Nephrotic Syndrome: Clinical triad of heavy proteinuria (24hrs urine protein 40mg/m^2/hr or 2mg/mg), hypoalbuminemia, and generalized edema.[6]

Rapidly progressive glomerulonephritis: Clinical syndrome defined by rapid loss (within days to weeks) of kidney function, accompanied by features of nephritic syndrome along with proteinuria, glomerular hematuria, and often oliguria.[7]

Chronic Kidney Disease (CKD): As per National kidney foundation, CKD is defined as presence of kidney damage, with a deterioration in GFR below 60ml/min/1.73m^2 of body surface area for > 3 months.[6]

Glomerular diseases have different histologic patterns and etiologies according to age and there are also primary and secondary disorders that can lead to glomerular diseases. In children, many signs of kidney disease are either hidden or they mimic other systemic diseases.[5] Due to limited resources available for the management, there is a delay in the diagnosis of acute kidney disease and chronic kidney disease which often contribute to the poor treatment outcomes seen in the developing countries.

So, there is a need for identifying renal disorders at an early stage to retard the rapid progression. There are very few published data on the histopathological spectrum of pediatrics renal disorders in Nepalese children.

Therefore, this study aimed to identify the different spectrum of glomerular diseases as well as recognizing the pathology underlying these diseases in pediatric renal biopsies.

MATERIALS AND METHODS

This is a cross-sectional prospective study undertaken at the Pathology Department, Pratham Pathology Laboratory, Lazimpat for 17 months (May 1st 2022 - Dec 31st 2023). A total of 97 pediatric patients aged between 0 (neonates) and 16 years with different glomerular diseases, undergoing renal biopsies that were received at the laboratory were enrolled in this study. Demographic data including age, sex and clinical diagnosis were recorded.

The final diagnosis was made by consultant pathologist after correlating the histopathological findings with immunofluorescence and other clinical and laboratory findings.

Selection and description of participants

All renal biopsies of pediatric age group patients (0 - 16 years age) received at the Pratham Pathology laboratory, and patient party willing to give informed written consent were included in the study. Adult patients of age > 17 years, inadequate kidney biopsy specimens and those who were unwilling to give consent were excluded from the study. All renal biopsies were processed following the standard processing technique, one each for light microscopy (LM) and immunofluorescence (IF). For light microscopy, paraffin sections were stained with hematoxylin and eosin stain, periodic acid schiff, masson trichome, congo red. For Immunofluorescence the slides were stained with Anti Human IgG, IgA, IgM, C3 and C1q.

Data were entered in Excel v 11 and exported to SPSS (Statistical Package for Social Sciences) 2020 for statistical analysis. For descriptive statistics frequency, percentage (%) and ratio were calculated along with graphical and tabular presentations.

RESULTS

In this study, 55 (56.7%) were females and 42 (43.3%) were males with male: female (M: F) ratio of 0.8:1. Majority of the patients were in the age group of 11-16 years (62.8%) followed by 6-10years (23.7%) and 0-5 years (13.4%). (Table 1, fig. 1). The minimum age of the patient was neonates and maximum age was 14 years.

DOI : 10.3126/jpn.v14i1.65917

Table 1: Age-wise categorical distribution of histopathological diagnosis

Histopathological Diagnosis	Age (years) 0-5	Age (years) 6-10	Age (years) 11-16
Lupus	2	3	14
Post-infectious Glomerulonephritis	1	3	14
Minimal change disease	3	3	6
IgA Nephropathy	1	5	3
Diffuse Proliferative Glomerulonephritis	1	1	6
Focal segmental glomerulosclerosis (NOS3, perihilar 1, tip 1)	0	2	3
Lupus like Nephritis	1	1	2
IgM Nephropathy	2	0	2
Antineutrophilic cytoplasmic antibody associated Rapidly progressive glomerulonephritis	0	1	2
Mesangioproliferative Glomerulonephritis	1	1	1
Membranous Nephropathy	0	0	2
Tubular Injury	0	1	1
Alport Syndrome	0	1	1
Descriptive	0	1	1
Membranoproliferative glomerulonephritis (Type 1)	0	0	1
Primary Hyperoxaluria	1	0	0
Acute Tubular Interstitial Nephritis	0	0	1
C3 Glomerulonephritis	0	0	1
TOTAL :	13	23	61

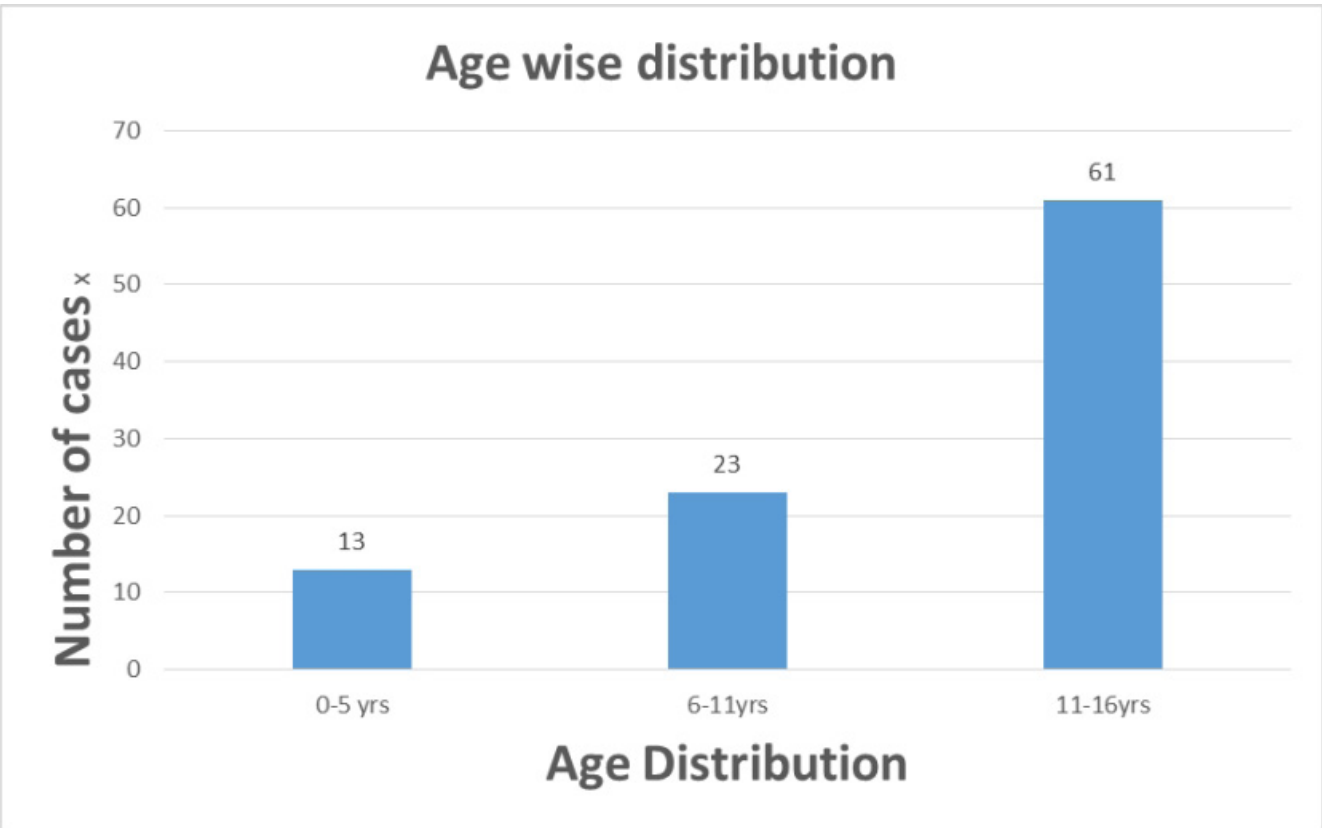

Figure 1: *Age-wise categorical distribution of cases*

DOI : 10.3126/jpn.v14i1.65917

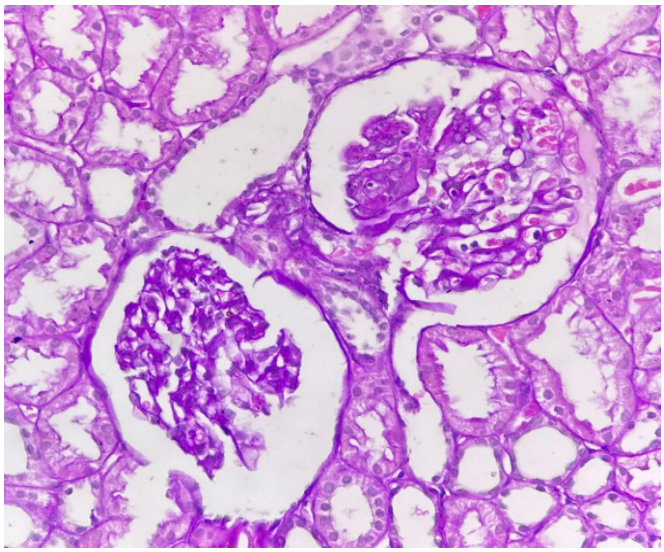

Figure 2*: Periodic acid schiff (PAS) stained slide showing FSGS lesion, NOS variant [40x].*

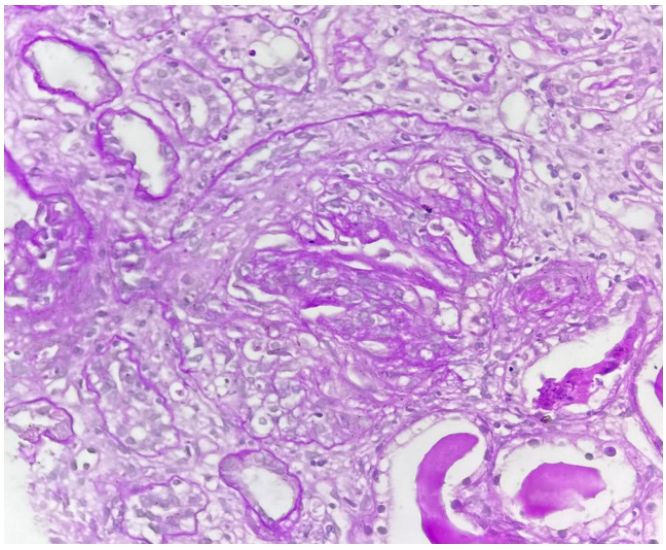

Figure 3: *Periodic acid Schiff (PAS) stained slide showing cellular crescent [40x].*

Among 97 cases studied, the most common glomerular disease was Lupus Nephritis with a frequency of 19 (19.6%), followed by Minimal change disease with a frequency of 18 (18.6%), IgA nephropathy with a frequency of 12 (12.4%), Diffuse proliferative glomerulonephritis with a frequency of 9 (9.18%), and least common was Membranoproliferative glomerulonephritis (type 1) with a frequency of 1 (1%) and 'others' glomerular diseases is seen in (Table 2).

Table 2: Histopathological spectrum of pediatric kidney biopsies among the study population

Histopathological spectrum of pediatric kidney biopsies	Frequency (n)	Percentage (%)
Lupus Nephritis	19	19.6
Post infectious glomerulonephritis	18	18.6
Minimal Change Disease	12	12.4
IgA Nephropathy	9	9.18
Diffuse proliferative Glomerulonephritis	8	8.16
Focal segmental glomerulosclerosis (NOS3, perihilar 1, tip 1)	5	5.10
Lupus like nephritis	4	4.08
IgM nephropathy	4	4.08
Antineutrophilic cytoplasmic antibody	3	3.2
Mesangio proliferative Glomerulonephritis	3	3.2
Membranous Nephropathy	2	2.1
Tubular Injury	2	2.1
Alport Syndrome	2	2.1
Descriptive	2	2.1
Membranoproliferative glomerulonephritis (Type 1)	1	1
Primary Hyperoxaluria	1	1
Acute Tubular Interstitial Nephritis	1	1
C3 Glomerulonephritis	1	1
TOTAL	**97**	**100**

DOI : 10.3126/jpn.v14i1.65917

Table 3: Frequency of Rapidly Progressive glomerulonephritis causes in children

Disease	Frequency (n) (%)
Post-infectious glomerulonephritis	5 (50%)
Antineutrophilic cytoplasmic antibody associated	2 (20%)
Lupus like Nephritis	1 (10%)
Lupus	1 (10%)
C3 Glomerulonephritis	1 (10%)
TOTAL	10 (100%)

Of the 97 cases included in the study, 6 cases were of chronic kidney disease. The most common cause of chronic kidney disease in children was Lupus with a frequency of 2 (33.6%) followed by ANCA associated, Alport's syndrome, Proliferative Glomerulonephritis, and Post Infectious glomerulonephritis with a frequency of 1 (16.6%) each as shown in (Table 4).

Table 4: Frequency of chronic kidney disease causes in children

Diseases	Frequency (n) (%)
Lupus	2 (33.6%)
Antineutrophilic cytoplasmic antibody associated	1(16.6%)
Alport's syndrome	1 (16.6%)
Proliferative Glomerulonephritis	1 (16.6%)
Post-infectious glomerulonephritis	1 (16.6%)
TOTAL	6 (100%)

DISCUSSION

The spectrum of renal diseases varies with different ethnic populations, geographic locations and environmental factors. The occurrence of pediatric renal diseases varies with age and there is variation in the manifestation of the same disease at different phases of childhood. Early detection of renal disease in childhood leads to better therapy and reduction in morbidity and mortality.

Rapidly progressive glomerulonephritis is an uncommon and yet serious disease among pediatric medical renal diseases. Pediatric chronic kidney disease is a progressive disease that leads to gradual loss of kidney function and is defined by the presence of structural or functional damage of the kidney for at least 3 months (except for neonates or infants < 3 months old). It is essential to develop strategies for the identification and treatment of CKD at early stages in children. This will improve survival rates of pediatric patients with CKD and it ultimately reduces complications faced by adults with childhood-onset CKD. Studies investigating renal biopsies in children are limited because most recent available data includes all age groups. This study provides detailed information about the biopsy-proven glomerular diseases in children of Nepal.

In the present study, the highest number of cases was in the age group 11-16 years followed by 6-10 years and 0-5years accounting for 62.8%, 23.07%, and 13.4% respectively. In a study by Khatum. N et al., the highest number of cases were in the age group 10-14 years which is concordant with present study.[3] Also in a study by Printza N et al., maximum number of cases was in the age group 11-14 years which is again concordant with this study.[8] One of the possible reasons for this may be due to the consideration of minimal change disease during this age group and performing biopsy regularly for these cases.

In the present study, 55 patients were females and 42 were male with male: female ratio of 0.8:1 and accounting for (56.7%) and (43.3%) respectively with slight female predominance. Yen C.W et al conducted a study on 339 cases which showed 184 females and 155 males with a male: female ratio of 1:1.1 highlighting female predominance.[9] However, in a study conducted by Yadav P.S et al. on 226 cases, there were 120 males and 106 females with a Male: Female ratio of 1.13:1 with a slight male predominance.[1] Similarly, Zahir. Z et al conducted a study on 2890 biopsies wherein there was male predominance as well.[10]

In present study, the most common histopathological diagnosis was Lupus Nephritis followed by Post Infectious Glomerulonephritis and Minimal Change Disease accounting for 19 (19.6%), 18 (18.6%) and 12 (12.4%) respectively. This finding was concordant with the study done by Zahir. Z et al. on 200 cases which showed the most common histopathological disease to be Lupus Nephritis followed by Post Infectious Glomerulonephritis. Similarly, a study conducted by Chen W.X et al on 339 renal biopsies showed the most common histopathological diagnosis to be Lupus Nephritis which is again similar to the present study.[9] Another study conducted by Khatun. N et al also showed the most common histopathological diagnosis to be Lupus Nephritis which is again concordant with the present study.[3] The reason could be due to the higher frequency of Nephritis in Asian people, and that SLE in childhood tends to be more aggressive carrying high disease course and activity compared to adults. A study conducted by Kanodia K.V et al on 346 renal biopsy samples showed the most common histopathological diagnosis to be Nephrotic syndrome (Membranoproliferative Glomerulonephritis) which is in opposition to the present study.[4] This discrepancy could be due to follow-up of Lupus cases in the Rheumatology clinic and also all cases not undergoing renal biopsy. The second most common histopathological diagnosis in the present study was Post Infectious Glomerulonephritis which is similar to the study done by Thakkar K. A et al.[5] A study done by Alhasan. K et al. showed the second most common histopathological diagnosis to be Lupus Nephritis which was in slight discrepancy with the present study.[2] Similarly, a study done by Printza. N et al. showed Post Infectious Glomerulonephritis as the least common diagnosis.[8] This was in opposition to the present study.

In the present study, there were 10 cases of Rapidly progressive glomerulonephritis and among them, the

most common cause of RPGN was Post Infectious Glomerulonephritis accounting for 5 (50%). Faisal. G et al showed the most common cause of RPGN to be Post-infectious glomerulonephritis (63%).[11] This finding was in near concordance with the present study. Another study conducted by Moorani K.N. et al. showed the common cause of RPGN to be PIGN followed by ANCA associated accounting for 75% and 17% which is in near concordance with the present study.[7]

In the present study, there were 6 cases of CKD and among them, the most common cause for CKD was Lupus accounting for 2 (33.6%). Study conducted by Becherucci. F et al showed the most common cause for CKD to be a congenital anomalies of kidney and urinary tract accounting for 49.1%.[12] This finding was in opposition to the present study. Another study conducted by Vansickle J. S et al also showed congenital anomaly of the kidney and urinary tract to be the most common cause for CKD, followed by Focal Segmental Glomerulosclerosis accounting for 49.1% and 8.1% respectively.[13] This finding was in opposition to the present study.

CONCLUSIONS

The most common age of patients undergoing biopsy was in the age group of 11-16 years and the least common was in 0-5 years with slight female predominance. The most commonly diagnosed glomerular disease in pediatric renal biopsies was Lupus Nephritis (19.6%) while Membranoproliferative glomerulonephritis (Type 1) (1%) was the least common disease. The leading cause of Rapid Progressive Glomerulonephritis was Post Infectious Glomerulonephritis, and Lupus was one of the leading causes for chronic kidney disease.

REFERENCES

1. Yadav SP, Shah GS, Mishra OP, Baral N. Pattern of renal diseases in children: A developing country experience. *Saudi J Kidney Dis Transpl*. 2016;27(2):371-6. DOI:10.4103/1319-2442.178565. Website
2. Alhasan K, Aloudah NM, Bakhit AA, et al. Renal histopathology spectrum in children with kidney diseases in Saudi Arabia, 1998-2017. *Saudi Med J*. 2020;41(4):369-75. DOI: Crossref
3. Khatun, N., Bista, K., & Mahaseth, C. (2015). Spectrum of Biopsy Proven Glomerular Disease in Children at Kanti Children's Hospital. *Journal of Nepal Paediatric Society*, *34*(3), 225–9. DOI: Crossref
4. Kanodia KV, Vanikar AV, Nigam LK, et al. Pediatric Renal Biopsies in India: A Single-Centre Experience of Six Years. Nephrourol Mon. 2015;7(4):e25473. DOI: Crossref
5. Thakkar KA, Poyekar SS. Pattern of pediatric renal diseases in a rural tertiary care hospital. *Int J Contemp Pediatr* 2020; 7: 2152. DOI: Crossref
6. Ibrahim HAA, Amin A, Zeid A, et al. A pattern of glomerular diseases in egyptian children: A single-center experience. *Open Access Maced J Med Sci* 2021; 9: 1305–12. DOI: Crossref
7. Moorani KN, Aziz M, Amanullah F. Rapidly progressive glomerulonephritis in children. *Pak J Med Sci*. 2022;38(2):417-25. DOI: Crossref
8. Printza N, Bosdou J, Pantzaki A, et al. Percutaneous ultrasound-guided renal biopsy in children: a single centre experience. *Hippokratia*. 2011;15(3):258-61. Available from: Website
9. Yen CW, Chen TD, Yen TH, Yu MC. The pathological spectrum of pediatric kidney disease: 18-Year experience from a single tertiary care center in northern Taiwan. *Pediatr Neonatol*. 2023;64(1):26-31. Crossref
10. Pattanashetti N, Gupta S, Rana S, et al. Intestinal Tuberculosis: A Rare Case of Massive Gastrointestinal Bleed in a Post-Renal Transplant Recipient. *Indian J Nephrol*. 2019;29(2):132-4. DOI: Crossref
11. Mosaad FG, Saggaf OM, Aletwady KT, et al. Assessment of the etiologies and renal outcomes of rapidly progressive glomerulonephritis in pediatric patients at King Abdulaziz University Hospital, Jeddah, Saudi Arabia. *Saudi Med J*. 2018;39(4):354-60. DOI: Crossref
12. Becherucci F, Roperto RM, Materassi M, Romagnani P. Chronic kidney disease in children. *Clin Kidney J*. 2016;9(4):583-91. DOI: Crossref
13. VanSickle JS, Warady BA. Chronic Kidney Disease in Children. *Pediatr Clin North Am*. 2022;69(6):1239-54. DOI: Crossref