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Original Research Article

Renal biopsy - indication and its implications in management of children admitted at a tertiary care hospital, Mangalore

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ABSTRACT

Background: Percutaneous renal biopsy is an established diagnostic tool for identification of renal pathology required for diagnosis, treatment, and prognostication. The present study was conducted to know the common indications and histopathological findings of renal biopsy, impact of biopsy report on treatment, and complications of procedure.
Methods: This was a retrospective observational study conducted in the paediatric ward of a tertiary care level hospital. Indications of renal biopsy as suggested by medical records were noted down. Any treatment changes happened after final histopathological report were recorded. Statistical analysis was made using statistical package for the social sciences (SPSS) version 20.0 (IBM, NY).
Results: The mean age of patients at which biopsy was done was 9.83±5.31 years. Most common indications of renal biopsy were nephritic onset nephrotic syndrome (34.8%), steroid-resistant nephrotic syndrome (21.7%), steroid-dependent nephrotic syndrome requiring calcineurin inhibitors (CNI) (17.4%), lupus nephritis (8.7%), nephrotic syndrome with later age of onset (8.7%), acute kidney injury (AKI) stage 3 (4.3%) and for evidence of calcineurin inhibitor toxicity (4.3%). Focal segmental glomerulosclerosis (26.1%), minimal change disease (21.7%) and membranoproliferative glomerulonephrosis (17.4%) were the most common histopathological findings.
Conclusions: This study reiterates the fact that renal biopsy is one of the decisive and diagnostic procedures and has good prognostic value in further management of medical renal disease.

Keywords: Percutaneous renal biopsy, Clinical diagnosis, Histopathology findings, Complications

INTRODUCTION

Children all over the world are susceptible to various types of kidney diseases. These diseases or their manifestations encompass a wide range of presentations including acute kidney injury, chronic kidney diseases, urinary tract infection, haematuria, vesicoureteral reflux, acute & chronic glomerulonephritis, nephrotic syndrome and kidney involvement in metabolic diseases.[1] Detection of many of these diseases is possible by taking complete history, thorough examinations and performing available diagnostic tests. However, in some cases, the accurate diagnosis of kidney disease, its treatment, and the prognosis of the disease requires biopsy of the kidney.[2]

In recent years, some non-invasive methods to detect early renal complications have been proposed which mostly are based on evaluating plasma and urinary biomarkers via omics technologies (genomics, proteomics and metabolomics) and genetic analysis. However, the value of these biomarkers in the diagnosis and treatment of patients is not well established and may not be affordable. Numerous studies have shown that biopsy report helps in improving the clinical course in patients with renal problems.[3]

Therefore, renal biopsy is the gold standard method to diagnose, treat and predict treatment outcomes in patients with certain renal problems. Renal biopsy (RB) plays a

major role in the management of paediatric kidney diseases. It especially helps to identify glomerular diseases that are a major cause of chronic kidney disease in developing countries.[4]

In paediatric practice, there are very precise indications for performing kidney biopsy. They include steroid-resistant nephrotic syndrome (NS) and secondary nephropathies. Renal biopsy provides a window to diagnose, prognosticate and manage many renal conditions. Clinico-pathological dissociation is commonly observed among renal disease either it is vasculopathy, glomerulopathy or tubulopathy.[5] It is often difficult to assume on the pathology in the kidney looking at the clinical signs or investigation and management is often linked up with pathological findings and its grading. This present study was planned to identify the indications of renal biopsy and the effect of that renal histopathological findings in treatment decisions. The frequency of complications following renal biopsy was also assessed.

METHODS

Patients in the age range of 1 year to 18 years who were admitted to the paediatric ward, including the intensive care unit, between January 2017 and March 2022 and who underwent renal biopsy were included in a retrospective record-based study. In this study, demographical data, clinical details, laboratory parameters including renal biopsy report, management and treatment change if any were collected and the information was recorded on a predesigned proforma. The demographic data includes the patient's age, and gender. The signs and symptoms presented was collected and analysed. Specific symptoms, like oedema, decreased urine output, gross haematuria, if presented, were noted. All the systemic findings, vital signs, and laboratory test results were collected from the case records were noted. The laboratory investigation reports include complete blood count (CBC), renal function test (RFT), serum electrolytes, urine analysis, C3 levels, C4 levels, ASO titre, ANA profile. Transabdominal ultrasonogram report was also noted. Histopathological report – light microscopy, immunofluorescence microscopy, and electron microscopy report was noted (wherever available). Post biopsy monitoring notes of vitals and presence of gross haematuria was noted. Any change in the treatment or initiation of newer drugs for the renal disease following the histopathological report were also studied. For statistical analysis, Data was described as frequencies and percentages for categorical variables. Continuous variables were reported as medians and ranges or as means and standard deviation. Data was entered in Microsoft excel and analysed using statistical package for the social sciences (SPSS) software version 2.

RESULTS

In our current study, out of 23 patients studied, 52% were male patients and 48% were female. The mean age of patients underwent biopsy was 9.83±5.31 years (minimum age 1 year; maximum age 16 years). The most common clinical features noted in our study was oedema in 87% of patients, followed by hypertension and haematuria in 69.80% and 34.80%, respectively. Atypical features like rashes were observed in 8.70% of patients (Figure 1).

The biochemical characteristics of our study showed 13 (56%) cases with anemia, thrombocytosis, and thrombocytopenia was observed in 13% of cases, each. Deranged RFT was observed in 34.4% of cases. Nephrotic range proteinuria was noted in 21 cases (90.3%) and microscopic haematuria was noted on 17 cases (73.1%). Moreover, granular cast was the most common finding in urine analysis followed by hyaline cast. Low C3 was observed in 26.10 % of cases and ANA was positive in 13% of cases. HbsAg was positive in 4.30 % of cases (Table 1).

The common clinical diagnosis in our study was nephrotic syndrome which was observed in 14 cases. Among the 14, 4 were steroid dependent nephrotic syndrome and 6 were steroid resistant nephrotic syndrome. Nephritic syndrome was observed in 6 cases, amongst which infection related glomerulonephritis in 3 patients, IGA nephropathy in 2, and PIGN/IGA nephropathy was observed in 1 patient. Systemic lupus erythematosus was observed in 2 cases. Haemolytic uremic syndrome with acute kidney injury stage III was observed in 1 patient.

While analysing the indications of renal biopsy, nephritic onset of nephrotic syndrome was observed in 8 (34%) patients and steroid resistant nephrotic syndrome was observed in 5 (22%). SDNS requiring calcineurin inhibitor was 4 (17%) and nephrotic syndrome with later age of onset and lupus nephritis were indication in 2 (8.7%) patients, each. Haemolytic uremic syndrome with acute kidney injury - stage III and to monitor for calcineurin inhibitor toxicity were the indications in 1 patient, each (Figure 2).

Renal histopathological reports suggested that there was focal segmental glomerulosclerosis in 6 patients (26.1%) and 5 patients were with minimal change disease (21.7%). The incidence of membranoproliferative glomerulonephritis accounted for 4 (17.4%), while class IV lupus nephritis- diffuse proliferative glomerulonephritis was observed in 2 patients (8.7%). IgA nephropathy was observed in 8.7%.[2] The renal dysfunction on acute post infectious glomerulonephritis (8.7%) was observed in 2 patients. Crescentic glomerulonephritis was observed in 1 patient (4.3%). In addition, one patient who presented acute renal injury had renal cortical necrosis with nonspecific IgM staining (4.3%).

Effect of renal histopathological findings on treatment decision in renal diseases was assessed. On the total population of 23 patients, 12 patients (52%, p value - 0.297) undergone for treatment change and 11 patients (48%) were still followed the same treatment after renal biopsy histopathological report. Among 5 patients with

steroid resistant nephrotic syndrome, 4 patients (17.40%) received treatment change while 1 patient (4.30%) was continued with same treatment. Among 8 cases with nephritic onset nephrotic syndrome, 3 patients (13%) received change in treatment while 5 (21.70%) received same treatment. In case of SDNS requiring calcineurin inhibitor all patients (4/4 - 17%), and calcineurin inhibitor toxicity (1/1 patients – 4.30%) treatment was changed after renal histopathological report. Among 2 patients with lupus nephritis, 1 (4.30%) went for treatment change and 1 (4.30%) followed same treatment. For patients with nephrotic syndrome – later age of onset (2 patients – 8.70%) and acute kidney injury stage – III (1 patient – 4.30%), there is no treatment change following the report (Figure 3). None of the patients who had renal biopsy had any complications.

Table 1: Demographic and biochemical characteristics.

Variable	Minimum	Maximum	Mean±SD
Hb (g/dl)	6.10	13.60	10.53±2.08
TLC (×10^3/µl)	5.40	30.08	14.62±6.53
Platelet count (×10^3/µl)	26.00	899.00	335.74±216.13
Urea (mg/dl)	9.00	162.00	49.35±42.27
Creatinine (mg/dl)	0.20	9.30	1.33±2.06
Sr. sodium (mmol/l)	117.00	140.00	131.65±5.85
Sr. potassium (mmol/l)	3.10	7.10	4.33±0.89

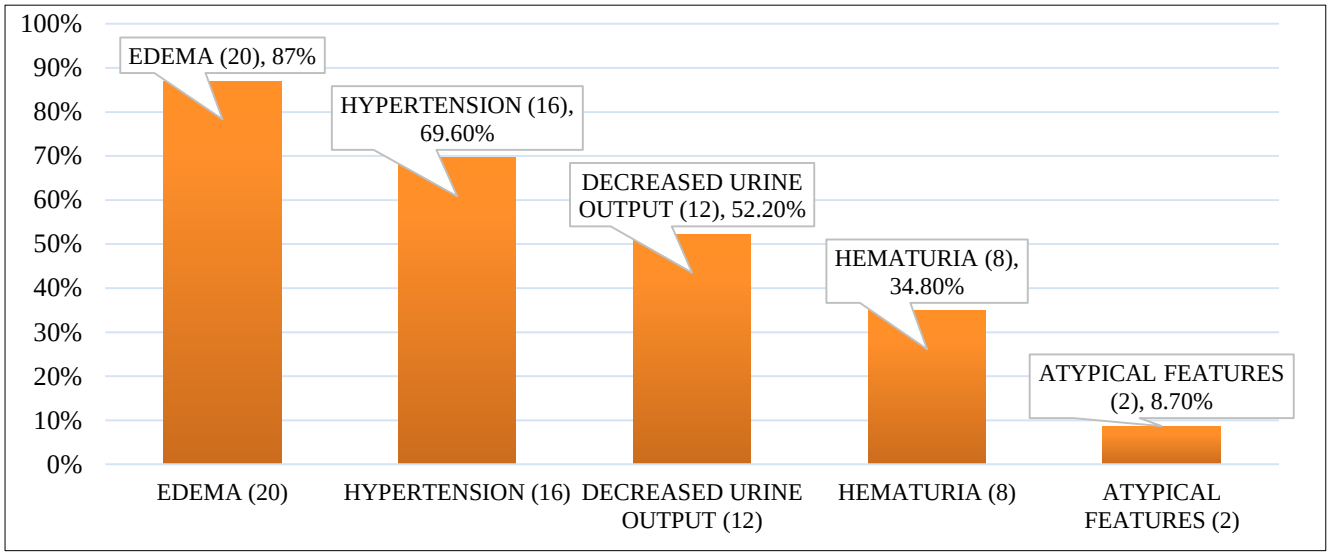

Figure 1: Clinical features (n=23).

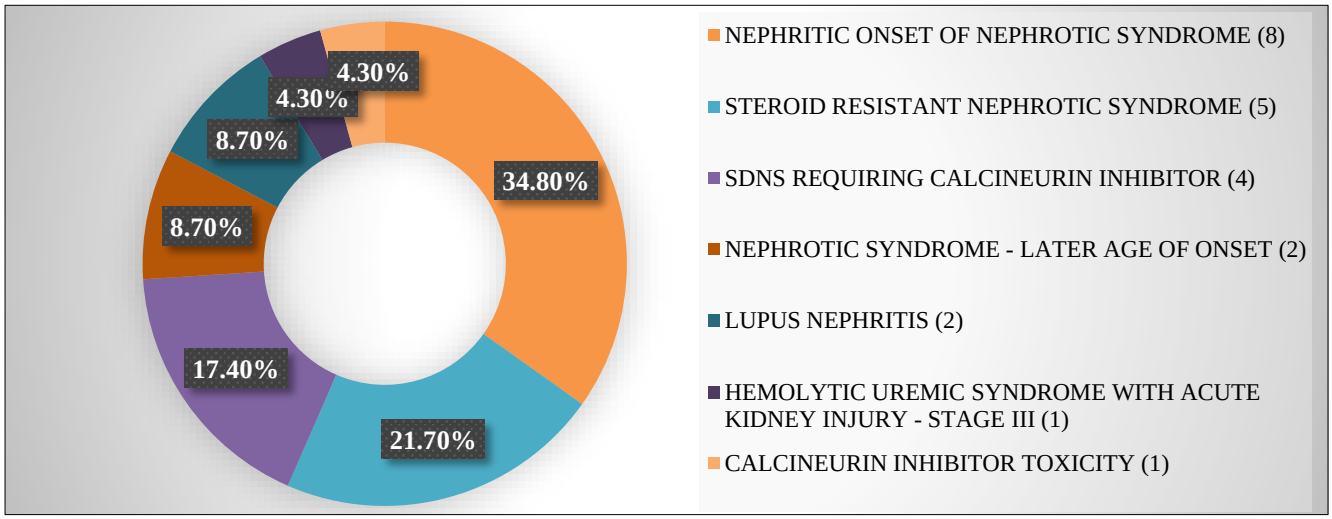

Figure 2: Indication of biopsy.

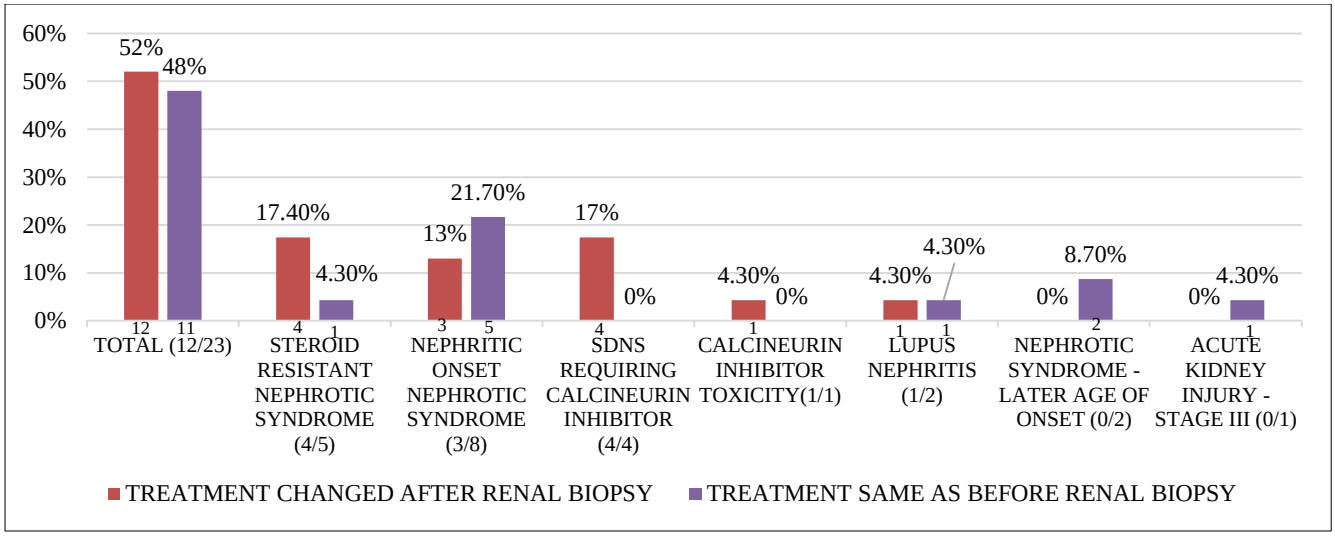

Figure 3: Effect of renal histopathological finding on treatment decisions in renal diseases.

DISCUSSION

In the present cohort, while observing the indications of renal biopsy, nephritic onset of nephrotic syndrome was observed in 8 patients and steroid resistant nephrotic syndrome was observed in 5 in our study which were the common indications. The most common indication of biopsy in Nammalwar series of 250 children with nephrotic syndrome was SRNS (65.2%) followed by steroid dependent nephrotic syndrome (17.6%) while in the study by Santangelo et al, SDNS was the most common indication followed by nephrotic syndrome secondary to systemic diseases which are comparable to our study.[6,7]

The common histopathological findings were focal segmental glomerulosclerosis in 6 patients followed by minimal change disease in 5, and membrano-proliferative glomerulonephritis in 4 patients. This is similar to the study conducted by Kumar in which they documented 38% FSGS and 32% MCD in 290 childhood biopsies studied.[8] In contrast Nammalwar, where the most common histology was minimal change disease (MCD, 52.1%), followed by focal segmental glomerulosclerosis.[6]

It has been noted that there is more than 50% change (p value - 0.297) in the treatment following histopathological report with maximum treatment change for steroid resistant nephrotic syndrome as similar to Stratta et al.[11] It was also noted in our study that none of the patients had complications following renal biopsy making it one of the safest procedures.

The study's strength was that the same pathologist reported the results of all kidney biopsies, limiting interobserver variation. Children as young as 1-year-old underwent biopsy in this study, representing a wide range of age groups. A wide variety of medical renal diseases were investigated. Retrospective study, a small sample size, and a single centre were the drawbacks.

CONCLUSION

Renal biopsy is an important investigation to make the diagnosis of an underlying glomerular or tubular disease. This study reiterates the fact that renal biopsy is one of the safest procedures and has good prognostic value in further management of medical renal disease.

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