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Spectrum of Biopsy-proven Renal Diseases in a Tertiary Care Center in South India: A Single Center Experience

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Abstract

Chronic kidney disease (CKD) is an emerging noncommunicable disease that imposes a huge burden on the infrastructure of middle- and low-income countries. In this context, performing renal biopsies has a major role in the early detection of kidney diseases that may be amenable to treatment, which may help to prevent their progression to CKD. In this retrospective study, we analyzed the spectrum of biopsy-proven renal diseases (BPRD) in a tertiary care hospital in western Tamilnadu, South India, over a period of two years from January 2021 to December 2022. Of the 60 cases analyzed, 50% belonged to the age group of 20–40 years, and the male:female ratio was 1:2. Among those who underwent biopsy, primary glomerulonephritis (PGN) was seen in 68% of patients, secondary glomerulonephritis (SGN) was seen in 24% patients, and vascular and tubulointerstitial disease was seen in 8% of patients. In those with PGN, membranous nephropathy (21%) was the most common pathology. Lupus nephritis (18%) was the most common cause of SGN. Among those with vascular and tubulointerstitial diseases, acute tubulointerstitial nephritis (5%) was the most common pathology. The most common age group with membranous nephropathy was 30–50 years (61.5%). Among the SGN group, 50% of lupus nephritis cases were observed in the age group of 20–30 years. In our study, membranous nephropathy was the most common PGN, in contrast to various earlier studies. This study shows the importance of maintaining renal biopsy registries in identifying emerging trends.

Keywords: biopsy-proven renal disease, epidemiology, glomerulonephritis, registry, renal biopsy

Introduction

Chronic kidney disease (CKD) is an emerging noncommunicable disease affecting approximately 10% of the global population [1], imposing a huge burden on the health infrastructure of low- and middle-income countries. Over the past two decades, CKD-related deaths have been increasing. Risk factors for CKD include age, race, environmental and geographical factors, diabetes, obesity, hypertension, acute kidney injury, and various types of glomerulonephritis. In this context, performing renal biopsy has a major role in the early detection of kidney diseases that may be amenable to treatment, which helps in preventing their progression to CKD. In addition, renal biopsy also helps in assessing the severity of the disease and its prognostication. Maintaining renal biopsy registries worldwide helps to determine the prevalence and nature of progression of biopsy-proven renal diseases (BPRD), as well as identify emerging trends. In India there is a lack of a central renal biopsy registry, but prevalence studies from various centers provide information about the pattern of BPRD in different regions of the country.

In this study, we performed a retrospective analysis of renal biopsies done in Coimbatore Medical College Hospital, a tertiary care center in western Tamilnadu, South India, over the past two years from January 2021 to December 2022.

Materials & Methods

We retrospectively analyzed the renal biopsies done from January 2021 to December 2022 in the nephrology department of Coimbatore Medical College Hospital. We excluded allograft biopsies. Name, age, sex, serum creatinine, urine protein creatinine ratio, 24 hour urine protein, viral markers (HbsAg, anti-HCV, HIV), serology (anti-nuclear antibody, anti-DNA antibody, serum Complement 3 and 4 levels), and indication for biopsy were recorded for the patients. The main indications for biopsy were nephrotic syndrome, rapidly progressive renal failure, unexplained renal failure, acute nephritic syndrome, and asymptomatic urinary abnormalities. Biopsy was done using automated biopsy guns after obtaining informed consent following standard protocol. Two samples were obtained, one each for light microscopy (LM) and immunofluorescence (IF). Electron microscopy was not done due to non-availability. The LM samples were stained using hematoxylin and eosin, periodic acid Schiff stain, methanamine silver, and Masson's trichrome. Special stains were used as required. IF was done using polyclonal antisera against IgG, IgM, IgA, C1q, C3, and kappa and lambda chains. The results were broadly classified under primary glomerulonephritis (PGN), secondary glomerulonephritis (SGN), and tubulointerstitial and vascular diseases. PGN included minimal change disease (MCD), focal segmental glomerulonephritis (FSGS), membranous nephropathy (MN), mesangioproliferative nephritis (MePGN), membranoproliferative nephritis (MPGN), crescentic glomerulonephritis, anti-glomerular basement membrane disease, and IgA nephropathy (IgAN). SGN included lupus nephritis (LN) and diabetic nephropathy (DN). Vascular and tubulointerstitial pathologies included acute interstitial nephritis, acute cortical necrosis, and thrombotic microangiopathy. We compared the data with those of other studies from India and centers around the world. We use percentages to represent categorical variables. This study was done as per Declaration of Helsinki.

Results

We analyzed a total of 60 cases, of which 33.3% (n=20) were males and 66.6% (n=40) were females. All patients fell within the age range of 13–66 years. The majority of the patients (50%) belonged to the age group of 20–40 years. The most common indication for biopsy was nephrotic syndrome. Table 1 shows an age distribution of various pathologies. PGN was seen in 68% (n=41) of patients, SGN was seen in 24% (n=14) of patients, and vascular and tubulointerstitial diseases were seen in 8% (n=5) of patients (Table 2). Among the PGN cases, MN was the most common histological pattern, followed by MCD (16%), FSGS (15%), MePGN (5%), and IgA nephropathy (5%). LN (18%) was the most common cause of SGN, followed by DN (5%). There was also a case of tuberculous pyelonephritis. Among the vascular and tubulointerstitial disease cases, acute tubulointerstitial nephritis was the most common histological pattern (5%), followed by acute cortical necrosis (1.6%) and thrombotic microangiopathy (1.6%). Patients in the age group of 30–50 years accounted for 61.5% (n=8) of all MN cases. Among those patients with MCD and FSGS, 100% and 77.7% belonged to the age group of 10–30 years, respectively. For SGN, 50% (n=5) of LN cases were observed in the age group of 20–30 years, and 30% (n=3) were observed in the age group of 30–40 years. Diabetic glomerulosclerosis accounted for 5% of SGN cases.The LM findings included observations of Kimmelstiel–Wilson nodules. The IF findings included linear staining of the basement membrane in IgG and IgM. Acute interstitial nephritis (5%) was the most common pathology affecting those with tubulointerstitial disease. According to our IF analysis, all cases of MN showed granular deposits of IgG and C3, and one case showed IgM in a sclerosed glomeruli. Some cases of MN stage-1 showed no thickening of the glomerular basement membrane and no spikes on silver staining. In such cases, which may not be distinguishable from MCD using LM, IF plays a vital role in establishing the diagnosis.

In our study, MCD was observed in 16% of all cases. Although IF staining for immunoglobulin and complement is not seen in MCD, in our study, faint immunopositivity for IgM was observed in one of the cases. IgA nephropathy was seen in 5% of cases. IF staining showed IgA and C3 deposits in the

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mesangium in all the cases. There is no single histopathological finding characteristic of IgA nephropathy, and mesangial proliferation may be observed in variety of glomerular lesions. In this situation, IF plays a crucial role in making the diagnosis. LN was the most common SGN observed in our study with three cases showing a full-house pattern (i.e., deposits of IgG, IgM, IgA, C3, and fibrinogen).

Table 1: Age distribution of various glomerular pathologies (n=number).

Glomerular diseases	10–20 years (n)	20–30 years (n)	30–40 years (n)	40–50 years (n)	>50 years (n)
Primary glomerular diseases	11	10	8	8	4
Secondary glomerular diseases	-	5	4	3	2
Vascular and tubulointerstitial diseases	-	3	-	-	2
TOTAL	11	18	12	11	8

Table 2: Various pathologies observed in renal biopsy (percentages are calculated from total number of cases).

Diagnosis	Cases (n=60)	Percentage (%)
I. Primary glomerulonephritis	41	68%
1. Membranous nephropathy	13	21
2. Minimal change disease	10	16
3. Focal segmental glomerulosclerosis	9	15
4. Mesangioproliferative glomerulonephritis	3	5
5. IgA nephropathy	3	5
6. Crescentic glomerulonephritis	1	1.6
7. Anti-glomerular basement membrane disease	1	1.6
8. Tuberculous pyelonephritis	1	1.6
II. Secondary glomerulonephritis	14	24%
1. Lupus nephritis	11	18
2. Diabetic nephropathy	3	5
III. Vascular and tubulointerstitial diseases	5	8%
1. Acute interstitial nephritis	3	5
2. Acute cortical necrosis	1	1.6
3. Thrombotic microangiopathy	1	1.6

Discussion

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The results of this retrospective study help to identify the demographics, clinical characteristics, and patterns of kidney disease in the western part of Tamilnadu, South India. The most common indication for performing renal biopsy was nephrotic syndrome, which was similar to most single-center reports from India as well as from centers around the world [2-4]. However, in Japan, where population-based urinary screening programs have been implemented, asymptomatic urinary abnormalities (AUAs) were the most common indication for biopsy [5,6]. AUAs were also the most common indication of biopsy in studies from Italy and France [7,8]. We observed a female predominance in both PGN and SGN, whereas various other studies from around the world showed male predominance in PGN [2,9,10]. This difference could be attributed to the fact that female patients comprised the majority of our study population. In our study, PGN was the most common BPRD, followed by SGN and tubulointerstitial nephritis. This pattern was similar to that of other published studies [2,9,10]. MN was the most common PGN reported in our study, followed by MCD, FSGS, MePGN, and IgAN. A recent study from South India also reported MN as the most common PGN, followed by IgAN and MCD [11], which is in contrast to the results of various earlier studies from Indian centers. In a retrospective study done in 2010, MCD was the most common PGN [4], and in a similar study, FSGS was the most common PGN [3].When compared to our data, this pattern may indicate emerging trends in the pattern of BPRD. In studies from Korea and Japan, the most common PGN was MCD, followed by MN and IgAN [6,9]. In a Czech registry, MN and IgAN were the most frequent pathologies, whereas in a study from Brazil, FSGS was the most common pathology [12].

Studies from India as well as other countries have reported an increasing prevalence of FSGS [13,14] with not otherwise specified being the most common variant. In our study, FSGS was the third most common PGN, among which tip lesion was the most common variant. Among those with SGN, LN accounted for the majority of cases. This result was similar to those of other studies from around the world [2-4,9,11]. The IF findings also showed deposits in all immunoglobulins.

Conclusion

Renal biopsy plays an important role in establishing the prompt diagnosis of various glomerular diseases. Early diagnosis and treatment can drastically improve the morbidity and mortality of patients. In our study, MN was the most common PGN, which was in contrast to various earlier studies. Maintaining a central renal biopsy registry may help to identify emerging trends in the disease pattern. The main limitation of our study was its small sample size.

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