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Histopathological Spectrum of Kidney Biopsy in Central India: A Two Center Retrospective Study

Dear Editor,

Kidney biopsy is indispensable in diagnosing glomerular, tubulointerstitial, and vascular disorders of the kidney. We report the frequency of various histopathological entities from two large centers from the central Indian state of Chhattisgarh. We analyzed native kidney biopsies performed in adult patients at All India Institute of Medical Sciences (AIIMS) Raipur (between June 2019 and June 2022) and Ramkrishna Care Hospital (RKC) (between June 2017 and June 2022) in the central Indian city of Raipur, Chhattisgarh. The study was approved by the Institutional Review Board at Institute Ethical Committee AIIMS Raipur, Chhattisgarh, number 1439/AIIMSRPR/IEC/2021/371, dated 29.01.2021.

During the study period, 906 kidney biopsies were performed, 800 of which were native kidney biopsies, and were included for final analysis. Three hundred Kidney biopsies were performed at RKC and five hundred at AIIMS, Raipur.

The mean age of the patients was 33.9 ± 16.1 years, and 365 (45.6%) were females. Three hundred and sixty (45%) had hypertension and 54 (6.75%) had diabetes. Three (0.4%) patients were positive for hepatitis B Antigen and one (0.1%) patient were positive for HIV. None were positive for hepatitis C. Eight (1.0%) patients who underwent biopsy had malignancy and 56 (7.0%) patients required dialysis before biopsy. The most common indication for renal biopsy was nephrotic syndrome (n = 399, 49.9%), followed by nephritic syndrome (n = 247, 30.9%) and acute kidney injury (AKI) (n = 65, 8.1%) [Table 1].

The size of the tissue core taken for biopsy was 0.89 ± 0.39 cm. Mean glomeruli in light microscopy sample was 16.2 ± 7.4 and in the immunofluorescence sample was 7.6 ± 3.9.

Seven hundred and twenty-four (90.5%) of the patients had predominantly glomerular disorders, 53 (6.6%) patients had predominantly tubulointerstitial disorders, and 23 (2.9%) had predominantly vascular pathology. The most common histopathological diagnosis was lupus nephritis (n = 139, 17.4%), followed by membranous nephropathy (MGN) (n = 124,15.5%), minimal change disease (MCD) (n = 110,13.7%), and IgA nephropathy (n = 106,13.2%).

Table 1: Demographic and clinical characteristics of the study population

Characteristics	N (%)
Age (years)	33.9 ± 16.1
Female	365 (45.6)
Diabetes	54 (6.75%)
Hypertension	360 (45%)
Malignancy	8 (1%)
Serum creatinine (mg/dl)	2.3 ± 3.6
24-hour protein (grams)	3.6 ± 3.5
No. of glomeruli on light microscopy	16.2 ± 7.4
No. of glomeruli on immunofluorescence microscopy	7.6 ± 3.9
Mean biopsy core size (cm)	0.8 ± 0.4
Indication for kidney biopsy	
Nephrotic syndrome	399 (49.9%)
Nephritic syndrome	247 (30.9%)
Acute kidney injury	65 (8.1%)
Chronic kidney disease	45 (5.6%)
Rapidly progressive renal failure	44 (5.5%)

Among 724 biopsies with predominantly glomerular disorders, 463 (64.0%) were primary glomerular disorders, 255 (35.2%) were secondary glomerular disorders, and 6 (0.8%) were diagnosed as chronic glomerulonephritis as all the glomeruli were globally sclerosed.

Among the primary glomerular disorders, MGN was the most common histopathological diagnosis accounting for 26.8% (n = 124) biopsies, followed closely by MCD (n = 110, 23.8%), IgA nephropathy (n = 106, 22.9%), and focal segmental glomerulosclerosis (FSGS) (n = 98, 21.2%). Among secondary glomerular diseases, lupus nephritis was the most common disease, accounting for 139 (54.5%) biopsies, followed by idiopathic immune complex diffuse proliferative glomerulonephritis (DPGN) (n = 41,16.1%) and diabetic nephropathy (DN) (15.7%). Amyloidosis accounted for 14 (5.5%) biopsies. Among 14 cases of amyloidosis, 12 were AL amyloidosis, and two were AA amyloidosis.

Acute tubular necrosis (n = 32, 60.4%) was the most common tubulointerstitial disease, followed by acute tubulointerstitial nephritis (n = 9, 17%), chronic

Table 2: Clinical syndrome presentation of various histopathological proven disorders

Renal biopsy diagnosis	Clinical syndrome					
	Nephrotic syndrome (N = 399, 49.9%)	Nephritic syndrome (N = 247, 30.9%)	AKI (N = 65, 8.1%)	CKD (N = 45, 5.6%	RPRF (N = 44, 5.5%)	Total (N = 800, 100%)
LN	28 (7.0%)	109 (44.13%)	1 (1.5%)	0	1 (2.2%)	139 (17.4%)
MGN	123 (30.8%)	0	0	1 (2.2%)	0	124 (15.5%)
MCD	109 (27.3)	1 (0.4%)	0	0	0	110 (13.7%)
IGAN	14 (3.50%)	70 (28.34%)	1 (1.5%)	0	21 (47.7%)	106 (13.2%)
FSGS	97 (24.3%)	0	0	1 (2.2%)	0	98 (12.2%)
IC DPGN	3 (0.7%)	33 (13.3%)	0	0	5 (11.3%)	41 (5.1%)
DN	7 (1.7%)	2 (0.8%)	0	28 (62.2%)	3 (6.8%)	40 (5.0%)
ATN	0	0	31 (47.7%)	0	1 (2.2%)	32 (4.0%)
TMA	0	0	20 (30.7%)	0	1 (2.2%)	21 (2.6%)
PI CGN	0	11 (4.45%)	0	1 (2.2%)	6 (13.6%)	18 (2.2)
Amyloidosis	14 (3.5%)	0	0	0	0	14 (1.7)
C3GN	0	11 (4.45%)	1 (1.5%)	0	0	12 (1.5)
MPGN	4 (1.00%)	5 (2.02%)	0	0	0	9 (1.1)
ATIN	0	0	7 (10.7%)	0	2 (4.5%)	9 (1.1)
CTID	0	0	0	8 (17.7%)	0	8 (1.0)
CGN	0	2 (0.81%)	0	5 (11.1%)	0	7 (0.9)
Anti-GBM	0	1 (0.4%)	0	0	3 (6.8%)	4 (0.5)
Pyelonephritis	0	0	2 (3.0%)	0	0	2 (0.2)
RCN	0	0	2 (3.0%)	0	0	2 (0.2)
Cast nephropathy	0	0	0	1 (2.2%)	1 (2.2%)	2 (0.2)
IgG4	0	1 (0.4%)	0	0	0	1 (0.1)
PGNMID	0	1 (0.4%)	0	0	0	1 (0.1)
Total	399	247	65	45	44	800

FSGS – Focal segmental glomerulosclerosis, IC DPGN – Immune complex diffuse proliferative glomerulonephritis, IGAN – IgA Nephropathy, LN – Lupus nephritis, MCD – Minimal change disease, MGN – Membranous nephropathy, MPGN – Membranoproliferative glomerulonephritis, PGNMID – proliferative glomerulonephritis with monoclonal immunoglobulin deposition, PI CGN – pauci immune crescentic glomerulonephritis, RCN – Renal cortical Necrosis, TMA – Thrombotic microangiopathy, ATIN – Acute tubulointerstitial nephritis, CGN – chronic glomerulonephritis, CTID – chronic tubulointerstitial disease, DN – Diabetic nephropathy, ATN - Acute Tubular Necrosis, C3GN - C3 Glomerulonephritis, GBM - Glomerular Basement Membrane, IgG - immunoglobulin G, RPRF: rapidly progressive renal failure

tubulointerstitial disease (n = 8, 15.1%), and cast nephropathy (n = 2, 3.8%). Among vascular disorders, a predominant finding was thrombotic microangiopathy (n = 21, 91.3%), and the remaining were renal cortical necrosis (n = 2, 3.7%).

The most common cause of nephrotic syndrome was MGN (n = 123, 30.8%) followed by MCD (n = 109, 27.3%), FSGS (n = 97, 24.3%), lupus nephritis (n = 28, 7%), and amyloidosis (n = 14, 3.5%). The most common cause of nephritic syndrome (n = 247) was lupus nephritis (n = 109, 44.1%), followed by IgA nephropathy (n = 70, 28.3%), immune complex DPGN (n = 33, 13.3%), pauci immune crescentic glomerulonephritis (n = 11, 4.5%), and C3 glomerulonephritis (n = 11, 4.5%). The most common cause of AKI (n = 65) was ATN (n = 31, 47.7%) followed by thrombotic microangiopathy (n = 20, 30.7%), acute interstitial nephritis (n = 7, 10.7%), and acute pyelonephritis (n = 2, 3.0%). The most common pathologies in patients with CKD (n = 42) were DN (n = 28, 66.7%) followed by chronic tubulointerstitial disease (n = 8,17.7%) and chronic glomerulonephritis (n = 5, 11.1%) [Table 2].

The most common biopsy diagnosis in patients with age less than 20 years was lupus nephritis, between 20 and 39 years was lupus nephritis, between 40 and 59 years and above 60 years age group was MGN.

Supplementary File 1 - Table 3 compares the renal biopsy findings reported in recent literature from different areas of India, revealing significant inter-regional and intra-regional variations.

Focal segmental glomerulosclerosis (FSGS) has been reported as the most common cause of nephrotic syndrome from AIIMS, New Delhi[1] and Postgraduate Institute for Medical Education and Research (PGIMER) Chandigarh[2] in North India, while Sher - i - Kashmir Institute of Medical Sciences (SKIMS) Srinagar[3] and Pandit Bhagwat Dayal Sharma Post Graduate Institute of Medical Sciences (PGIMS) Rohtak[4] reported MCD as the most common cause. FSGS was also reported as the most common cause of nephrotic syndrome from Christian Medical College (CMC) Vellore[5] in South India, whereas MCD was reported as the most common cause in Nizam Institute of Medical Sciences (NIMS), Hyderabad.[6] MCD was reported as the most common cause of nephrotic syndrome in Sawai Mansingh Hospital (SMS), Jaipur (S1) from West India and Institute of Post-Graduate Medical Education and Research and Seth Sukhlal Karnani Memorial Hospital (IPGMER), Kolkata (S2) from East India, and also from North Eastern Indira Gandhi Regional Institute of Health and Medical Sciences (NEIGRIMS), Shillong (S3) from North-East India.

Our study has revealed MGN as the most common cause of nephrotic syndrome, followed by MCD, FSGS, and lupus nephritis. Our study showed lupus nephritis as the most common secondary glomerular disorder, similar to other previous Indian studies and studies from different parts of the world. The second common entity was idiopathic immune complex DPGN followed closely by DN. Most of the other studies have DN as the second most common secondary glomerular disorder. Our study showed the predominance of AL amyloidosis compared to AA amyloidosis. Our study has also shown a decreasing trend in MPGN prevalence, similar to studies from across the world, which can be explained by improved hygienic environments, universal precautions, and vaccination.

The current study has reported a spectrum of kidney biopsies from two high-volume centers in central India, one being public and the other being a private sector hospital and therefore is likely to capture all socioeconomic groups and be more representative. However, the study has limitations in being retrospective and, therefore, limited data are collected from medical records. Furthermore, electron microscopy was done in selected cases, indispensable for better diagnosis.

To conclude, this study records the histopathological spectrum of kidney biopsy from central India. A central registry for kidney biopsy is needed to circumvent the heterogeneity in the biopsy data.

Conflicts of interest

There are no conflicts of interest.

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