International Journal of Research in Medical Sciences
Nikhil KDG et al. Int J Res Med Sci. 2026 Oct;14(10):xxx-xxx
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20263378

Original Research Article

Clinicopathological spectrum of renal biopsies at a tertiary care hospital in South India: a cross-sectional study

Nikhil Kumar D. G., Madhusudan Pai*, Manana Gowda, Yeshavanth G.

Department of General Medicine, S.S. Institute of Medical Sciences, Davangere, Karnataka, India

Received: 20 August 2026
Revised: 09 September 2026
Accepted: 18 September 2026

***Correspondence:**
Dr. Madhusudan Pai,
E-mail: bmadhusudanpai@gmail.com

ABSTRACT

Background: Renal biopsy provides definitive tissue-based diagnosis in patients with suspected intrinsic renal disease, and its spectrum varies geographically and by referral pattern. Data from South Indian tertiary-care centers remain limited. This study evaluated the clinical presentation, biochemical profile, and histopathological spectrum of renal biopsies at a tertiary-care hospital in Davangere, Karnataka.
Methods: This hospital-based cross-sectional study included 30 consecutive patients undergoing native percutaneous renal biopsy between July 2022 and June 2023. Demographic, clinical, and laboratory parameters were recorded, biopsies evaluated by light microscopy, and histopathological diagnoses assessed descriptively against presenting renal syndromes.
Results: Mean age was 39.9±16.3 years; 17 (56.7%) were male. Pedal edema was present in 25 (83.3%) and hematuria in 15 (50.0%); 13 (43.3%) had diabetes and 9 (30.0%) hypertension. Asymptomatic microscopic hematuria/proteinuria, macroscopic hematuria, and nephrotic syndrome each accounted for 6 (20.0%), while nephritic syndrome, rapidly progressive glomerulonephritis, and acute kidney injury each accounted for 4 (13.3%). Membranous nephropathy was the commonest diagnosis (9, 30.0%), followed by IgA nephropathy (6, 20.0%); diabetic nephropathy and acute tubular injury/necrosis each accounted for 4 (13.3%). Six patients (20.0%) had nephrotic-range proteinuria, and among 13 diabetic patients, only 4 had diabetic nephropathy while 9 had other renal lesions.
Conclusions: The renal biopsy spectrum in this cohort was heterogeneous, with membranous nephropathy and IgA nephropathy the most frequent diagnoses. The frequent occurrence of alternative renal lesions among diabetic patients highlights the value of biopsy when the clinical diagnosis does not adequately explain the renal presentation. These findings provide locally relevant clinicopathological data from South India.

Keywords: Renal biopsy, Membranous nephropathy, IgA nephropathy, Diabetic nephropathy, Glomerulonephritis, Clinicopathological correlation

INTRODUCTION

Renal biopsy remains an important diagnostic tool in the evaluation of patients with suspected intrinsic renal disease because it provides tissue-based information that may establish the underlying pathological diagnosis and guide clinical management. The spectrum of renal diseases identified by biopsy varies considerably between populations and institutions, influenced by geographic and ethnic characteristics, referral patterns, patient demographics, and the clinical indications for biopsy.[1-3]

International biopsy series have demonstrated substantial geographic variation in the relative frequencies of glomerular diseases. IgA nephropathy is particularly frequent in several east Asian and European populations, whereas other cohorts have reported different patterns, including greater representation of focal segmental glomerulosclerosis and membranous nephropathy.[1-4] Such

differences highlight the importance of interpreting renal biopsy data within the clinical and geographic setting in which they are obtained.

India represents a heterogeneous setting in this regard. Published Indian biopsy studies have reported regional differences in the relative frequencies of IgA nephropathy, membranous nephropathy, diabetic nephropathy, minimal change disease, and other glomerular lesions.[5-7] More recent Indian reports continue to demonstrate variation between centers, reflecting differences in referral populations and biopsy practices.[8-10]

Renal biopsy may also identify clinically relevant discordance between an initial clinical diagnosis and the underlying pathological lesion. This is particularly important in patients with diabetes, in whom diabetic kidney disease may coexist with or be mimicked by other renal disorders.[11,12] Similarly, the clinical presentation of nephrotic syndrome, hematuria, nephritic syndrome, rapidly progressive glomerulonephritis, or acute kidney injury may encompass multiple histopathological diagnoses.

The present study was therefore undertaken to describe the clinical presentation, biochemical profile, and histopathological spectrum of native renal biopsies performed at a tertiary-care hospital in Davangere, Karnataka, and to examine the relationship between clinical renal syndromes and biopsy findings.

METHODS

Study design and setting

This was a hospital-based cross-sectional observational study conducted in the department of general medicine at S. S. Institute of Medical Sciences and Research Centre (SSIMS&RC), Davangere, Karnataka, India, over a one-year period from July 2022 to June 2023.

Study participants

The study included 30 consecutive patients who underwent native percutaneous renal biopsy during the study period. Patients were selected when renal biopsy was clinically indicated and the patient consented to the procedure. The study size comprised all eligible biopsies available during the defined study period.

Patients were considered for biopsy in the presence of active urinary sediment, hematuria with suspected intrinsic renal disease, significant proteinuria, or suspected renal involvement in systemic disease.

Patients were excluded when biopsy was considered unsuitable because of lack of cooperation, renal mass or solitary kidney, active renal or overlying skin infection, uncorrected coagulopathy, or obstructive uropathy.

Clinical and laboratory assessment

Demographic characteristics, clinical symptoms and signs, relevant comorbidities, and laboratory investigations were recorded at the time of evaluation. Clinical variables included pedal edema, hematuria, diabetes mellitus, and hypertension.

Laboratory investigations included hemoglobin, total leukocyte count, urea, serum creatinine, total protein, serum albumin, total cholesterol, triglycerides, antinuclear antibody testing, and 24-hour urinary protein excretion.

Diabetes mellitus was defined by a previous diagnosis of diabetes and/or current use of antidiabetic medication, with glycemic parameters considered where available.

For descriptive analysis, anemia was recorded when hemoglobin was <12 g/dl. Hematuria included both microscopic and macroscopic hematuria. Nephrotic-range proteinuria was defined as urinary protein excretion of ≥3.5 g/day.

Clinical presentations were categorized as asymptomatic microscopic hematuria/proteinuria, macroscopic hematuria, nephrotic syndrome, nephritic syndrome, rapidly progressive glomerulonephritis (RPGN), or acute kidney injury (AKI), according to the clinical assessment at presentation.

Renal biopsy procedure and histopathological assessment

All renal biopsies were performed percutaneously under real-time ultrasonographic guidance after assessment of procedural suitability and informed consent.

Biopsy specimens were evaluated by the reporting pathologist using light microscopy. Histopathological diagnoses were recorded according to the final pathology report. Because systematic immunofluorescence and electron microscopy findings were not available for the entire cohort, lesions with proliferative or membranoproliferative patterns were reported descriptively as proliferative/MPGN-pattern lesions rather than implying a specific immunopathological classification. Hyperfiltration injury was retained as a separate histopathological category.

Statistical analysis

Continuous variables were summarized using mean±standard deviation and range. Categorical variables were expressed as frequencies and percentages. Clinicopathological findings were assessed descriptively across clinical presentation categories. No hypothesis testing or multivariable analysis was undertaken because of the small sample size and descriptive nature of the study.

Ethical considerations

The study was approved by the institutional ethics review board of S. S. Institute of Medical Sciences and Research Centre (IERB/368-2022). Written informed consent was obtained from all participants in their regional language before participation and biopsy. Patient confidentiality and privacy were maintained throughout the study.

RESULTS

Demographic and clinical characteristics

A total of 30 patients underwent renal biopsy during the study period. The mean age was 39.9±16.3 years (range, 12-71 years), and 17 (56.7%) were male.

Pedal edema was the most frequent clinical finding, present in 25 (83.3%) patients, while hematuria was present in 15 (50.0%). Diabetes mellitus was present in 13 (43.3%) patients and hypertension in 9 (30.0%).

The distribution of clinical presentations is shown in Table 1. Asymptomatic microscopic hematuria/proteinuria, macroscopic hematuria, and nephrotic syndrome each accounted for 6 (20.0%) patients. Nephritic syndrome, RPGN, and AKI each accounted for 4 (13.3%) patients.

Table 1: Demographic and clinical characteristics of the study population (n=30).

Characteristic	Value
Age, years, mean±SD	39.9±16.3
Age range, years	12-71
Male sex, N (%)	17 (56.7)
Pedal edema, N (%)	25 (83.3)
Hematuria, N (%)	15 (50.0)
Diabetes mellitus, N (%)	13 (43.3)
Hypertension, N (%)	9 (30.0)
Asymptomatic microscopic hematuria/proteinuria, N (%)	6 (20.0)
Macroscopic hematuria, N (%)	6 (20.0)
Nephrotic syndrome, N (%)	6 (20.0)
Nephritic syndrome, N (%)	4 (13.3)
RPGN, N (%)	4 (13.3)
AKI, N (%)	4 (13.3)

Laboratory findings

The mean hemoglobin concentration was 11.1±1.5 g/dl, and 21 (70.0%) patients had hemoglobin <12 g/dl. Mean total leukocyte count was 11,292±4,018/mm³.

Mean serum urea was 58.6±26.9 mg/dl and mean serum creatinine was 2.93±1.55 mg/dl. Mean total protein and serum albumin were 6.23±0.65 g/dl and 3.33±0.42 g/dl, respectively. Mean total cholesterol was 168.4±41.4 mg/dl and mean triglyceride concentration was 149.9±38.5 mg/dl. Mean 24-hour urinary protein excretion was 2.18±1.24 g/day. Six (20.0%) patients had nephrotic-range proteinuria.

Table 2: Laboratory characteristics of the study population.

Laboratory parameter	Mean±SD	Range
Hemoglobin, g/dl	11.1±1.5	8.2-14.2
Total leukocyte count, /mm³	11,292±4,018	3,450-18,240
Urea, mg/dl	58.6±26.9	10-142
Creatinine, mg/dl	2.93±1.55	0.8-7.2
Total protein, g/dl	6.23±0.65	4.1-7.2
Albumin, g/dl	3.33±0.42	2.4-4.2
Total cholesterol, mg/dl	168.4±41.4	78-256
Triglycerides, mg/dl	149.9±38.5	36-244
24-hour urinary protein, g/day	2.18±1.24	0.4-4.8

Histopathological spectrum

Membranous nephropathy was the most frequent histopathological diagnosis, identified in 9 (30.0%) patients. IgA nephropathy was identified in 6 (20.0%), while diabetic nephropathy and acute tubular injury/necrosis were each identified in 4 (13.3%) patients.

Minimal change disease was identified in 2 (6.7%) patients. Lupus nephritis and hyperfiltration injury were each identified in 1 (3.3%) patient. Three patients (10.0%) had proliferative/MPGN-pattern lesions, comprising immune-complex glomerulonephritis, C3-mediated glomerular disease, and MPGN in the underlying pathology reports.

Table 3: Histopathological diagnoses in the study population.

Histopathological diagnosis	N (%)
Membranous nephropathy	9 (30.0)
IgA nephropathy	6 (20.0)
Diabetic nephropathy	4 (13.3)
Acute tubular injury/necrosis	4 (13.3)
Proliferative/MPGN-pattern lesions	3 (10.0)
Minimal change disease	2 (6.7)
Lupus nephritis	1 (3.3)
Hyperfiltration injury	1 (3.3)
Total	30 (100)

Clinical presentation and histopathological correlation

The relationship between clinical presentation and histopathological diagnosis is shown in Table 4.

Among the six patients with asymptomatic microscopic hematuria/proteinuria, two had IgA nephropathy, two had minimal change disease, and one each had membranous nephropathy and diabetic nephropathy.

Among the six patients with macroscopic hematuria, four had IgA nephropathy and two had membranous nephropathy.

Of the six patients with nephrotic syndrome, five had membranous nephropathy and one had a proliferative/ MPGN-pattern lesion.

Among the four patients with nephritic syndrome, three had diabetic nephropathy and one had a proliferative/ MPGN-pattern lesion. The four patients presenting with RPGN had membranous nephropathy, proliferative/ MPGN-pattern disease, hyper-filtration injury, and lupus nephritis, respectively.

All four patients presenting with AKI had acute tubular injury/necrosis.

Diabetes mellitus and biopsy findings

Among the 13 patients with diabetes mellitus, 4 (30.8%) had diabetic nephropathy on biopsy, while the remaining 9 (69.2%) had other histopathological diagnoses.

The alternative lesions included membranous nephropathy, IgA nephropathy, acute tubular injury/necrosis, minimal change disease, and other glomerular lesions.

Table 4: Clinical presentation according to histopathological diagnosis.

Clinical presentation	MN	IgAN	Prolif/MPGN	MCD	Hyperfilt.	ATN/ATI	DN	LN	Total
Asymptomatic microscopic hematuria/proteinuria	1	2	0	2	0	0	1	0	6
Macroscopic hematuria	2	4	0	0	0	0	0	0	6
Nephrotic syndrome	5	0	1	0	0	0	0	0	6
Nephritic syndrome	0	0	1	0	0	0	3	0	4
RPGN	1	0	1	0	1	0	0	1	4
AKI	0	0	0	0	0	4	0	0	4
Total	9	6	3	2	1	4	4	1	30

MN: membranous nephropathy; IgAN: IgA nephropathy; MCD: minimal change disease; ATN/ATI: acute tubular necrosis/acute tubular injury; DN: diabetic nephropathy; LN: lupus nephritis; RPGN: rapidly progressive glomerulonephritis; AKI: acute kidney injury

DISCUSSION

This study describes the clinicopathological spectrum of native renal biopsies performed at a tertiary care hospital in South India and demonstrates substantial heterogeneity in both clinical presentation and histopathology. Membranous nephropathy (MN) was the most frequent histopathological diagnosis, accounting for 9 of 30 biopsies (30.0%), followed by IgA nephropathy (IgAN) in 6 (20.0%). Diabetic nephropathy (DN) and acute tubular injury/acute tubular necrosis (ATN/ATI) each accounted for 4 cases (13.3%). Previous renal biopsy studies have demonstrated substantial variation in the observed spectrum of renal disease according to geographic region, age, referral patterns, and biopsy indications.[2,3,5-7,10-12] These differences support interpretation of the present findings as representative of the clinical case-mix reaching this center rather than as population-level estimates of disease prevalence.

The relatively high frequency of MN in the present cohort may partly reflect the clinical case-mix leading to biopsy. Nephrotic presentations constituted an important component of the biopsy population, and 5 of the 6 patients with nephrotic syndrome had MN. In contrast, IgAN was particularly represented among patients presenting with macroscopic hematuria, with 4 of 6 such patients having IgAN. Previous biopsy series have similarly demonstrated IgAN as an important cause of hematuric presentations, while MN is frequently encountered among patients undergoing biopsy for nephrotic-range proteinuria or nephrotic syndrome.[4-7] A Central Indian biopsy study, for example, reported nephrotic syndrome as the commonest indication for biopsy while identifying IgAN, MN, and FSGS among the major primary glomerular lesions.[5] Thus, the predominance of MN in the present study may reflect the clinical spectrum selected for biopsy, particularly the substantial representation of nephrotic presentations, rather than a specific geographic predisposition. The small sample size and absence of population-level denominator data preclude conclusions regarding the true prevalence of MN in the surrounding South Indian population.

The association between clinical syndrome and histopathology was further illustrated by the remaining diagnoses. All four patients presenting with AKI had ATN/ATI, while proliferative/MPGN-pattern lesions occurred among patients presenting with nephritic syndrome or rapidly progressive glomerular disease. IgAN was particularly represented among patients with macroscopic hematuria. These findings illustrate the diagnostic value of renal biopsy when the clinical presentation suggests intrinsic renal disease but does not establish the underlying pathology. However, because immunofluorescence and electron microscopy were not systematically available in the present study, the proliferative/MPGN-pattern category was intentionally retained as a descriptive histological grouping rather than interpreted as a uniform immunopathological entity.

An important finding was the high frequency of non-diabetic renal lesions among patients with diabetes mellitus. Of the 13 patients with diabetes, only 4 (30.8%) had DN, whereas 9 (69.2%) had another histopathological diagnosis, including MN, IgAN, ATN/ATI, minimal change disease, hyperfiltration injury, and a proliferative/MPGN-pattern lesion. This finding should be interpreted in the context of biopsy selection: these were not unselected patients with diabetes and kidney disease, but patients in whom renal biopsy had been considered clinically appropriate. Nevertheless, the observation is consistent with the broader biopsy literature showing that diabetic patients selected for biopsy may have renal lesions other than diabetic kidney disease.[6,11,12]

The present dataset does not permit determination of the specific clinical feature that prompted biopsy in each diabetic patient. In particular, diabetic retinopathy status was not systematically available, and the retrospective records did not permit reliable reconstruction of the trajectory of renal function before biopsy. Therefore, the present study cannot establish that absence of retinopathy, rapid decline in GFR, or atypical urinary findings accounted for the high proportion of non-diabetic lesions. This limitation is important because the observed 9 of 13 frequency should not be interpreted as the prevalence of non-diabetic renal disease among all patients with diabetes. Rather, it indicates that diabetes alone did not reliably identify the underlying renal lesion among patients selected for biopsy in this cohort.

The finding nevertheless has a practical clinical implication. Diabetes should not automatically be assumed to explain renal abnormalities when the clinical phenotype is atypical. A joint position statement of the Italian Society of Nephrology and the Italian Diabetes Society identifies rapid progression of albuminuria, sudden onset of nephrotic syndrome, rapid decline in GFR, hematuria, active urinary sediment, and clinical or laboratory suspicion of another systemic disease as circumstances in which renal biopsy should be considered in diabetic patients.[13] Accordingly, in a general medical or tertiary-care setting, these features may serve as practical triggers for nephrology referral and consideration of biopsy rather than attribution of the renal presentation to diabetic kidney disease alone. The present study does not establish a specific numerical threshold for biopsy, and the decision should remain individualized according to the clinical syndrome, trajectory of kidney function, urinary findings, bleeding risk, expected diagnostic yield, and whether histological information is likely to influence management.[13,14]

The biochemical profile of the cohort was consistent with a population with clinically significant renal disease. Mean serum creatinine was 2.93±1.55 mg/dl, while mean 24-hour urinary protein excretion was 2.18±1.24 g/day. Six patients (20.0%) had nephrotic-range proteinuria, and six (20.0%) fulfilled the clinical classification of nephrotic syndrome. The presence of nephrotic-range proteinuria across different histopathological diagnoses also illustrates why proteinuria alone cannot reliably determine the underlying lesion. In this cohort, MN accounted for most nephrotic-syndrome presentations, but other lesions were also identified.

Anemia was present in 21 patients (70.0%). Although anemia may accompany impaired renal function and chronic systemic disease, the present study was not designed to determine its specific cause or prognostic significance. It is therefore best interpreted as a descriptive characteristic of the cohort rather than as a clinicopathological predictor.

The clinical-pathological discordance observed in several patients supports the continuing role of renal biopsy in selected patients with unexplained intrinsic renal disease. Kidney biopsy provides tissue-level diagnostic information that can distinguish among glomerular, tubulointerstitial, vascular, and other renal processes when clinical findings alone are insufficient.[14] This is particularly relevant in patients with diabetes or other systemic diseases in whom the presumed underlying condition may coexist with, or be mistaken for, another renal pathology. At the same time, the findings of the present study should not be interpreted as establishing new indications or numerical thresholds for renal biopsy.

The study has several strengths. It provides contemporary biopsy data from a tertiary care center serving Davangere and surrounding areas and incorporates clinical presentation, biochemical parameters, comorbidities, and histopathological findings in the same cohort. The clinical presentation categories and pathology diagnoses were examined together, allowing direct description of clinicopathological relationships. The study also included 30 consecutive eligible native kidney biopsies and used a standardized descriptive approach.

Several limitations should be acknowledged. First, the sample size was small and the study was conducted at a single tertiary care center over one year; therefore, the findings cannot be generalized to the wider South Indian population or interpreted as population prevalence estimates. Second, the study included only patients who underwent biopsy, introducing selection and referral bias. Third, histopathological assessment was based on light microscopy, with no systematic immunofluorescence or electron microscopy, limiting diagnostic resolution for some glomerular lesions. The proliferative/MPGN-pattern category was consequently reported descriptively. Fourth, a systematic evaluation of secondary causes of MN, including serological and malignancy-related assessment, was not available. Fifth, diabetic retinopathy status was not systematically documented, preventing analysis of its relationship with DN and non-diabetic renal disease. Finally, treatment response, long-term renal outcomes, and post-biopsy complications were not systematically assessed.

Overall, this study demonstrates a heterogeneous spectrum of renal pathology among patients undergoing biopsy at a tertiary care center in South India, with MN and IgAN being the most frequent diagnoses. The observed predominance of MN appears to be closely related to the clinical case-mix reaching biopsy, particularly the substantial representation of nephrotic presentations, rather than providing evidence of a geographic predisposition. The finding that 9 of 13 diabetic patients had non-diabetic renal lesions further emphasizes that diabetes should not be regarded as sufficient explanation for an atypical renal presentation. In clinical practice, hematuria or active urinary sediment, rapidly increasing proteinuria or nephrotic syndrome, unexplained or rapidly declining renal function, and other features suggesting an alternative renal or systemic disease should prompt nephrology referral and consideration of kidney biopsy where appropriate.

CONCLUSION

This study demonstrates a diverse spectrum of renal pathology among patients undergoing native renal biopsy at a tertiary-care hospital in South India, with membranous nephropathy and IgA nephropathy being the most frequent diagnoses. The findings also demonstrate clinically important discordance between diabetes and biopsy-proven diabetic nephropathy, as well as clinic-pathological associations between nephrotic presentation and membranous nephropathy and between acute kidney injury and acute tubular injury/necrosis. Although the findings are limited by the small, single-center sample and light-microscopy-based evaluation, they provide useful local data and reinforce the role of renal biopsy in establishing a specific diagnosis in selected patients

ACKNOWLEDGEMENTS

The authors acknowledge the department of pathology and the clinical and laboratory staff of S. S. Institute of Medical Sciences and Research Centre, Davangere, for their assistance in the evaluation and management of study participants.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Uezono S, Hara S, Sato Y, Komatsu H, Ikeda N, Shimao Y, et al. Renal biopsy in elderly patients: a clinicopathological analysis. Ren Fail. 2006;28(7):549-55.
2. Yim T, Kim Y, Park S, Lim JH, Jung HY, Cho JH, et al. Patterns in renal diseases diagnosed by kidney biopsy: A single-center experience. Kidney Res Clin Pract. 2020;39(1):60-9.
3. Su S, Yu J, Wang Y, Wang Y, Li J, Xu Z. Clinicopathologic correlations of renal biopsy findings from northeast China: A 10-year retrospective study. Medicine (Baltimore). 2019;98(23):e15880.
4. Donadio JV Jr, Grande JP. IgA nephropathy. N Engl J Med. 2002;347(10):738-48.
5. Bhawane A, Pasari AS, Tolani P, Balwani MR. Spectrum of biopsy-proven native kidney disease in Central India. Saudi J Kidney Dis Transpl. 2022;33(5):688-92.
6. Mittal P, Agarwal SK, Singh G, Bhowmik D, Mahajan S, Dinda A, et al. Spectrum of biopsy-proven renal disease in northern India: A single-centre study. Nephrology (Carlton). 2020;25(1):55-62.
7. Chowdhary PK, Kumar AV, Kale SA, Nayak S, Joshi P, Badge RP, et al. Histopathological spectrum of kidney biopsy in Central India: A two-center retrospective study. Indian J Nephrol. 2024;34(4):379-82.
8. Ghimire M, Vaidya S, Upadhyay HP. Clinicodemographic profile of kidney diseases in a tertiary hospital of Central Nepal, Chitwan: A descriptive cross-sectional study. JNMA J Nepal Med Assoc. 2020;58(227):459-64.
9. Sharma RK, Singh V, Sood V, Dogra PM. Spectrum of glomerular diseases in North India and its clinicopathological correlation – An observational study. J Mar Med Soc. 2024;26:41-6.
10. Gangdev AN, Kandari S, Kant R, Dhoot DK, Garg S, Cheriyan A, et al. Clinicopathological spectrum of glomerular disorders in adult versus elderly patients: a prospective observational study from a tertiary care centre in North India. Int J Res Med Sci. 2026;14(9):3941-6.
11. Lin Z, Xie S, Wang W, Hong T, Jiang B, Chen C, et al. Changes in the spectrum of kidney diseases: a 14-year single-center retrospective renal biopsy study from southeast China. PeerJ. 2025;13:e19302.
12. Josephine S, Barathi G, Susruthan M, Balasubramanian S. A spectrum of biopsy-proven renal disorders and their clinicopathological correlation in elderly population from a tertiary care center in South India. Cureus. 2021;13(8):e17031.
13. Di Paolo S, Fiorentino M, De Nicola L, Reboldi G, Gesualdo L, Barutta F, et al. Indications for renal biopsy in patients with diabetes. Joint position statement of the Italian Society of Nephrology and the Italian Diabetes Society. Nutr Metab Cardiovasc Dis. 2020;30(12):2123-32.
14. Luciano RL, Moeckel GW. Update on the native kidney biopsy: Core Curriculum 2019. Am J Kidney Dis. 2019;73(3):404-15.

Cite this article as: Nikhil KDG, Pai M, Gowda M, Yeshavanth G. Clinicopathological spectrum of renal biopsies at a tertiary care hospital in South India: a cross-sectional study. Int J Res Med Sci 2026;14:xxx-xx.