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Histopathological Patterns of Renal Biopsy and their Treatment Outcomes at a tertiary hospital in Dhakka: An Observational Study

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Abstract:

Background: Renal biopsy is the gold standard for diagnosing the underlying cause of renal diseases. It provides critical insights into histopathological patterns, enabling tailored management and prognostic assessment. In this study, we have assessed the histopathological patterns of renal biopsy and their treatment outcome at our tertiary care hospital in Dhakka.

Method: This was a retrospective observational study among patients who underwent renal biopsies from June' 24 to September' 25 (16 months) at department of Nephrology.

Result: Total of 60 patients were included in the study. Mean age was 39 (±2) years, with a male to female ratio of 2:3. The most common co-morbidity observed was Hypertension (42%), followed by Diabetes Mellitus (18%). Renal biopsy was most frequently indicated for proteinuria (48.33%, 29/60), with Nephrotic Syndrome accounting for 62% (18/29) of these cases. IgANw s the commonset diagnosis followed by FSGS, 26.9% and 15% respectively. Complete or partial remission was achieved in 38.3 % of patients at one year. Tubule-interstitial involvement at presentation was associated with a poorer outcome.

Conclusion: This study highlights that among our cohort of patients at a tertiary hospital the most frequent diagnosis was IgAN. Complete and partial remission was observed in one third of our patients. It is therefore important to diagnose the GN at an early stage with prompt treatment that may help to improve the clinical outcome of our patients.

Key words: Histopathology, IgAN, FSGS, Membranous GN, Immunosuppression, Glomerulonephritis.

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Introduction:

Kidney disease represents a significant global health burden, contributing substantially to morbidity and mortality.[1] Accurate and timely diagnosis of the underlying pathology is paramount for effective clinical management and for providing an informed prognosis. While clinical presentation, laboratory investigations, and imaging provide strong indications, the definitive diagnosis of primary and secondary glomerular and tubulointerstitial diseases relies on histopathological examination.

Patients often present with diverse clinical indications such as proteinuria, nephrotic syndrome, acute glomerulonephritis (GN), or unexplained kidney dysfunction, requiring histopathological evaluation to determine the precise etiology and trace subsequent treatment strategies as per recognized guidelines.

The cornerstone of this diagnostic process is the percutaneous renal biopsy. It is widely considered the gold standard procedure, offering critical insights into the microscopic architecture of the kidney. The tissue obtained allows for examination via multiple modalities, typically light microscopy, immunofluorescence, and sometimes electron microscopy, providing a comprehensive view of the disease process. This level of detail is indispensable, as it allows clinicians to differentiate between various histopathological patterns, enabling the selection of tailored, specific therapeutic regimens that are known to improve patient outcomes.[2] Furthermore, the biopsy findings, such as the extent of interstitial fibrosis or tubular atrophy (tubulointerstitial involvement), are crucial prognostic indicators that guide long-term follow-up and counseling.

Objectives:

The rationale of this study were two-fold:

1. To analyze the spectrum of histopathological patterns identified in renal biopsies performed at a tertiary care center department of nephrology, Evercare hospital, Dhakka.
2. To observe the treatment outcomes, including rates of remission, relapse, and progression to end-stage kidney disease (ESKD).

By characterizing the regional profile of kidney diseases, this objective of the study is to contribute valuable data to the local and regional literature, ultimately helping to optimize diagnostic approaches and therapeutic strategies for patients presenting with various renal disorders.

Methodology:

Study Design and Setting:

This investigation was a retrospective observational study. The study was conducted over a duration of 16 months, spanning from June 2024 to September 2025. The institutional setting for this research was department of nephrology and transplantation at Evercare hospital, a tertiary care facility known for managing complex and diverse nephrological conditions in Bangladesh.

Patient Selection: Inclusion Criteria: The study population comprised adult patients (age $\geq$ 18 years) who were admitted to the Department of Nephrology and underwent a kidney biopsy after providing informed written consent for the procedure. Exclusion Criteria: Patients whose renal biopsy procedure was performed outside of our hospital, were excluded from the analysis.

Renal Biopsy Procedure:All renal biopsies were performed percutaneously and under real-time sonographic guidance to ensure accurate needle placement and minimize complications. A standardized procedure was followed to ensure specimen adequacy. At least two core tissue samples were typically obtained from each patient. These specimens were processed and sent for immediate histological evaluation, which included: Light Microscopy (LM): Samples were fixed, embedded, sectioned, and stained with standard and specialized stains (e.g., Hematoxylin and Eosin, Periodic Acid-Schiff, Masson's Trichrome, Silver methenamine).

Direct Immunofluorescence (DIF): Fresh tissue samples were flash-frozen and stained with fluorochrome-labeled antibodies against various immunoglobulins (IgG, IgA, IgM), complement components (C3, C1q), and fibrinogen to detect immune complex deposition.

Pathological reports generated by the hospital's Histopathology and Laboratory Medicine Team were utilized for histopathological classification.

Data Collection and Statistical Analysis:
Prior to inclusion in the study, informed written and verbal consent was obtained from all participating patients or their legally authorized representatives. The study adhered to the ethical principles for medical research involving human subjects. Ethical Approval was granted by the Ethical approval Board of Evercare hospital, ERC-79/2025-17. Demographic data (e.g., age, sex, weight), clinical investigation results, co-morbidity status (e.g., Hypertension, DM), the specific indication for the renal biopsy, the comprehensive histopathology report, the prescribed treatment regimen, and the final clinical outcome were meticulously documented in a pre-formed, structured data collection sheet.

Statistical Analysis: Due to the observational and descriptive nature of the study, statistical analysis primarily involved the determination of simple descriptive statistics. Percentages and the mean with standard deviation were calculated using SPSS version 29 (IBM, Armonk, New York, USA to summarize the data.

Results:

Study Population and Demographics: The study analyzed the records of a Total number of 60 patients who underwent renal biopsy during the study period.
Mean age of the cohort was (39±2) years and Male-to-Female ratio (M: F) was determined to be 2:3, indicating a higher proportion of female patients in the biopsied population. Average weight of the patients was (68 ± 2) kg although BMI was not calculated.
Co-morbidities: Pre-existing medical conditions were analyzed. The most prevalent co-morbidity was Hypertension, which was documented in approximately 42% of the patients. This was followed by Diabetes Mellitus (DM), present in 18% of the study, Figure 1.

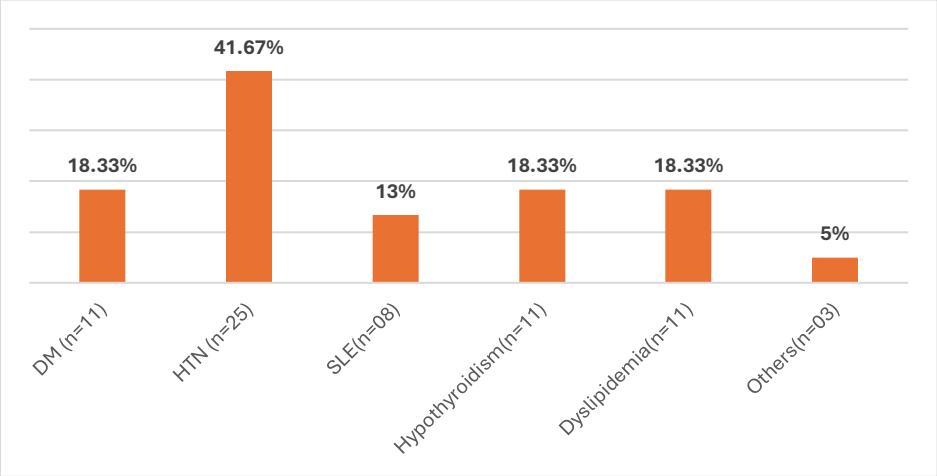

Figure 1: Prevalence of co-morbidities among 60 patients undergoing kidney biopsy.

Kidney Biopsy & HP Pattern

Indications for biopsy: Among the indications for renal biopsy in our study population, Renal biopsy among native kidney biopsy patients was indicated for proteinuria (48.33%, 29/60), with Nephrotic Syndrome accounting for 62% (18/29) of these cases. 14 other patients had features of Acute GN, 14/60 (23.33%), unexplained Acute Kidney Injury (AKI) in 9/60 (15%), and eight patients underwent kidney biopsy for possibility of kidney transplant rejection (13.33%), figure 2.

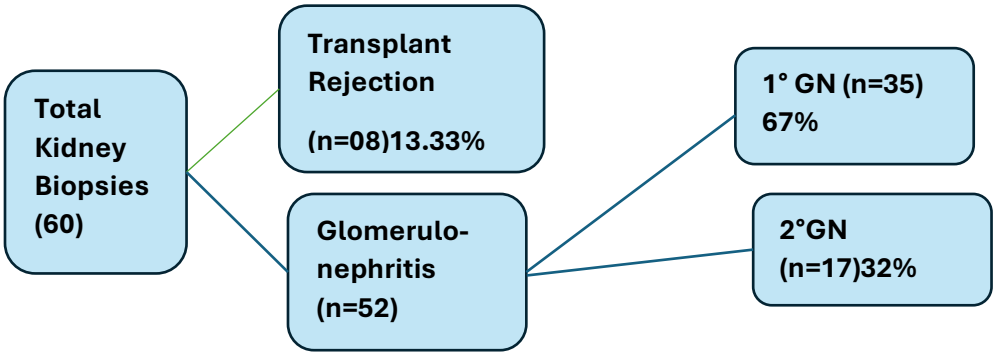

Figure 2: Histopathological prevalence of Glomerulonephritis (primary and secondary) and transplant rejection among study population.

Among the patients having Primary Glomerulonephritis, the most common histopathological pattern observed was IgA nephropathy (IgAN), accounting for (23.3%, n=14) of cases, followed by focal segmental glomerulosclerosis (FSGS) (13.3%, n=8) and others, Table 1.

Table 1: Biopsy findings of primary glomerulonephritis among study population.

Diagnosis	N (%)
IgAN	14 (23.3)
FSGS	8 (13.3)
MCD	3 (5)
MPGN	5 (8.3)
MGN	5 (8.3)

The study analyzed the histopathological patterns of Secondary GN (SGN) in a total of (32%, n=17) patients. The findings indicate that the most common cause of SGN was Systemic Lupus Erythematosus (SLE), accounting for 8 cases (13.3%), followed by Diabetes Mellitus (and others Figure 3.

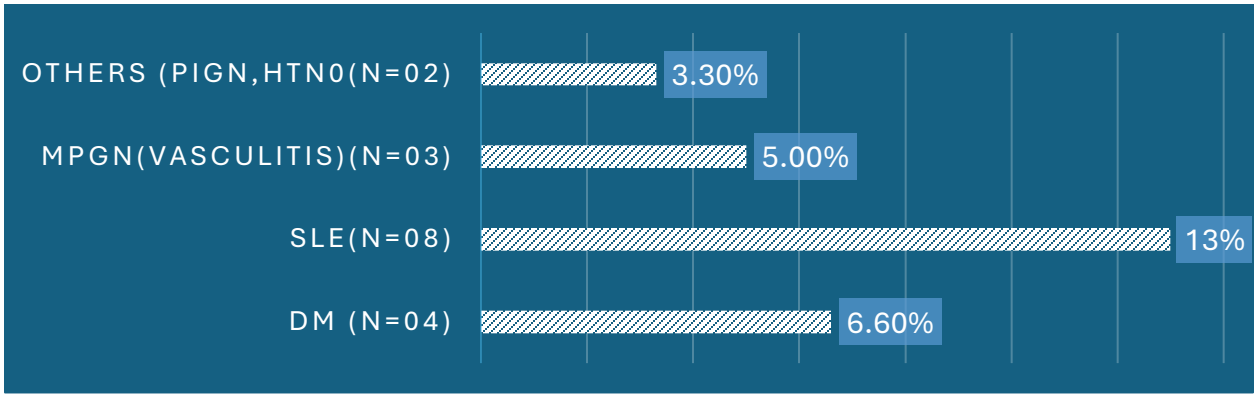

Figure 3: Biopsy pattern of secondary glomerulonephritis among 60 patients undergoing kidney biopsy .

Further analysis of specific secondary GN patterns revealed that among patients with Lupus Nephritis (LN), Class IV was the maximum finding, observed in (7/8) cases (88%). Only 4 patients with DM were biopsied had IgAN, FSGS, MPGN and a case of MGN.

Management Protocols:

The management of patients following renal biopsy involved both specific and general treatment protocols as per KDIGO guidelines. [2]

The specific treatment regimens were tailored to the histopathological diagnosis. For vasculitis, patients received steroids, which were combined with either cyclophosphamide or rituximab. In cases of FSGS (Focal Segmental Glomerulosclerosis), the treatment included steroids plus calcineurin inhibitors or cyclophosphamide. For MGN (Membranous Glomerulonephritis), patients were given rituximab or a combination of steroid and calcineurin inhibitors. Patients with MCD (Minimal Change Disease), among others, were primarily treated with steroids.

General Treatment Regimens:

In addition to disease-specific therapy, general treatment measures were implemented. These included: RAS blockade (Renin-Angiotensin System blockade), diuretics, statins, blood pressure control, and glycemic control. Furthermore, patients received vaccination and prophylactic antibiotics during immunosuppression.

Treatment outcome over study period:

The study observed the treatment outcomes over a 15 months follow-up period in the total patient cohort. The largest category of patients (46.67%,n=28) were still receiving immunosuppression at the time of the study. Complete cessation of disease activity was achieved in (18.33%, n=11) of patients and partial remission was achieved by (20%, n=12) of patients. A significant portion of the cohort, (28.33%, n=17), was Lost to follow-up. Adverse outcomes, though less frequent, included relapse and progression to end-stage renal disease requiring hemodialysis.

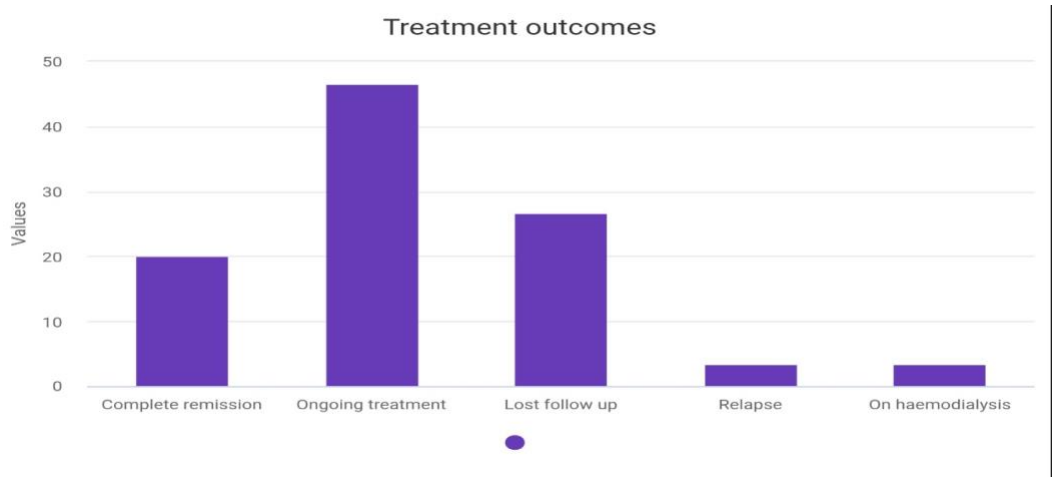

Figure 4: Treatment outcome of 60 kidney biopsy patients at the time of analysis.

Relation of Age, eGFR, and Tubulointerstitial Involvement at Presentation with Outcome:

The study analyzed how Age, estimated Glomerular Filtration Rate (eGFR), and Tubulointerstitial Involvement (TAI) at the time of presentation correlated with patient outcomes (Remission, Partial Remission, or Relapse/On Hemodialysis), Figure 5. For estimated Glomerular Filtration Rate (eGFR), the best outcome (Remission) was associated with the highest mean eGFR at presentation, measuring 72.4. Patients who achieved Partial Remission had an average eGFR of 60.38, while those who Relapsed or were On Hemodialysis (Relapse/HD) had the lowest mean eGFR of 46.1.

Tubulointerstitial Involvement on Biopsy (IFTA) was measured as a percentage, the worst outcome (Relapse/HD) was associated with the highest average score of 75%. While patients with complete or partial remission had a mean score of 50%.

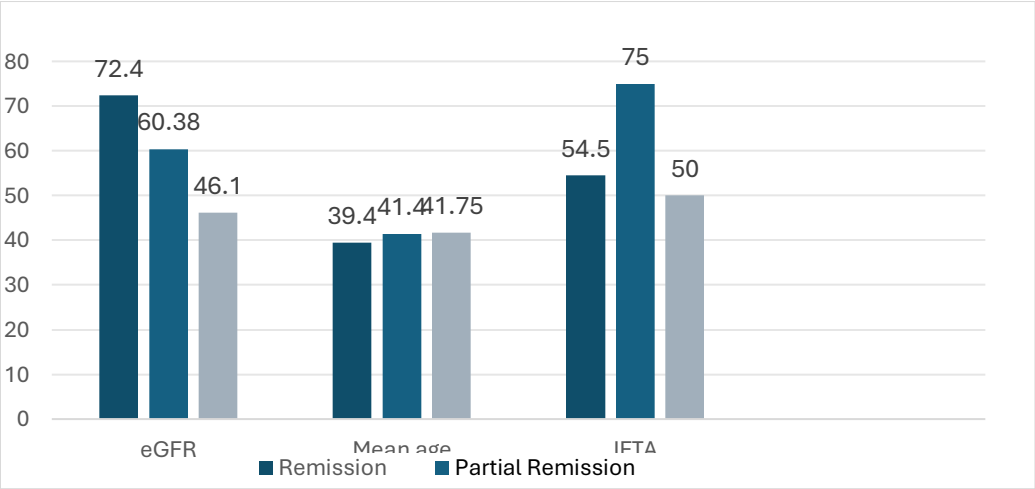

Figure 5: Relation of Age, eGFR, and Tubulointerstitial Involvement at Presentation with Outcome.

Discussion

The findings of this observational study underscore the indispensable role of renal biopsy in the accurate diagnosis and evidence-based management of kidney diseases in a tertiary care setting in Dhakka. Our patient population was relatively young with mean age of 39 years which is often characteristic of cohorts presenting with immune-mediated and primary glomerular diseases in Asia and especially subcontinent. [4-6]

The most frequent indication for biopsy was significant Proteinuria (48.33%), with Nephrotic Syndrome being the dominant clinical presentation (62% of proteinuria cases) and unexplained hematuria.
In terms of specific pathology, IgA Nephropathy was the most common histopathological finding among Primary Glomerulonephritis cases. This finding aligns closely with epidemiological data from other studies conducted in the Indian subcontinent, suggesting a regional predisposition or common environmental/genetic factors contributing to this pathology. 7-

An earlier study from 2018; by Islam et.al; of a cohort of 235 kidney biopsies at Armed forces institute of Pathology Dhaka reported diffuse proliferative GN(24.3%)as the most common etilogy followed by FSGS (19.2%) and lupus nephritis was the most common secondary GN.[7]

Another recent study by Salahuddin et.al reported in 2017, FSGS and Mes Proliferative GN as most common(18.8%) histopathologic pattern among 101 kidney biopsies. [8]

Among the secondary causes, Systemic Lupus Erythematosus (SLE) was the second highest diagnosis after DM, and the overwhelming predominance of Class IV Lupus Nephritis (88%) in the LN subgroup is a critical finding. Class IV LN is the most common and clinically severe form of proliferative lupus nephritis, mandating aggressive and protracted immunosuppressive therapy.[9] There were only 4 patients with Diabetes mellitus and had variable histological diagnosis. Such findings among diabetic patients is not uncommon and can reach upto 50% of biopsies among diabetic patients. [10]
Changing patterns of kidney disease etiology is evident globally and similarly in Bangladesh while in 2012, a metanalysis revelaed GN (67%) as the most common cause of CKD, while in a recent publication from Urban Dhaka found Hypertension and diabetes as the most common causes.[11] While the later study did not clearly identify GN as one of the causes of CKD, presence of hematuria was observed to be strongly related also to CKD.

The treatment outcomes at one year showed that a combined 38.33% of patients achieved either complete or partial remission. While encouraging, the high percentage of patients in the Ongoing Treatment category (46.67%) indicates the chronic and relapsing nature of these diseases, requiring early intervention and long-term pharmacological management. The significant proportion of patients lost to follow-up (28.33%) presents a major limitation to the study, potentially masking the true rates of long-term remission, relapse, or progression to ESKD. Lack of EM was a limitation and While diagnosis of FSGS is dependent on light microscopic findings the refinement with EM suggesting primary vs secondary GN is suggestive by diffuse effacement of foot process in the former. This may help in predicting the prognosis in such cases. [3,12]

Diffuse proliferative GN and Mes GN are diagnosis that need IF and EM to identify the underlying pathology. While clinical and histopathological diagnosis may be enough for Lupus nephritis, other diseases such as IgAN, Complement mediated GN, and post infectious etc. can be reliably labelled with EM even if the IF is technically incorrect or not done.[3,9,12]

Conclusion:

Renal biopsy remains an indispensable tool for the accurate diagnosis and appropriate management of renal diseases. IgAN was the commonest finding followed by FSGS in our patients. Continuous collection and analysis of this data by forming registries at national level in Bangladesh can help in are crucial, as it can significantly contribute to improving outcomes in renal disease management.

Conflict of interest: None declared.

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