Original Article

Patterns of Kidney Diseases in Native Biopsies: A Single-Center Experience

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ABSTRACT

Background: Kidney biopsy is the definitive diagnostic method for kidney disease, providing essential histopathological information for prognosis and treatment. However, in Indonesia, comprehensive data on kidney biopsy patterns remain limited, making it difficult to assess disease prevalence and epidemiological trends.

Objective: To analyze the epidemiology of biopsy-confirmed kidney diseases in a single-center cohort and evaluate the distribution of clinical and histopathological diagnoses.

Methods: A retrospective descriptive analysis was performed on patients who underwent a kidney biopsy at Siloam Hospital Kebon Jeruk between January 2021 and August 2024. Data on demographics, clinical manifestations, biopsy indications, histopathological findings, and immunofluorescence results were analyzed using descriptive statistics.

Results: A total of 45 kidney biopsies were conducted, resulting in a biopsy rate of 5.24 per 1,000 individuals, higher among young adults (15–44 years). The median patient age was 43 years, with a nearly equal male-to-female ratio. Nephrotic syndrome was the leading clinical presentation (35.9%), followed by nephritic syndrome (33.3%). Hematuria and proteinuria (35.6%) were the most frequent biopsy indications. Glomerular diseases represented as majority of histopathological diagnoses, with focal segmental glomerulosclerosis (FSGS) being the most common finding (37.8%), followed by lupus nephritis and IgA nephropathy. A rare case of monoclonal gammopathy of renal significance was also identified.

Conclusion: This study provided insight into biopsy-confirmed kidney disease patterns in Indonesia. The predominance of glomerular diseases, particularly FSGS, aligns with global trends. The low biopsy rate underscores the need for expanded nephrology services and further multicenter studies to develop a comprehensive national kidney disease registry.

Keywords: Kidney, Biopsy, Histopathology, Kidney Disease, Indonesia.

Introduction

Biopsy is considered the gold standard for diagnosing kidney disease, and it is crucial for its management and for predicting disease progression.[1] Kidney disease currently ranks as the seventh leading cause of death, impacting survival, quality of life, and healthcare costs, which are influenced by factors such as demographic changes, obesity, and climate change.[2]

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As an invasive diagnostic method, kidney biopsy is advised based on specific criteria, such as for confirming a diagnosis or offering information that informs treatment decisions.[3] It is especially recommended when the expected progression of a suspected disease carries substantial morbidity and/or mortality, or when understanding its clinical course can be improved with appropriate treatment.[3] Physicians should carefully evaluate the risks of kidney biopsy in comparison to the expected benefits a patient may receive from establishing a histopathological diagnosis.[3]

However, the available data on kidney biopsies in Indonesia remains limited, making it difficult to obtain comprehensive information on the prevalence, patterns, and causes of kidney disease within the population. Thus, the objective of this study is to analyze the epidemiology of biopsy-confirmed kidney disorders in our population.

In 2020, the number of patients diagnosed with kidney disease in Indonesia reached 68,180, with chronic kidney disease (CKD) accounting for more than 90% of cases.[4] According to the 2018 Indonesia Basic Health Research (RISKESDAS) report, the prevalence of CKD in Indonesia was 0.38% (3.8 per 1,000 population). Additionally, dialysis is required as a treatment for approximately 60% of individuals with kidney failure.[5]

Methods

Design and participants

This study employs a descriptive methodology, focusing on the observation and analysis of existing data without variable manipulation, to systematically describe the examined issue. This research adhered to applicable regulations, the Declaration of Helsinki, and Good Clinical Practice guidelines. Ethical clearance was obtained from the Ethical Committee of the Mochtar Riady Institute of Nanotechnology (protocol number 1501001-03) along with local committees at all participating centers.

Statistical analysis

Data on patient characteristics, clinical manifestations, biopsy indications, histopathology, and immunofluorescence results were collected for every native biopsy performed between January 2021 and August 2024 at Siloam Hospital Kebon Jeruk. The biopsy indications were adapted from the American Journal of Kidney Diseases and the European Renal Association for diagnosis. A descriptive analysis was conducted on a total of 45 complete datasets using SPSS for Windows, version 27.

Definitions

1. Kidney biopsy: A procedure involving the extraction of a small sample of kidney tissue through percutaneous needle insertion, conducted to identify the pathological condition and diagnosis of a renal disorder, track the progression of kidney disease, evaluate therapeutic response, and detect signs of renal transplant rejection.[6]
2. Hematuria: The occurrence of acanthocytes or red blood cell casts in the urine, accompanied by either elevated serum creatinine levels or the presence of proteinuria.[1]
3. Proteinuria: Urinary protein excretion >1 g/day on multiple occasions without clear comorbidity; >3 g/day if not diabetic, or rapidly increasing despite diabetes; <3 g/day with elevated serum creatinine and no evident comorbidities such as diabetes or hypertension.[1]
4. Acute Kidney Injury (AKI): Defined as ongoing kidney damage despite resolution of the underlying cause in acute tubular injury, or if serum creatinine fails to return to baseline within 7–14 days of onset. In suspected acute interstitial nephritis, AKI is considered if kidney function does not improve following discontinuation of the causative medication.[1]
5. Chronic Kidney Disease (CKD): Structural or functional kidney abnormalities lasting at least 3 months with health implications. CKD is diagnosed when either of the following is present:

- Glomerular filtration rate (GFR) <60 mL/min/1.73 m²
- One or more markers of kidney damage, including albuminuria (ACR ≥30 mg/g [≥3 mg/mmol]), abnormal urine sediment, persistent hematuria, electrolyte imbalances from tubular dysfunction, histological or imaging-detected abnormalities, or a history of kidney transplantation.[7]

Results

Patient Kidney Biopsy Rate and Patient Characteristics

From January 2021 to August 2024, a total of 45 patients underwent kidney biopsy. The kidney biopsy rate was 5.24 per 1,000 individuals, and the median age was 43 years. Among them, 25 patients (55.6%) were between 18 and 44 years old (Figure 1A). The sex distribution was nearly equal, with 22 males (48.9%) and 23 females (51.1%) (Figure 1B).

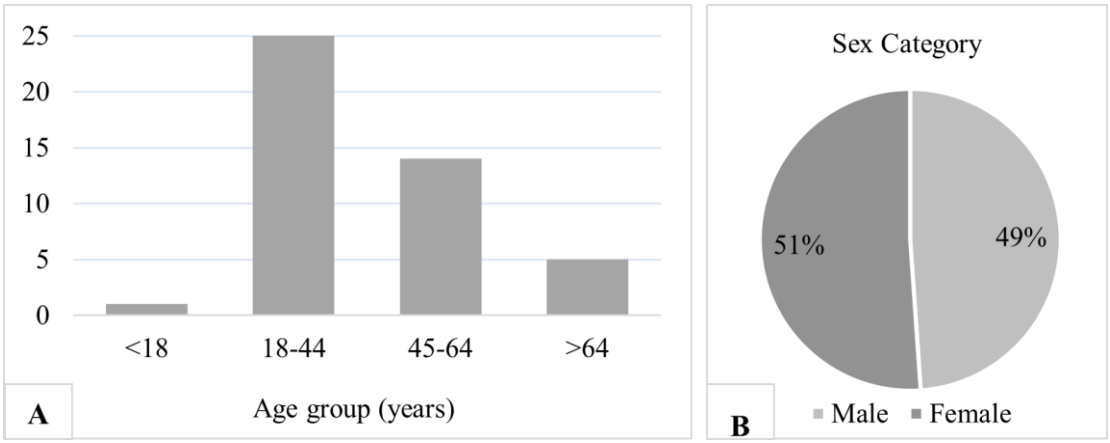

Figure 1. Overview of demographic characteristics of patients undergoing Kidney Biopsy at Siloam Hospitals Kebon Jeruk from January 2021 – August 2024. (A) Biopsy demographic according to age category. (B) Biopsy demographic according to sex category

The most prevalent biopsy indication was the presence of both hematuria and proteinuria, accounting for 16 patients (35.6%) of the total. Chronic kidney disease (CKD) was the second most common indication, observed in 14 patients. Additionally, proteinuria was detected in 9 patients, hematuria in 4 patients, and acute kidney injury (AKI) in 2 patients (Figure 2).

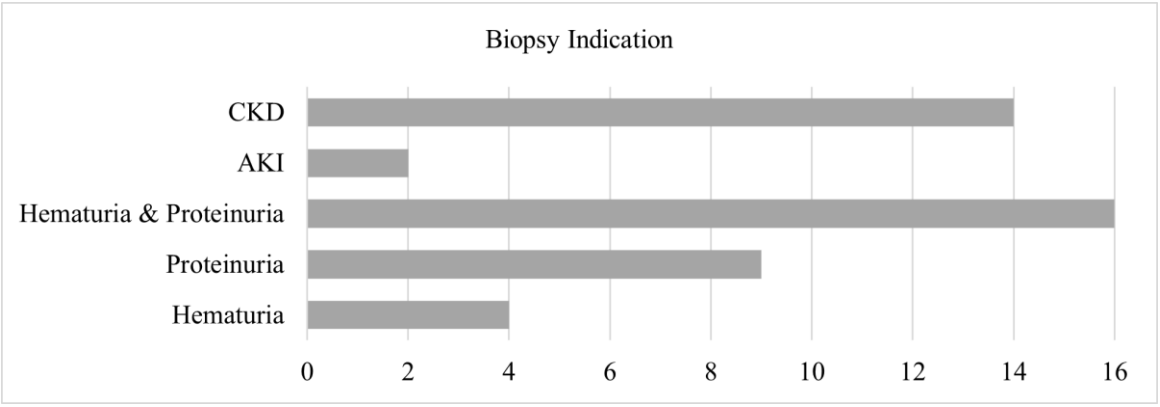

Figure 2. Biopsy indication based on clinical manifestation of patients undergoing kidney biopsy at Siloam Hospitals Kebon Jeruk from January 2021 – September 2024. CKD: chronic kidney disease; AKI: acute kidney injury

Table 1 summarizes the clinical manifestations of glomerular disease in 39 out of 45 patients (later detailed in the histopathological diagnosis). Nephrotic syndrome was the most prevalent presentation, observed in 35.9% of patients, followed by nephritic syndrome (33.3%) and chronic glomerulonephritis (20.5%). Rapidly progressive glomerulonephritis (RPGN) (7.7%) and macroscopic hematuria (2.6%) were less common manifestations.

Table 1. Clinical Manifestation of Glomerular Disease

CLINICAL MANIFESTATION	N	PERCENT (%)
Nephritic Syndrome	13	33.3
Macroscopic Hematuria	1	2.6
RPGN	3	7.7
Nephrotic Syndrome	14	35.9
Chronic GN	8	20.5
Total	**39**	**100.0**

RPGN: rapidly progressive glomerulonephritis; GN: glomerulonephritis

Histopathological Diagnosis

The analysis of histopathology and immunofluorescence findings (Table 2) revealed that most patients had glomerular disease. Only one patient was diagnosed with tubulointerstitial disease. Among glomerular diseases, focal segmental glomerulosclerosis (FSGS) was the most common diagnosis, observed in 37.8% of cases, followed by systemic lupus erythematosus (SLE) and IgA nephropathy. We were unable to determine the cause of secondary FSGS (hereditary, genetic, or other factors), as testing was not yet available. A unique case in our study involved a specific disease not classified under the ERA-EDTA PRD registry: monoclonal gammopathy of renal significance.

Table 2. Histopathological diagnosis of kidney biopsy

HISTOPATHOLOGICAL DIAGNOSIS	N	PERCENT (%)
Glomerular disease		
Primary FSGS	7	15.6
HSP	1	2.2
RPGN	2	4.4
Glomerulonephritis Secondary to Systemic Disease	3	6.7
Secondary FSGS	10	22.2
SLE	8	17.8
IgA Nephropathy	6	13.3
Membranous Nephropathy	2	4.4

Table 2 (cont.)		
Tubulointerstitial disease		
Tubulointerstitial Nephritis	1	2.2
Diabetes Mellitus		
Diabetic Nephropathy in Type II DM	2	4.4
Other systemic disease affecting the kidney		
Myeloma Cast Nephropathy	1	2.2
Hypertension / renal vascular disease		
Hypertensive Renal Disease	1	2.2
Other specific disease		
Monoclonal Gammopathy of Renal Significance	1	2.2
Total	45	100.0

Histopathological diagnosis was grouped based on Primary Renal Disease codes on ERA-EDTA Registry.[8] FSGS: focal segmental glomerulosclerosis; HSP: Henoch-Schönlein purpura; RPGN: rapidly progressive glomerulonephritis; GN: glomerulonephritis; HIV: human immunodeficiency virus; SLE: systemic lupus erythematosus; IgA: immunoglobulin A; DM: Diabetes Mellitus.

Discussion

Approximately 8.5 million people in West Jakarta are at risk of kidney disease, with an incidence of 3.8 cases per 1,000 population.[5,9] The focus of this study was the epidemiology of kidney biopsies at our centre. Although biopsy is the definitive method for diagnosing kidney disease, the number of biopsies performed remained low in our study (January 2021 to August 2024), with a biopsy rate of 5.24% of the estimated total cases requiring biopsy.[1] Differences in socioeconomic status and financial resources among nephrology centres contribute to variations in nephrologists' decisions regarding when to perform a biopsy.[8]

The biopsy rate in this study was higher among younger adults (18–44 years), and the median age was 43 years, which aligns with biopsy data from Western Europe (44.5–55.6 years) and Northwest China (22–55 years).[10,11] The sex distribution was nearly equal, with a slight female predominance over males, consistent with studies in the United States (51% female, 49% male) and Malaysia (60.4% female, 39.6% male).[3,12]

A kidney biopsy is recommended to help delay the progression of end-stage kidney disease (ESKD) by providing crucial information on disease progression, prognosis, and treatment decisions, particularly for patients with un-explained acute kidney injury (AKI), proteinuria, or hematuria.[1,8] Supporting our findings, registries across the United States and several developing countries in Asia have reported that nephrotic syndrome (NS) and AKI are frequent indications for renal biopsy in adults.[8,13,14]

Glomerular diseases are a major cause of morbidity and are frequently associated with ESKD progression.[12] The prevalence of focal segmental glomerulosclerosis (FSGS) among glomerular diseases appears to be increasing worldwide.[15] Our study aligns with findings from the United States, which identified FSGS as the most common renal biopsy diagnosis, accounting for 15% of biopsy samples.[12] Similarly, the Malaysian Registry of Renal Biopsy reported that FSGS is the most common histopathological diagnosis in primary glomerulonephritis (GN), with nephrotic syndrome as its most frequent clinical manifestation, followed by minimal change disease, IgA nephropathy, and idiopathic membranous nephropathy.[13] Additionally, lupus nephritis was identified as a leading cause of secondary GN in their study.[13]

Conclusion

Kidney biopsy is essential for the diagnosis and management of kidney diseases. In Indonesia, more comprehensive data is needed to improve studies on kidney disease epidemiology due to existing limitations. From January 2021 to August 2024, a total of 45 kidney biopsies were

performed at our center, with a biopsy rate of 5.24 per 1,000 population. The biopsy rate was higher among younger adults, with a median patient age of 43 years and an almost equal sex distribution. Nephrotic syndrome was the most common clinical presentation and biopsy indication. Glomerular diseases were the primary diagnosis, with focal segmental glomerulosclerosis (FSGS) being the most prevalent histopathological finding.

Limitations of the Study

Our study has certain limitations. Further multicenter research is necessary to determine whether our findings accurately reflect the true epidemiology of kidney disease. Currently, Indonesia lacks comprehensive kidney biopsy data, making it challenging to establish a clear understanding of national kidney disease patterns.

Declarations

Ethics approval and consent to participate

This research adhered to applicable regulations, the Declaration of Helsinki, and Good Clinical Practice guidelines. Ethical clearance was obtained from the Ethical Committee of the Mochtar Riady Institute of Nanotechnology (protocol number 1501001-03) along with local committees at all participating centers.

Competing interests

There are no conflicts of interest in writing this article.

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Author's Contribution

Idea/concept: DN. Design: DN. Control/supervision: DN. Data collection/processing: DN, RABP, SC. Analysis/interpretation: DN, RABP, SC. Literature review: DN, RABP. Writing the article: RABP, DN, SC. Critical review: DN. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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