


Indications for Renal Needle Biopsy and Histological Spectrum of Kidney Disease in Togo

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Abstract

Introduction: The frequent late-stage diagnosis of chronic kidney disease (CKD) constrains the treatment choices for nephrologists. Renal biopsy (RB) is crucial for accurately identifying renal lesions. This key nephrological procedure, however, is invasive and not without potential complications. The purpose of this study was to evaluate the indications, frequency, and histological lesion profiles of renal biopsies in Togo. **Materials and Methods:** We conducted a descriptive cross-sectional study encompassing all renal biopsies performed in Togo from the inception of nephrology services to the present. Data were compiled from the medical records of the patients. **Results:** From 2015 to 2023, 68 high-quality renal biopsies were executed in Togo. The patients had an average age of 30.6 years, with a predominance of males (69.1%). The most common indication was nephrotic syndrome, accounting for 66.2% of cases. Histologically, glomerulopathies were predominant, representing 61.8% of lesions, followed by vascular nephropathies (25%) and tubulointerstitial nephropathies (13.2%). The most frequently observed primary glomerulopathy was focal segmental glomerulosclerosis (FSGS). Gross hematuria was the sole complication, occurring in 1.4% of the cases. **Conclusion:** RB is an evolving practice in Togo. Glomerulopathies are the most commonly observed lesions. The histological categorization of renal lesions is vital for clinicians in their diagnostic reasoning and approach.

Keywords

Renal Needle Biopsies, Histology, Kidney Failure, Epidemiology, Togo

1. Introduction

Chronic kidney disease (CKD) represents a significant public health challenge globally. Diagnosis often occurs in advanced stages, limiting treatment options [1]. Renal biopsy (RB) accurately identifies renal lesions, enabling classification and assessment of activity, severity, and chronic damage [2]. Its pivotal role in diagnosing, guiding treatment choices, and establishing the prognosis of renal diseases underscores its importance in nephrology. This procedure encompasses both morphological and immunohistochemical analyses [2]. Proficient execution by the medical practitioner is essential due to potentially fatal complications. Unlike the previous decade, renal biopsy is now more common in Sub-Saharan Africa, including countries like Senegal and the Ivory Coast [3] [4]. However, in Togo, there is currently no data on the practice of renal biopsy, though the field appears to be growing with the increase in nephrologists [5]. This study aimed to identify indications, frequency, and histological profiles of renal biopsies in Togo.

2. Materials and Methods

2.1. Study Setting and Design

It was a descriptive cross-sectional study including all the renal biopsies carried out in Togo from beginning of nephrology services to date. The study was conducted in two locations: the nephrology department of Sylvanus Olympio University Hospital in Lomé, established in the 1990s, and the nephrology department of Kara University Hospital, situated 420 km north of Lomé and founded in 2020.

2.2. Inclusion and Non Inclusion Criteria

The study included all patients who underwent RB performed by a nephrologist. It did not include cases related to general histology, specifically nephrectomy specimens. Patient data were extracted from medical records.

2.3. Variables

The study focused on various patient-related variables: age, gender, socio-economic status, occupation, medical history, RB indication, proteinuria (g/24h), and anatomic-pathological features (primary glomerular, tubulointerstitial, and vascular lesions, along with extra- and endomembranous immune complex deposits).

Data collection was performed using Excel 2019, and the analysis was conducted using Epi Info software. Quantitative variables were presented as mean and standard deviation, with binary and qualitative variables expressed as percentages.

2.4. Procedure

The biopsy procedure was standardized across the study. Nephrologists performed the biopsies, guided by ultrasound imaging, using needles of variable

sizes (ranging from 14 to 18 gauges) tailored to the patient's body structure. Two pieces were taken from each patient. The first tissue sample, always designated for optical microscopy, was preserved in acetic alcohol formalin (AFA). The second sample, taken on a non-routine basis for immunofluorescence analysis, was fixed in Michel's fluid prior to dispatch.

3. Results

Prior to 2015, only 3 renal biopsies had been conducted in Togo. However, from 2015 onwards, there have been 75 biopsies. Among these, 68 biopsies that met the inclusion criteria were analyzed. The remaining samples were excluded as they did not constitute renal biopsies but were from adjacent organs.

Figure 1 shows the annual number of biopsies performed.

The patients' mean age was 30.6 years, ranging from 14 to 66 years, with a standard deviation of ± 13.4 years. The study observed a male predominance, with 69.1%. A majority, 88.2%, of the patients had intermediate to high economic status, and 83.8% had some form of social coverage.

The most common indication for renal biopsy was nephrotic syndrome, accounting for 66.2% of the cases, followed by rapidly progressive glomerulonephritis syndrome, which constituted 17.6% (**Table 1**).

Based on histological evaluations, the mean length of biopsy cores was 11 ± 1.9 mm. The examined tissue fragments predominantly had a cortico-medullary structure (92.6% of cases, $n = 63$), with some being purely cortical (5.9% of cases, $n = 5$) or having a cortico-medullo-cortical configuration (1.5% of cases, $n = 1$). The average count of glomeruli per core was 14.7 ± 10.1 , ranging from 3 to 73. Immunofluorescence analysis was conducted in 73.5% of the patients.

Table 2 details the categorization of histological types. In terms of renal lesion topography, glomerulopathies constituted 61.8%, vascular nephropathies 25%, and tubulointerstitial nephropathies 13.2%. Of the 42 cases involving glomerular damage, 28.6% were identified as secondary. Specific cases included diabetic nephropathy (6 cases), lupus-related nephropathy (3 cases), HIV-associated nephropathy (2 cases), and hepatitis B virus (HBV) related nephropathy (1 case). Only one patient, accounting for 1.4% of cases, experienced a post-biopsy complication, specifically macroscopic hematuria, which resolved within 24 hours.

Table 1. Indications for renal biopsy in Togo.

	Number	Percentage
Nephrotic syndrom	45	66.2
RPN	12	17.6
AKI	4	5.9
Hématuria	4	5.9
R-DN	3	4.4
	68	100.0

RPN: Rapidly progressive nephropathy; AKI: Acute renal failure; R-DN: Renal impairment during diabetic nephropathy.

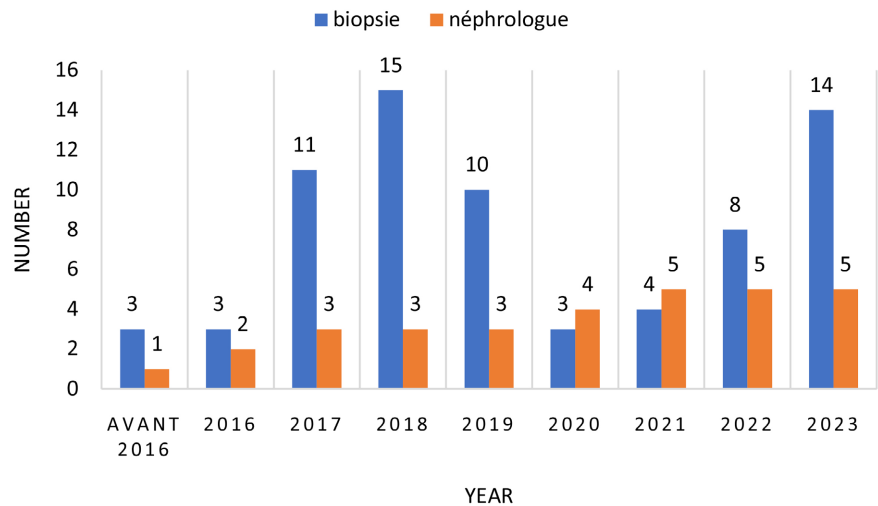


Figure 1. Incidence of renal biopsies performed in Togo, and number of nephrologists available.

Table 2. Distribution according to initial nephropathy.

	Number	Percentage
FSGS	27	39.7
Benign Nephroangiosclerosis	14	20.6
CIN	9	13.2
Diabetic nephropathy	6	8.8
MN	4	5.9
MAT	3	4.4
IgA nephropathy	2	2.9
EGN	2	2.9
MCD	1	1.5
Total	68	100.0

MCD: Minimal Change Disease; FSGS: Focal segmental glomerulosclerosis; MN: Membranous Nephropathy; EGN: Extracapillary Glomerulonephritis; HN: Hypertensive nephrosclerosis; TMA: Thrombotic microangiopathy; NIC: Chronic interstitial nephritis.

4. Discussion

Renal biopsy (RB), a crucial procedure in clinical nephrology, is not widely practiced in Sub-Saharan Africa [6]. This is largely due to the scarcity of nephropathologists, a highly specialized field that remains largely unrecognized and is not a part of the medical school curriculum in West Africa, especially in Togo.

Additionally, the conduct of RBs depends on the availability and expertise of nephrologists, who are responsible for recommending and performing these biopsies. In our study, we observed an increase in renal biopsy activities with the rise in the number of nephrologists, from fewer than 2 over a decade to more

than 10 within a single year. The drop in activity between 2020 and 2022 can be attributed to the COVID-19 pandemic, which disrupted the existing system for processing biopsy specimens due to various border closures. Histological analyses, not available in Togo until 2023, required sending biopsy samples to nephropathology labs abroad, primarily in Ivory Coast and France, either via parcel delivery services or through intermediaries. From January 2023, local histological processing became feasible in Togo through a collaboration between Togolese pathologists and a Togolese nephropathologist based in France. Post-biopsy, the samples are processed locally, including slicing, staining, and taking microscopic camera images, which are then sent to the nephropathologist for collaborative interpretation with the local nephrologist. Additionally, the cost of the RB and the subsequent anatomopathological examination, as estimated in our study, is 160,000 FCFA (270 USD), equivalent to three times the Togolese minimum wage, making it accessible primarily to the relatively well-off social segment.

Since the inception of the two nephrology services in Togo, a total of 68 high-quality renal biopsies have been performed. The age at which these biopsies are conducted varies across different studies, with the average age fluctuating between 26.5 and 39 years [2]. It's important to note that this average does not represent the median age of renal disease patients in a given area [7]. A male predominance in renal diseases is a common finding in various African studies [8]. This trend in our context may be attributed to men's greater financial capacity to afford an expensive examination and the fact that kidney disease more frequently affects males [9].

Nephrotic syndrome (NS) was the main indication for RB, observed in 66.2% of cases, as in several other studies [2] [10] [11]. The role of renal biopsies is unequivocal in diagnosing nephrotic syndrome, systemic diseases with renal implications, urinary sediment anomalies, and acute renal failure (ARF) [12]. In cases of vasculitis and systemic lupus erythematosus (SLE), RB is instrumental not only for diagnosis but also for the classification of the disease.

The high incidence of nephrotic syndrome (NS) as a primary indication is closely linked to the prevalence of glomerulopathies identified in the histological lesion epidemiology from renal biopsies (RB). In our study, glomerular damage accounted for 61.8%, vascular damage for 25%, and tubulointerstitial damage for 13.2% similar as Lemrabott, who reported 63% glomerulopathy and 25% vascular nephropathy [13]. Additionally, a multicentric study involving biopsy specimens from four West African countries (Burkina-Faso, Ivory Coast, Guinea, Togo) noted a similar predominance of glomerular involvement at 86% [3]. The prominence of glomerulopathies is a near-constant finding in both African and global studies [14] [15] [16]. Contrasting with N'dah's observation of a low 2.2% frequency, the significant presence of tubulointerstitial involvement in our series may be attributed to atypical clinical presentations that necessitated RBs [3].

In our series, primary glomerulopathies accounted for 71.4% and secondary

glomerulopathies for 28.6%. The most common primary glomerulopathy was focal segmental glomerulosclerosis (FSGS), noted in 39.7% of cases, aligning with N'dah and Lemrabortt's findings of 34.6% and 27.5%, respectively. FSGS is recognized as the foremost cause of nephrotic syndrome and the predominant nephropathy diagnosed via renal biopsy in Africa [3]. However, several Moroccan studies have observed a higher incidence of minimal change disease (MCD) [2] [17]. The prevalence of FSGS in our study could be linked to the APOL1 gene, prevalent in the black population and correlated with the development of FSGS [8]. On a global scale, minimal change disease (MCD) is the most frequent cause of idiopathic nephrotic syndrome in adults, with incidences varying across studies, up to 44.5% in the Italian renal biopsy registry [14].

Regarding secondary glomerulopathies, diabetic glomerulosclerosis was most prevalent (6 cases). In cases of rapid proteinuria progression or swiftly advancing renal failure in long-term diabetics, even with retinopathy, RB is advised to investigate for renal lesions beyond nodular or diffuse diabetic glomerulosclerosis [7]. This evaluation should follow the exclusion of conditions that might induce secondary NS, including a basic viral and autoimmune screening with anti PLA2R.

Abnormalities in urinary sediment, like hematuria or leukocyturia, serve as additional indications for RB. These symptoms, when persisting for over three months, are diagnostic of chronic kidney disease [18]. They might indicate severe diseases with a potential inevitable progression towards renal failure. In our study, hematuria was the reason for biopsies in only 6% of cases, which is considerably lower than in developed countries studies where it accounts for over 30% of indications [19] [20]. This led to the identification of the first two cases of IgA nephropathy in Togo.

In the context of acute renal failure (ARF), RB is warranted when there is no identifiable cause or in situations involving rapidly progressive glomerular damage, recent onset hypertension, or extended oliguria [12]. The diagnostic process should be comprehensive and prompt, facilitating the timely execution of RB and the commencement of treatment strategies even before the biopsy results are available. In our research, 17.6% of patients exhibited rapidly progressive glomerulonephritis syndrome, and 6% had acute renal failure of unknown origin with an atypical course, necessitating RB.

The advent of real-time ultrasound guidance has markedly reduced the incidence of complications, which are generally mild, including macroscopic hematuria, perirenal hematoma, and lingering pain at the puncture site [21]. Major complications, those with clinical significance, such as acute renal failure (ARF), septicemia, hemothorax, or in rare cases, death, are much less common [21]. In our study, no fatalities were reported, despite the lack of real-time ultrasound guidance. There was one instance of macroscopic hematuria, constituting 1.4% of cases, which resolved within 24 hours with adequate hydration. The minimal complication rate can be attributed not only to the safety afforded by real-time ultrasound guidance but also to the nephrologists' proficiency in performing RB.

The histological quality of the selected samples, including the average number of glomeruli per core, the topography, and the length of the specimens, was on par with the findings reported by N'dah [3].

This observational study offers insights into the indications for renal biopsies and the outcomes of the anatomopathological evaluations. Its retrospective design and the lack of certain specific data were limitations. Nonetheless, it is a pioneering effort, laying the groundwork for the future establishment of a renal biopsy registry.

5. Conclusion

The implementation of renal biopsy is on the rise in Sub-Saharan Africa. Despite its invasive nature, it is being performed more safely with fewer complications. Yet, its high cost makes it less accessible. In our setting, nephrotic syndrome was the predominant indication. Glomerulopathies were the most common type of lesions identified. The detailed characterization of the histological spectrum of renal lesions is essential for clinicians in formulating their diagnostic strategies and approaches. This underscores the need to develop and establish a comprehensive national, and possibly sub-regional, renal biopsy registry.

Strengths of the Study

- This represents the first extensive study on renal biopsy (RB) conducted in Togo.
- It provides valuable insights into the indications, demographic profiles of the patients, and the types of histological lesions encountered.

Weaknesses of the Study

- The sample size is relatively small.
- The reliance on patient medical records for data collection may lead to potential biases.

Suggestion

- Continued efforts are crucial to improve the accessibility of RB in Togo.
- The establishment of a national RB registry would be instrumental in monitoring trends and enhancing the care of patients with renal diseases.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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