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RESEARCH ARTICLE

Clinical and Anatomopathological Profile of Kidney Disease by Renal Biopsy at the Renaissance University Hospital Center in N'Djamena, Chad

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Abstract

Introduction: Kidney biopsy is the gold standard in the diagnosis and management of underlying parenchymal renal diseases. Information garnered from histologic examination of renal tissue is essential in studying the histological lesions affecting the kidney, in order to make a positive diagnosis and a better choice of treatment. However, renal biopsy is not within the reach of all african countries, in which least of all is in sub-Saharan Africa. The objective of this study is to determine the hospital prevalence, the indications for percutaneous renal biopsy and the clinical and histopathological profile of kidney disease.

Patients and Methods: We conducted a descriptive cross-sectional study focusing on PRB which was carried out between from August 1, 2020 to July 31, 2023 within the Nephrology and Hemodialysis Department of the Renaissance University Hospital Center, a tertiary referral hospital in N'Djamena, Chad. Included in the study were all children and adult patients who had undergone a renal biopsy and had no contraindications in undergoing the procedure. The variables studied were the hospital prevalence of kidney biopsy, epidemiological and clinical data and etiological of kidney disease, indications of PRB and histological results.

Results: During the study period, 1700 patients were hospitalized in the department. However, 22 patients were included in our study with a hospital prevalence of 1.29%. The median age was 25 years +/- 14.9 years with extremes ranging from 6 to 60 years. The sex ratio was 1.4. Nephrotic syndrome was the main indication in 68.2% (n=15) of cases, followed by isolated acute renal failure in 13.6% (n=3) of cases, chronic renal failure with extrarenal manifestations in 13.6% (n=3) of cases and rapidly progressive glomerulonephritis in 4.5% (n=1). Glomerular involvement was the most frequent in 86.4% (n=19) of cases, tubulo-interstitial involvement in 9.1% (n=2) of cases and renal vascular involvement in 4.5% (n=1). The most common histological lesions were focal segmental glomerular hyalinosis in 40.9% (n=9) of cases, lupus nephritis in 27.4% (n=6) of cases and extracapillary glomerulonephritis in 9.1% (n=2) of cases.

Conclusion: Renal histology has a very important place in the diagnosis, treatment and prognostic assessment of renal diseases. Focal segmental glomerular hyalinosis is the main histological lesion found in this series. The establishment of a registry of renal biopsy in our department would allow better knowledge and management of kidney pathologies in Chad.

Keywords: Kidney Biopsy, Nephrotic Syndrome, FSGS, Chad.

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1. Introduction

Kidney biopsy (KB) is a technique which allows a fragment of the renal parenchyma to be taken for a histological study [1]. It constitutes to be an essential step in the study of nephropathy. The contribution of renal biopsy in the diagnosis, therapeutic guidance and prognosis of histopathologic lesions is essential because it helps make an accurate diagnosis, defines the degree of damage, directs the type of treatment and provides prognostic information beyond clinical and laboratory data.

It includes a morphological study using a light microscopy and fluorescent immunohistochemistry [2]. By it being an invasive procedure, renal biopsy can have various complications and the most common complication is hemorrhage [3]. The incidence of renal diseases diagnosed by a kidney biopsy varies with region, race, age, sex and type of clinical practice[4].

Renal biopsy is a technique that has been practiced for many years in Western, Asian and North African countries and in South Africa. However, it is carried out in only a few countries in sub-Saharan Africa [5]. In carrying out this work, we set ourselves with the objective of determining the hospital prevalence of kidney biopsies, the indications for a percutaneous renal biopsy and the clinical and histopathological profile of nephropathy in renal diseases.

2. Patients and Methods

This is a descriptive cross-sectional study carried out in the Nephrology and Hemodialysis Department of the Renaissance University Hospital Center in N'Djamena, Chad. The study period was for 3 years, from August 1, 2020 to July 31, 2023. We included all patients who had undergone a renal biopsy of the native kidney and who had given their informed consent.

The samples of renal tissue were taken by the nephrologist and was done by first placing the patient in a prone position, in order to remove the tissue, a semi-automatic biopsy gun is inserted by fine-needle aspiration through the skin using an ultrasound probe to help guide the needle into the kidney.

After performing the biopsy, the patients were monitored for 24 hours. Monitoring consisted of assessing the vital signs, hemoglobin levelcs?? and the macroscopic appearance of the urine. Two samples were systematically taken from each patient. One fragment intended for the study by light microscopy and another for the study by direct immunofluorescence or fluorescence immunohistochemistry. The fragments obtained were fixed in formalin, alcohol and glacial acetic acid for light microscopy and in Michel's solution for immunofluorescence. The samples were then sent to a pathology laboratory and interpreted in either Dakar, Senegal and/or Casablanca, Morocco. The results were received via email.

All samples were accompanied by an analysis report containing information on epidemiological data, personal history (medical, surgical, gyneco-obstetrics and lifestyle), clinical and biological data, indications for biopsy and possibly diagnostic hypotheses.

All tissue samples were accompanied by adequate clinical information to enable proper interpretation of findings such as, past medical history of the patient, indications for biopsy, possible diagnostic hypotheses, epidemiological, etiological, clinical and biological data. Confidentiality of the data collected was required. The data were entered using Microsoft Word 2013 and analyzed using the Sphinx Software.

The quantitative variables were expressed as median and standard deviation with extreme values. The variables studied were the prevalence of kidney biopsies, sociodemographic variables (age, sex, employment), clinical variables (reasons for consultation, past medical history, indication for kidney biopsy) and histopathological results.

3. Results

During the study period, 1700 patients were hospitalized in the department. However, 22 patients were included in our study with a hospital prevalence of 1.29%. The median age in this series was 25 years +/- 14.9 years with extremes ranging from 6 to 60 years. We noted 59.1% (n=13) of men, as a sex ratio of 1.4. The vast majority of patients were 23 to 33 years of age which is 36.4% (n=8) of cases followed by the age group of 1 to 11 years which is 31.8% (n=7) of cases.

We noted that 31.8% of patients had nephrotic syndrome while 13.5% had systemic lupus erythematosus. Nephropathy revealed signs such as edematous syndrome in 59.1% (n=13) of patients, urine sediment abnormalities in18.2% (n=4) of patients, impaired renal function in 13.6% (n=3) of patients and abnormal diuresis in 9.1% (n=2) of patients.

Dermatological, joint and neurological lesions were noted in 22.7% (n=5), 13.6% (n=3) and 4.5% (n=1) of patients, respectively. In the context of lupus, the

dermatological manifestations were malar erythema in 10% (n=2), macules in 10% (n=2) and alopecia in 5% (n=1). The main indication for biopsy was nephrotic syndrome in 68.2% (n=15) of cases, isolated acute renal failure in 13.6% (n=3) of cases, chronic renal failure stage 3 with extrarenal manifestations in 13.6% (n=3) of cases and rapidly progressive glomerulonephritis in 4.6% (n=1).

In children whose age range was from 1 to 11 years, the indications for renal biopsy were frequent relapses (more than 2 relapses in 6 months) in 3 children (13.6%) of cases, steroid-resistant nephrotic syndrome in 9.2% (n=2) of cases and steroid-dependent nephrotic syndrome in 9.2% (n=2) of cases.

Histological lesions were secondary in 49.9% (n=9) of cases. Lupus nephritis was found in 27.4% (n=6) of cases, anti-neutrophil cytoplasmic antibody (ANCA) vasculitis in 4.5% (n=1), focal segmental glomerulosclerosis (FSGS) secondary to HIV in 4.5% (n=1) and atypical hemolytic uremic syndrome with anti-factor H antibodies in 4.5% (n=1).

Class I minimal mesangial lupus nephritis was found in 4.5% (n=1), class II mesangial proliferative lupus nephritis in 4.5% (n=1), class III focal lupus nephritis in 9.1% (n=2) and class IV diffuse lupus nephritis in 91% (n=2). Image 1 showed proliferative lupus glomerulonephritis.

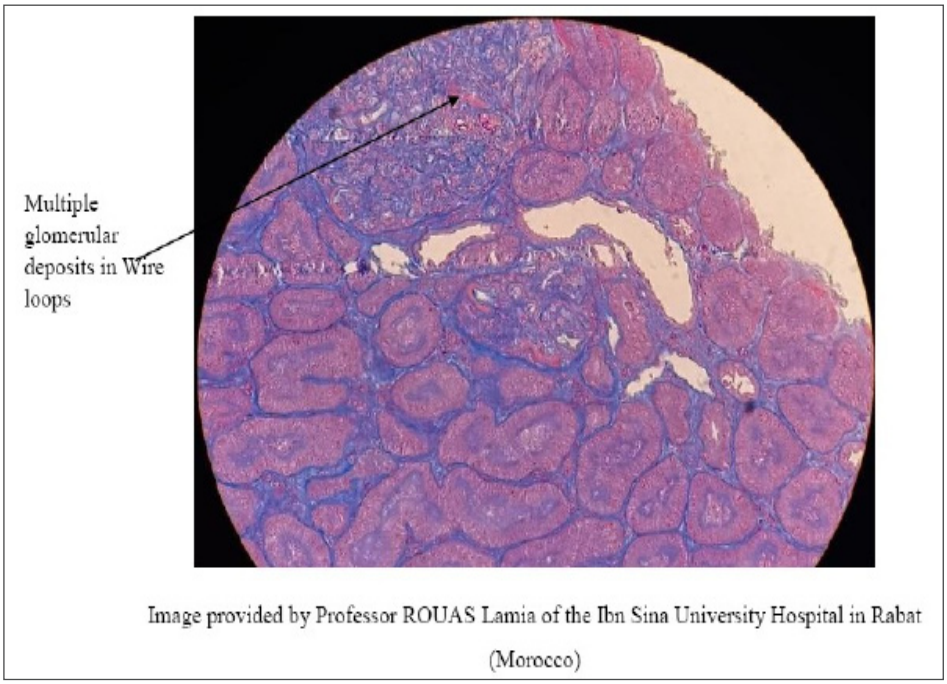

Figure 1. *Two glomeruli showing "wire loop deposits" by immunofluorescence in diffuse LN class IV in a 27-year-old patient.*

All renal biopsies were performed percutaneously. In 95.5% of cases, the biopsies were carried out without any complications. Hematuria was observed in 4.5% (n=1). No cases of death have been recorded.

On histology, the lesions were glomerular in 86.4% (n=19), tubulointerstitial in 9.1% (n=2) and vascular in 4.5% (n=1). The different histological lesions were summarized in Table 1.

Table 1. *The different histological lesions.*

Histological lesions	Number (n)	Percentage (%)
Focal Segmental Glomerulosclerosis (FSGS)	9	40.9
Lupus Nephritis (LN)	6	27.4
Membranous Nephropathy (MN)	2	9.1
Chronic Tubulointerstitial Nephritis (CTIN)	2	9.1
Membranoproliferative Glomerulonephritis (MPGN)	1	4.5
Minimal Change Disease (MCD)	1	4.5
Anti-Neutrophil Cytoplasmic Antibody (ANCA) Vasculitis	1	4.5
Total	22	100

4. Discussion

Renal biopsy plays a pivotal role in the diagnostic, therapeutic and prognostic aspects in kidney disease. The limitations in our study were mainly the lack of a pathology laboratory in Chad. All tissue samples were sent to foreign countries to be analyzed.

For this reason, the practice of renal biopsy is not developed in many countries of the sub-Saharan region in clinical nephrology, lacking considerably in many countries and particularly in Africa [6]. The indications for kidney biopsies are numerous, but few nephrology departments have the appropriate equipment's namely biopsy needles. The study highlighted certain epidemiological, clinical and etiological particularities of renal pathologies in Chad, which are close to those described in the literature.

During the study period, 22 kidney biopsies were performed. This number of renal biopsies varies from one series to another. Marouane in Morocco in 2021 had carried out 70 kidney biopsies in three years [1] while Chang in Seoul in 2009 reported 1818 biopsies over a period of twenty years [7].

The median age in this series was 25 years with extremes ranging from 6 to 60 years which is close to other studies carried out in Brazil by Arias et al and in Egypt by Ibrahim S et al with 28.2 years and 26.5 years, respectively [8,9]. This result is similar to observations made in other series [10,11].

Nephrotic syndrome, the most common indication for renal biopsy, is encountered more in men than in women in several data in the literature [12-14]. Nephrotic syndrome was the most common presentation of renal diseases and the main indication for biopsy in this series which is 68.2% of cases.

This predominance of nephrotic syndrome was reported by Mhamedi et al in Morocco and Okpechi et al in South Africa who found a rate of 61% and 58.6% of cases, respectively [15,16]. In a study carried out by Taehoon Yim in South Korea, urinary sediment abnormalities were noted in 62.5% of cases [4].

In the sub-Saharan region, mostly the bacterial, parasitic and viral antigenic stimulation is the genesis of nephrotic syndrome [6]. Percutaneous renal biopsy is the main procedure used as noted in the literature [11,15].

However, it also has complications mainly hemorrhage, as shown in this study in 4.5% (n=1). Halimi et al in a French cohort study, reported the same observation with a risk of hematuria occurring in 5% of cases [18] but the bleeding rate was higher compared to Sabi et al in Togo cohort study with 2.2% [11].

The histopathological study confirmed the diagnosis of kidney disease in all cases. This report demonstrated that the histological result was mainly dominated by glomerular damage in 86.4% of cases. This high rate of glomerular nephropathy is constantly observed in the vast majority of the different series [2, 3, 10,18].

Acute renal failure is the second indication for PRB in this series with 13.6% of cases. This is also the case in a study carried out in Morocco and France with a prevalence of 14% [2,19]. Focal segmental glomerular (FSGS) hyalinosis is the first cause of nephrotic syndrome and the first nephropathy diagnosed by renal biopsy in this study (40.9%). Indeed, this high frequency is also observed in other studies [20-22].

This could be explained by the fact that black individuals have a genetic predisposition to the G1 and G2 genes encoding the apolipoprotein L1 (apoL1) which increases the risk of developing glomerular disease such as focal segmental glomerular hyalinosis [15]. On the other hand, in other studies carried out in South Korea [3], the United States [23], Italy [24] and Australia [25], the most frequently observed diagnosis was IgA nephropathy.

Nephropathy with IgA deposits, in the West and Asia are linked to a genetic susceptibility to the COL4A3 and COL4A4 genes and especially to early detection of urinary sediment abnormalities, which increases the indications for renal biopsies [26]. The incidence of kidney diseases diagnosed by percutaneous renal biopsy varies depending on region, race, age, gender and type of clinical practice [4].

5. Conclusion

Kidney biopsy is an indispensable tool for current practice of evidence-based medicine and is the gold standard for the diagnosis and management of kidney diseases. Kidney biopsy, appropriately processed and interpreted, will yield the correct clinico-pathologic diagnosis, leading to the appropriate therapeutic strategy.

However, its availability is limited by not having pathology laboratories in our country, Chad. The lesions detected in our series were mainly glomerular diseases with the most common lesion being focal segmental glomerular sclerosis (FSGS), followed by lupus nephritis. A study with a larger sample will allow us to take a broader look at the spectrum of histological lesions of kidney disease in Chad.

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