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J C N JOURNAL OF CLINICAL NEPHROLOGY
ISSN 2576-9529

Research Article

Anatomo-clinical and Etiological Profile of Nephropathies Biopsied in the Nephrology Department of the Thies Regional Hospital (Senegal)

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Submitted: September 09, 2024
Approved: September 13, 2024
Published: September 30, 2024

How to cite this article: Dieng A, Ndongo N, Fall R, Diawara MS, Cissé MM. Anatomo-clinical and Etiological Profile of Nephropathies Biopsied in the Nephrology Department of the Thies Regional Hospital (Senegal). J Clini Nephrol. 2024; 8(3): 127-131. Available from: https://dx.doi.org/10.29328/journal.jcn.1001140

Keywords: Biopsy; Renal; Nephropathy; Etiology

Abstract

Introduction: In many developing countries, particularly in Africa, the use of renal biopsy (RB) in clinical nephrology is severely lacking. The objectives were to describe the anatomoclinical and etiological profile of these biopsied nephropathies, as well as the factors associated with the etiology of the nephropathies.

Patients and method: This was a retrospective descriptive and analytical study from 1 April 2020 to 30 October 2022. The patients were selected from the renal biopsy register of the nephrology department of the Thiès Regional Hospital. Sociodemographic, clinical, biological, and histological parameters were studied.

Results: 75 renal biopsies were included. The mean age was 33.3 ± 14.8 years, with a male predominance (65.3%). The main indications were nephrotic syndrome in 50.67% of cases. RB was adequate in 82.7%, inadequate in 13.3%, and borderline in 4%. Glomerular nephropathies predominated, with focal segmental glomerulosclerosis (FSGS) in 34.7%, membranous nephropathy (MN) in 17.3%, minimal change disease (MCD) in 10.67%, extracapillary glomerulonephritis (ECGN) in 5.3% and lupus nephritis (LN) in 3.9%. Thrombotic microangiopathy (TMA) was found in 9.3%. Chronic tubulointerstitial nephropathy (CTIN) accounted for 5.3% of all RB and acute tubular necrosis (ATN) for 4%. The etiologies were primary in 48%, secondary in 28%, and undetermined in 24%. In the bivariate analysis, the etiology was correlated with the mean SBP (p = 0.023), the mean level of hemoglobin (p = 0.028), the levels of GFR (p = 0.017), and the type of kidney disease (p = 0.000).

Conclusion: Glomerular nephropathy was more frequent and FSGS was the most common histological lesion found. Primary causes predominated. Associated factors were identified to improve patient management.

Introduction

Renal biopsy (RB) is a technique used to harvest a fragment of renal parenchyma. It is a fundamental examination in nephrology because of its threefold value: diagnosis, treatment, and prognosis. The sample is analyzed using light microscopy, immunofluorescence (IF), and sometimes electron microscopy. In many developing countries, particularly in Africa, the use of this technique in clinical nephrology is severely lacking. In Senegal, it has become a common practice and is only done in Dakar. To our knowledge, no study has been carried out in other regions of the country to assess the exact profile of biopsied kidney diseases on a national scale. Significant variations have been observed amongst different centers. For example, IgA nephropathy (IgAN) is the most common form of glomerulonephritis (GN) seen in Western Europe, Australia, and some Asian countries, while in South America focal segmental glomerulosclerosis (FSGS) appears to be the most common GN [1]. Nephrotic syndrome (30.2%), acute renal failure (24.6%) and chronic renal failure (22.2%) are the main indications for renal biopsy [2]. Glomerular nephropathy predominates in most series. In South Africa, secondary causes were more common in young (< 40 years) and middle-aged (40-60 years) people of all ethnic groups, while primary glomerular disease was more common in the elderly [3]. In Senegal, FSGS is the main histological lesion, accounting for 27.48% of all biopsies performed between 2010 and 2016 [4]. Based on this observation, we conducted a descriptive and analytical study of renal biopsies performed in the nephrology department

of Thies Regional Hospital. The objectives were to describe the anatomoclinical and etiological profile of these biopsied nephropathies, as well as the factors associated with the etiology of the nephropathies.

Methods

This was a retrospective descriptive and analytical study from 1 April 2020 to 30 October 2022. Patients were selected from the renal biopsy register of the nephrology department of the Thiès Regional Hospital. All patients whose clinical and histological data were not recorded in their medical records were excluded. Free and informed consent was obtained from all study participants. Sociodemographic (age, gender), clinical, biological (hemoglobin, creatininemia, azotemia eGFR), and histological (indications, nephropathies, etiologies) parameters were studied. The renal biopsy was adequate (10 glomeruli), borderline (between 8 and 10 glomeruli), and inadequate (less than 8 glomeruli). Data were entered manually using a survey form and then recorded in a spreadsheet using Epi-info software. The data collected were expressed as a proportion (percentage) for the qualitative variables and as the mean followed by the standard deviation for the quantitative variables. In the univariate analysis, the Chi-square test was used to compare percentages. The difference was statistically significant when the *p* - value was < 0.05.

Results

During this period, 79 renal biopsies (30 biopsies/year) were performed. Four patients whose clinical and histological data were not provided were excluded. Therefore, the study was based on 75 renal biopsies. The mean age was 33.3 ± 14.8 years, with a male predominance (65.3%). The mean systolic blood pressure (SBP) was 140±25.4 and the mean diastolic blood pressure (DBP) was 91 ± 17.3. The mean hemoglobin level was 11.7 ± 3.1 g/dl. The mean creatinine was 31.0 ± 44.5 mg/l with a mean glomerular filtration rate (GFR) of 72.9 ± 52.7 ml/min/1.73 m^2. The mean azotemia was 0.69 ± 0.7 g/l. Five patients tested positive for hepatitis B virus (HBV) and one patient tested positive for hepatitis C virus (HCV). Two out of six patients had a positive anti-PLA2R antibody dosage. Antinuclear antibody testing was performed in 4 patients. Native anti-DNA antibodies were positive in 2 patients. Anti-U1RNP antibodies were positive in 2 patients. Anti-Jo-1, anti-SSA, anticentromere, and anti-Sm antibodies were positive in 1 case each. The main indications were nephrotic syndrome in 50.67% of cases, glomerular disease in 32%, and acute renal failure (ARF) in 8% (Table 1). RB was adequate in 82.7%, inadequate in 13.3%, and borderline in 4%. Glomerular nephropathies predominated, with focal segmental glomerulosclerosis (FSGS) in 34.7% (Figure 1), membranous nephropathy (MN) in 17.3%, minimal change disease (MCD) in 10.67%, extracapillary glomerulonephritis (ECGN) in 5.3% and lupus nephritis (LN) in 3.9%. Thrombotic microangiopathy (TMA) was found in 9.3%. Chronic tubulointerstitial nephropathy (CTIN) accounted for 5.3% of all RB and acute tubular necrosis (ATN) for 4%. Table 2 summarises all the biopsied nephropathies. The etiologies were primary in 48%, secondary in 28%, and undetermined in 24%. Lupus was the main cause of nephropathy in 7 patients (Table 3). In the bivariate analysis, etiology was correlated with mean SBP (p = 0.023), mean hemoglobin level (p = 0.028), GFR levels (p = 0.017), and type of kidney disease (p = 0.000) (Table 4).

Table 1: Distribution of patients according to RB indications N = 75.

Indications	Frequency (n)	Percentage (%)
Nephrotic Syndrome	38	50.7
Glomerular Diseases	24	32
Acute Renal Failure	6	8
Lupus Nephropathy	2	2.7
RPGN	2	2.7
CKD	1	1.2
Unspecified	2	2.7
Total	75	100

RPGN: Rapidly Progressive Glomerulonephritis; CKD: Chronic Kidney Disease

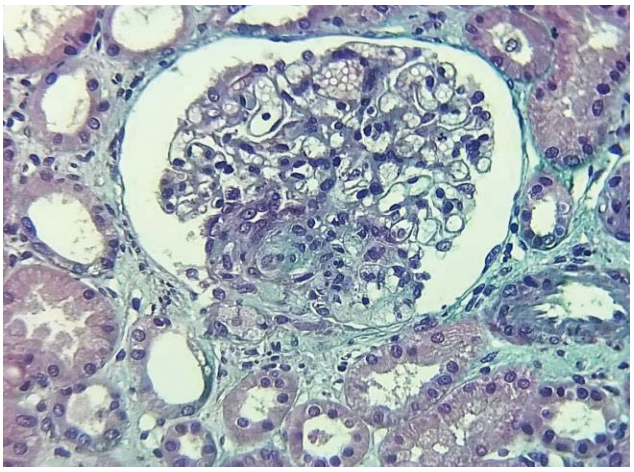

Figure 1: FSGS classic form Trichrome Masson magnification X250, pathological laboratory of the Idrissa Pouye General Hospital.

Discussion

Renal biopsy is an essential step in the study of kidney disease. It provides essential histological evidence that forms the basis of the classification of nephropathies, particularly glomerular nephropathies. It is not widely used in sub-Saharan Africa, and data are fairly limited. The mean age of our patients was 33.3 years. These results were consistent with those of LEMRABOTT (Senegal) and F. ZERDOUMI (Algeria), with mean ages of 28 and 33.94 years, respectively [4,5]. In the OKPECHI study in South Africa, the mean age of the patients was 36.8 ± 14.0 years [3]. This suggests that on average biopsies are performed more frequently in younger patients. The male predominance found in our series was in contrast to the results of MBARKI which had a sex ratio of 0.9 [6]. Hypertension was already known in 17.3% of the patients, with a mean SBP of 140 ± 25.4 mmHg and a mean

Table 2: Distribution of patients according to kidney disease.

Nephropathies	Frequency (n)	Percentage (%)
FSGS		
Classical form	19	25.3
Collapsing form	3	4.0
Tip-lesion form	4	5.3
MN	13	17.3
MCD	8	10.7
TMA	7	9.3
ECGN	4	5.3
CTIN	4	5.3
ATN	3	4.0
Lupus GN		
Class I	1	1.3
Class II and V	1	1.3
Class III and V	1	1.3
MCD *vs.* MN	2	2.7
Diabetic Glomerulosclerosis	1	1.3
MPGN	1	1.3
RB to be repeated	3	40
Total	75	100

FSGS: Focal Segmental Glomerulosclerosis; MN: Membranous Nephropathy; MCD: Minimal Change Disease; ECGN: Extracapillary Glomerulonephritis; GN: Glomerulonephritis; TMA: Thrombotic Microangiopathy; CTIN: Chronic Tubulointerstitial Nephropathy; ATN: Acute Tubular Necrosis; MPGN: Membrano-Proliferative Glomerulonephritis

Table 3: Distribution of patients by type of secondary kidney disease.

Etiologies	Frequency (n)	Percentage (%)
Mixed Connective Tissue Disease	1	5.3
Cryoglobulinemia	1	5.3
Diabetes	1	5.3
Sickle Cell Disease	1	5.3
Malignant HTN	4	21.1
Lupus	7	36.8
Polymyositis	1	5.3
Toxic	2	10.6
ANCA associated Vasculitis	1	5.3
Not specified	2	10.6
Total	21	100

HTN: Hypertension; ANCA: Anti Neutrophil Cytoplasmic Antigen

DBP of 91 ± 17.3 mmHg. Furthermore, in our study, SBP was related to etiology; the mean SBP was higher in secondary nephropathy. The causes of secondary kidney disease, such as lupus, diabetes, etc., can increase blood pressure in patients with preexisting hypertension.

The mean hemoglobin level was 11.7 ± 3.1 g/l and 55.3% of the patients had anemia. This was consistent with the results of MHAMEDI which found an average of 11.8 g/dl [7]. OKPECHI found a proportion of anemia similar to ours [3]. This would be due to the degree of CKD associated with the defect in erythropoietin production and the severity of tubulointerstitial lesions. We found that hemoglobin levels were statistically correlated with the etiology of kidney disease (p = 0.028). Certain causes of kidney disease, such as sickle cell anemia, can worsen the anemia associated with kidney disease itself. The mean GFR was 72.9 ± 52.7 ml/min/1.73m^2 and the stage of CKD was correlated with the etiology (p - value = 0.017). CKD stage 1 was more frequent in the primary etiology group, while stage 5 was more frequent in the secondary etiology group. This shows that certain etiologies can affect the kidneys in different ways, with glomerular, tubulointerstitial, or vascular lesions leading to a more severe deterioration of the GFR.

Table 4: Factors associated with the etiologies of kidney disease.

		Etiologies			
		Primary	Secondary	Undetermined	p
Age (years)	< 50	31 (51.7%)	16 (26.7%)	13 (21.7%)	0.579
	≥ 50	5 (41.7%)	5 (41.7%)	2 (16.7%)	
Sex n (%)	Male	28 (57.1%)	10 (20.4%)	11 (22.4%)	0.064
	Female	8 (30.8%)	11 (42.3%)	7 (26.9%)	
HTN n (%)	Yes	19 (54.3%)	12 (34,3%)	4 (11.4%)	0.055
	No	17 (42.5%)	9 (22.5%)	14 (35%)	
SBP (mmHg)	Mean	132 ± 21	151 ± 29	153 ± 19	0.023*
DBP (mmHg)	Mean	87 ± 14	98 ± 21	91 ± 8	0.103
Hemoglobin (g/dl)	Mean	12 ± 3	10 ± 3	12 ± 4	0.159
	< 12	12 (46.2%)	13 (50%)	1 (3.8%)	0.028*
	≥ 12	15 (71.4%)	3 (14.3%)	3 (14.3%)	
Creatinemia (mg/l)	Mean	21 ± 27	50 ± 66	26 ± 16	0.106
	≤ 13	14 (73.7%)	4 (21.1%)	3 (15.8%)	0.141
	> 13	13 (44.8%)	12 (41.4%)	1 (4.5%)	
Azotemia (g/l)	Mean	0.6 ± 0.6	0.9 ± 0.9	0.4 ± 0.3	0.277
	≤ 0.45	12 (63.2%)	4 (21.1%)	3 (15.8%)	0.181
	> 0.45	11 (50%)	10 (45.5%)	1 (4.5%)	
eGFR(ml/min/1,73m^2)	Mean	87 ± 52	55 ± 53	52 ± 40	0.092
	<15	2 (28.6%)	5 (71.4%)	0	0.017*
	15-30	2 (50%)	0	2 (50%)	
	30-60	6 (42.9%)	7 (50%)	1 (7.1%)	
	60-90	7 (87.5%)	0	1 (12.5%)	
	>90	10 (66.5%)	4 (26.7%)	1 (6.7%)	
Proteinuria (g/24h)	Mean	3 ± 2	3 ± 2	3 ± 2	0.815
	≤ 3	13 (56.5%)	9 (39.1%)	1 (4.3%)	0.454
	> 3	13 (59.1%)	6 (27.3%)	3 (13.6%)	
Nephropathies n (%)	Glomerular	36 (62.1%)	12 (20.7%)	10 (17.2)	0.000*
	Vascular	0	5 (71.4%)	2 (28.6%)	
	Tubulo-interstitial	0	0	4 (100%)	
	Tubular	0	3 (100%)	0	

Nephrotic syndrome was the predominant presentation of kidney disease in our patients of all ages. Therefore, it represents the first indication for RB with a frequency of 50.7% in our study. This percentage was in line with that of KALLOSSY.O in Mali, which was 54.4% [8]. These data can be explained by the recommendations that stipulate the systematic indication of RB in any adult presenting with a nephrotic syndrome.

RB was adequate in 82.7% (n = 62), inadequate in 13.3% (n = 10), and limited in 4% (n = 3). In the KALLOSSY study, inadequate RB accounted for 14.3% of biopsies, while OKPECHI had a lower rate of 2.3% [3,8]. This difference is believed to be related to pathology reading techniques and the experience of the different centers that perform this examination.

FSGS was the most frequent histological lesion, accounting

for 34.6% of all RBs and 44.8% of glomerulopathies. It was also the most common lesion in the DIOUF and LEMRABOTT studies, with percentages of 46% and 27.48%, respectively [9,10]. The classic form of FGSG was the most represented, with 73.07%. This was also the case in the KEITA.Y study in Senegal and the ELJOUEHARI study in Morocco, where the classic FSGS dominated at 67.20% and 64.05%, respectively [11,12]. The form of glomerular tip injury was observed in 15.38% of FSGS. Lower rates were observed in Morocco in the ELJOUAEHARI and NYIRAHABINEZA studies with 1.6% and 10.6%, respectively [12,13]. The collapse form was present in 11.53%. This result is consistent with that of D'AGATI in the United States, whose work showed a rate of 12% [14]. Perihilar and cellular variants were not present in our study. MN was observed in 17.3% of all RB and 22.4% of glomerular nephropathies. This result may be underestimated due to the absence of immunofluorescence examination in our series. MN was primary in 53.8%, secondary in 7.8%, and not investigated in 38.4%. The limitations of certain tests, in particular immunological tests, would explain the percentage of MN of undetermined etiology.

We found 8 cases of MCD, that is, 10.7% of all renal biopsies. In their studies, MBARKI H and TRAORE H found, respectively, 13.7% and 12% cases of MCD [6,15]. OKPECHI in South Africa and COVIC in Romania found lower rates of MCD at 6% and 8.5%, respectively [3,16]. The absence of an IF examination in some studies may explain the discrepancies in the results, as many MN were diagnosed by default for MCD.

Seven patients in our series had lupus nephropathy, 3 of whom were diagnosed by renal biopsy before immunological confirmation. According to the ACR/EULAR 2019 classification, classes 3 and 4 of lupus nephropathy are considered the main diagnostic criteria for lupus.

The limitations of this study were the sample size and the single-center study. Further multicenter nationwide studies including a large number of patients would be necessary to better appreciate our results.

Conclusion

Glomerulopathies were by far the predominant histological lesions in our study. Nephrotic syndrome was the main indication. FSGS was the most common histological lesion found. Primary causes predominated and lupus was the main secondary cause of nephropathy. Factors associated with the etiology of nephropathies such as systolic blood pressure, mean hemoglobin level, GFR levels, and type of kidney disease have been identified. Knowledge of these factors could be of interest in the management and development of nephropathies.

Data availability

Data were collected from the Thies Regional Hospital Renal Biopsy Registry. The data used to support the findings of this study are available from the corresponding author upon request.

What is already known about this topic

- Renal biopsy is an essential examination for good practice of clinical nephrology.
- It has a diagnostic, therapeutic, and prognostic interest

What this study adds

- This study informs us about the histological profile of nephropathies in sub-Saharan Africa.
- The etiological groups of nephropathies encountered in our practice as well as the associated factors

Author's contributions

Ameth dieng (editor), rokhaya fall (investigator), mame selly diawara (re-reader), mouhamadou moustapha cissé (re-reader).

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