Most common histopathological patterns of the Minas Gerais Association of the Centers of Nephrology

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SUMMARY

INTRODUCTION: We analyzed the distribution and frequency of glomerular diseases in patients biopsied between 1992 and 2016 in centers that make up the AMICEN (Minas Gerais Association of Nephrology Centers).

METHODS: We analyzed the biopsy reports of patients from 9 AMICEN nephrology centers. We took note of their age, gender, ultrasound use, post-biopsy resting time, whether the kidney was native or a graft, number of glomeruli and indication for the biopsy. The kidney biopsy findings were broken down into four categories: glomerular and non-glomerular diseases, normal kidneys and insufficient material for analysis. Those patients diagnosed with glomerular diseases were further divided into having primary or secondary glomerular diseases.

RESULTS: We obtained 582 biopsy reports. The median age was 38 years (1 to 85). The number of glomeruli varied between 0 and 70 (median = 13.0). In total, 97.8% of the biopsies were ultrasound guided. The main indication was nephrotic syndrome (36.9%), followed by hematuria-proteinuria association (16.2%). Primary glomerular diseases proved to be the most frequent (75.3%), followed by secondary diseases (24.7%). Among the primary glomerular diseases, FSGS was found at a higher frequency (28.8%), while among the secondary diseases, SLE was the most prevalent (42.4%). Regarding prevalence findings, those for both primary and secondary diseases were similar to those found in the large Brazilian registries published thus far.

CONCLUSION: Glomerular disease registries are an important tool to identify the prevalence of such disease in regions of interest and can serve as an instrument to guide public policy decisions concerning the prevention of terminal kidney diseases.

KEYWORDS: Epidemiology. Biopsy. Glomerulonephritis. Kidney Diseases.

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INTRODUCTION

Renal biopsy has been used in clinical practice for approximately 50 years.¹ Its initial description as a diagnostic method dates back to 1951 after Iversen and Brun developed the percutaneous technique.²,³ This diagnostic modality has proven to be a valuable tool in establishing not only a diagnosis of certainty but also in evaluating disease severity and prognosis, as well as guiding the treatment of renal diseases.⁴ There has been growing interest in the prevalence of histopathological patterns of kidney diseases in
Brazil and in the world. Some countries have a national registry of kidney histopathology. In Brazil, several attempts, although fragmented, have been made to gather such data.

Thus, we decided to contribute by trying to establish the epidemiology of the histopathological patterns found in kidney biopsies coming from “Zona da Mata” and “Campos das Vertentes” in the state of Minas Gerais, Brazil. We analyzed the distribution and frequency of glomerulopathies of patients biopsied between 1992 and 2016 in AMICEN member centers (Figure 1) and compared them with publications from national and international registries.1-18

METHODS

This is a cross-sectional study in which we analyzed biopsy reports of patients from 9 centers with nephrology units members of AMICEN. The kidney biopsies come from adults and children outpatients from “Zona da Mata” and “Campos das Vertentes” in the state of Minas Gerais, Brazil. The area covered by the study was mainly the Zona da Mata, with an estimated area of 35748 km², a population of 2,175,254 inhabitants, with a density of 60 in/km, a gross domestic product (GDP) per capita of US $ 2,575 and a Human Development Index (HDI) of 0.76, and the “Campos das Vertentes”, with an area of 12 564 km², a population of 546,007 inhabitants, Gross domestic products (GDP) per capita of U $ 1470 and an Human development Index (HDI) of 0.77, both in the State of Minas Gerais.

This study was approved by the Human Research Ethical Board at the São João de Deus Hospital/Fundação Geraldo Corrêa (number: 2.208.247).

The data were plotted onto a table, and supplementary information was obtained directly from the doctors of the respective clinics. After collection, the data were computed using Microsoft Office Excel 2016 software, and the results were obtained after the data were transferred to Statistical Package for Social Sciences (SPSS) 19.0 (SPSS, IBM Company, Chicago, IL). By these means, we carried out a descriptive analysis of the information collected, using data values of central tendency, variability, and frequency. Within the data gathered, we identified age, gender, ultrasound use, resting time after the biopsy, number of glomeruli and type of indication. Regarding kidney biopsy findings, the data were broken down into four categories: glomerular and non-glomerular diseases, normal kidneys, and insufficient material for analysis. The patients diagnosed with glomerulopathies were split into primary and secondary glomerulopathies. After splitting them, we analyzed the most frequent pathologies in each of these two groups.

RESULTS

In the period from 1992 to 2016, we carried out a renal biopsy study involving 672 patients from 9 nephrology centers that are associated with AMICEN. Of these, 49 were excluded because they had transplanted kidneys, as were another 41 lacking confirmed glomerular disease, thus leaving 582 biopsies remaining.

The median age was 38 years; the youngest patient was 1 year old and the eldest 85 years of age. Regarding the number of glomeruli, the lowest was zero, and the highest was 70, with a median of 13.0. In total, 97.8% of the biopsies were ultrasound guided. As far as patient resting time after the biopsy was concerned, we obtained data from 487 cases, of which 63.1% remained under observation for a period between 6 and 12 hours, and 20.6% for a period between 12 and 24 hours. Additionally, 49.1% of the biopsies were performed in females and 50.9% in males. In most cases (99.1%), the material was sufficient for analysis.

As noted in Table 1, the main reason for biopsy indication was nephrotic syndrome, which corresponded to 215 cases (36.9%), followed by proteinuria/hematuria association in 94 (16.2%), hematuria alone in 34 (5.8%), acute kidney injury (AKI) in 20 (3.4%), chronic glomerulonephritis in 11 (1.9%), hematuria associated with hypertension in 2 (0.3%), and other causes in 206 (35.4%). The primary glomerulopathy was present in 438 cases (75.3%), and secondary glomerulopathy was present in 144 cases (24.7%), yield-

| Frequency | % |
|-----------|---|
| Nephrotic syndrome | 215 | 36.9 |
| Hematuria + Proteinuria | 94 | 16.2 |
| Isolated Hematuria | 34 | 5.8 |
| AKI | 20 | 3.4 |
| Chronic glomerulonephritis | 11 | 1.9 |
| Hematuria + hypertension | 2 | 0.3 |
| Others | 206 | 35.4 |
| Total | 582 | 100.0 |

*Acute Kidney Injury
ing a total of 582 cases of glomerular involvement.

Table 2 shows that 75.3% of the primary glomerulopathies could be classified as FSGS in 126 cases (28.8%), minimal change disease (MCD) in 84 cases (19.2%), IgA nephropathy in 80 cases (18.3%), membranous GN in 74 cases (16.9%), rapidly progressive GN in 27 cases (6.2%), diffuse glomerular sclerosis in 24 cases (5.5%), membranoproliferative GN (MPGN) in 15 cases (3.4%), and anti-GBM GN in 2 cases (0.5%). Other causes were found in 6 cases (1.4%).

Of the 144 cases with secondary glomerulopathy (Table 3), which represented 24.7% of the total, 61 cases (42.4%) had lupus nephritis. The second most common cause was diabetic nephropathy, which was found in 18 cases (12.5%), followed by thrombotic microangiopathy in 9 cases (6.3%), post-infectious GN in 5.6% and amyloidosis in 8 cases (5.6%). Diffuse HIV-related proliferative GN was found in 1 patient (0.7%). Other causes were found in 39 patients (27.1%).

**DISCUSSION**

In this study, we evaluated the different histopathological patterns in 582 patients from 9 centers of nephrology that make up AMICEN.

AKI was a reason for renal biopsy in a small percentage of our sample (3.4%). This is because most of the patients came from outpatient clinics adults and children.

As in other studies, primary glomerulopathies corresponded to the most frequent lesions, with FSGS being the most prevalent and found in 28.8% of cases. These data are in line with those reported in the Paulista Registry of Glomerulopathy and a review of 9617 histopathological findings from kidney biopsies performed in Brazil. However, this is in disagreement with the Italian and Spanish registries, in which the most reported histologic type of primary glomerulopathy was IgAN.

IgAN was the third most frequent cause of primary glomerulopathy found in this study, corresponding to 18.3%. These data are similar to those reported in the Paulista Glomerulopathy Registry and in a survey on the frequency of kidney biopsies performed in Brazil, in which IgA nephropathy was also the third most frequently found histopathological pattern. However, we must admit that several Brazilian nephrology centers belonging to AMICEN do not biopsy patients with hematuria alone, but only if they also present proteinuria, hypertension, or kidney function impairment. If these centers would biopsy their patients, it is very likely that the most common form of primary glomerulopathy found would be IgAN.

In this study, we found that MGN represented 16.9% of primary glomerulopathy cases, ranking fourth among the subgroups of primary glomerulopathies. Such data are in disagreement with a study carried out in the southern region of Brazil, the Paulista Glomerulopathy Registry, and the review of diagnoses by renal biopsy in Brazil.

Worldwide, especially in developed countries, there has been a reduction in the frequency of cases of infection-related glomerulopathies, such as membranoproliferative GN and post-infectious GN. In this study, we found that membranoproliferative GN was the seventh most common histopathological pattern among primary glomerulopathies, corresponding to

**TABLE 2** PRIMARY GLOMERULOPATHIES

|                | Frequency | %    |
|----------------|-----------|------|
| FSGS           | 126       | 28.8 |
| MCD            | 84        | 19.2 |
| IgAN           | 80        | 18.3 |
| MGN            | 74        | 16.9 |
| RPGN           | 27        | 6.2  |
| Diffuse Glomerular Sclerosis | 24       | 5.5  |
| MPGN           | 15        | 3.4  |
| Anti-GBM GN    | 2         | 0.5  |
| Other primary GN | 6        | 1.4  |
| Total          | 438       | 100.0|

FSGS: Focal Segmental Glomerulosclerosis; MCD: Minimal Change Disease; IgAN: IgA Nephropathy; MGN: Membranous Glomerulonephritis; RPGN: Rapidly Progressive Glomerulonephritis; MPGN: Membranoproliferative Glomerulonephritis; Anti-GBM GN: Anti- Glomerular Basement Membrane Glomerulonephritis; Other primary GN: Other primary Glomerulonephritis

**TABLE 3** SECONDARY GLOMERULOPATHIES

|                | Frequency | %    |
|----------------|-----------|------|
| SLE            | 61        | 42.4 |
| DM             | 18        | 12.5 |
| Thrombotic microangiopathy | 9        | 6.3  |
| Post-infectious GN | 8        | 5.6  |
| Amyloidosis    | 8         | 5.6  |
| HIV-related GN | 1         | 0.7  |
| Other secondary GN | 39       | 27.1 |
| Total          | 144       | 100.0|

SLE: Systemic Lupus Erythematosus; DM: Diabetes Mellitus; GN: Glomerulonephritis
only 3.4% of cases, while post-infectious GN corresponded to 5.6% of secondary glomerulopathy cases. Such data are in disagreement with the Pernambuco Registry of Glomerulopathies (REPEG).17

Lupus nephropathy was the most common type of secondary glomerulopathy found, corresponding to 42.4% of cases. The low prevalence of diabetic nephropathy in our sample stems from the fact that we only biopsied diabetic nephropathy patients when they presented with a high degree of atypia. On the contrary, diabetic nephropathy would probably be regarded as the main cause of secondary GN in our population.

CONCLUSION

This study provides data regarding the frequency of histopathological findings from renal biopsies of 9 nephrology centers in the state of Minas Gerais. We found that FSGS was the most frequent primary glomerulopathy while lupus nephropathy was the main type of secondary glomerulopathy and that a low incidence of glomerulonephritis was associated with infectious conditions.

Creating and expanding these registries to identify the epidemiology of kidney diseases in our country will help create policies that can fight these diseases early in life in order to prevent an increase in the number of patients with chronic kidney failure, which is an important public health problem.

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REFERENCES

1. Cardoso ACD, Kirsztajn GM. Padrões histopatológicos das doenças glomerulares no Amazonas. J Bras Nefrol. 2006;28(1):39-43.
2. Cohen AH, Nast CC, Adler SG, Kopple JD. Clinical utility of kidney biopsies in the diagnosis and management of renal disease. Am J Nephrol. 1989;9(4):309-15.
3. Iversen P, Brun C. Aspiration biopsy of the kidney 1951. Am J Med. 1951;11(3):324-30.
4. Oliveira VS, Vieira Junior AE, Barreto JC, Ramos Filho R. Biópsia renal: experiência do Hospital Geral de Goiânia. J Bras Nefrol. 2004;3(Suppl. 2):S1.
5. Richards NT, Darby S, Howie AJ, Adu D, Michael J. Knowledge of renal histology alters patients management in over 40% of cases. Nephrol Dial Transplant. 1994;9(9):1255-9.
6. Barros RT, Alves MAVER, Dantas M, Kirsztajn GM, Sens YAS. Biópsia renal. In: Lima EQ, Barros RT, eds. Glomerulopatias: patogenia, clínica e tratamento. 2a ed. São Paulo: Servier; 2006. p.100-5.
7. Gesualdo L, Di Palma AM, Morrone LF, Strippoli GF, Schena FP, Italian Immunopathology Group, Italian Society of Nephrology. The italian experience of the national registry of renal biopsies. Kidney Int. 2004;66(3):890-4.
8. Mazzuchi Frantzche N, Di Martino Compte LA. Epidemiología de las glomerulopatías primarias en el Uruguay. Arch Med Interna. 1997;19(1):21-6.
9. Rivera F, López-Gómez JM, Pérez-Garcia R. Spanish Registry of Glomerulonephritis. Frequency of renal pathology in Spain 1994–1999. Nephrol Dial Transplant. 2002;17(9):1594-602.
10. Andrade LCF, Vieira PA, Reis MF, Pernambuco JM, Franco MN, Bastos MG. Análise de 121 biópsias renais (BXR) comparadas com o Registro Paulista de Glomerulopatias (RPG). J Bras Nefrol. Proceedings of the XXII Congresso Brasileiro de Nefrologia. 2004. Sep 18-22. Salvador, Bahia, Brasil. p 9.
11. Polito MG, Moura LA, Kirsztajn GM. An overview on frequency of renal biopsy diagnosis in Brazil: clinical and pathological patterns based on 9,617 native kidney biopsies. Nephrol Dial Transplant. 2010;25(2):490-6.
12. Ferraz FH, Martins CGB, Cavalcanti JC, Oliveira FL, Quirino RM, Chicon R, et al. Perfil das doenças glomerulares em um hospital público do Distrito Federal. J Bras Nefrol. 2010;32(3):249-56.
13. Malafronte P, Mastroianni-Kirsztajn G, Betônico GN, Romão JE Jr, Alves MA, Carvalho MF, et al. Paulista Registry of glomerulonephritis: 5-year data report. Nephrol Dial Transplant. 2006;21(11):3098-105.
14. Crensiglova C, Rehme BB, Kinasz LR, Chula DC, Nascimento MM, Soares MF. Frequency and clinical histological analysis of glomerular diseases in a tertiary hospital in southern Brazil. J Bras Nefrol. 2016;38(1):42-8.
15. Sugiyama H, Yokoyama H, Sato H, Saito T, Kohda Y, Nishi S, et al.; Committee for Standardization of Renal Pathological Diagnosis; Committee for Kidney Disease Registry; Japanese Society of Nephrology; Japan Renal Biopsy Registry and Japan Kidney Disease Registry. Committee Report for 2009 and 2010. Clin Exp Nephrol. 2013;17(2):155-73.
16. Kasamatsu E, Nunes V MC, Morán M, Centurión M, Campos de Alvarenga S. Glomerulopathies in Paraguay. Report of Registry of Renal Biopsies in 1072 cases. Mem Inst Investig Cienc Salud. 2005;3:51-7.
17. Costa, DM, Valente LM, Gouveia PA, Sarinho FW, Fernandes GV, Cavalcante MA, et al. Comparative analysis of primary and secondary glomerulopathies in the northeast of Brazil: data from the Pernambuco Registry of Glomerulopathies - REPEG. J Bras Nefrol. 2017;39(1):29-35.
18. Rocha LP, Carminati CR, Machado JR, Laterza VL, Reis MA, Corrêa RR. Prevalence of nephropathies in children and adolescents and alterations in renal biopsies in Minas Gerais, Brazil, from 1996 to 2010. Ann Diagn Pathol. 2013;17(1):22-7.