EPIDEMIOLOGIC DATA OF ADULT NATIVE BIOPSY-PROVEN RENAL DISEASES IN CROATIA

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ABSTRACT

PURPOSE: There is a paucity of epidemiological data on biopsy-proven renal disease in Croatia. The purpose of this report is a review of clinical and histological data, over a period of 15 years, from the single biggest adult native renal biopsy centre in Croatia.

METHODS: This report includes data from 922 adult native renal biopsies in patients referred from the whole country and performed in our centre from 1996 till February 2012. Data on age, gender, serum creatinine, urine sediment, 24-hour proteinuria, clinical syndrome and histological diagnosis were collected and analyzed retrospectively. In all patients light, immunofluorescence and electron microscopic analysis was performed.

RESULTS: The median age of the patients was 48 years (interquartile range 36-59 years), and the majority of patients were men (57.8%). The most common indication for renal biopsy was nephrotic syndrome (40.3%) followed by asymptomatic urinary abnormalities (31.7%). The most common biopsy-proven renal disease in total was IgA glomerulonephritis (19.3%), followed by FSGS (15.8%) and membranous glomerulonephritis (9.2%). In men similar results were found, while in women the most common were hereditary nephritis (13.4%), FSGS (12.9%) and connective tissue disease-related glomerular disorders (11.6%).

CONCLUSION: The presented data are an important contribution to the better understanding of the epidemiology of biopsy-proven renal disease in Croatia and Europe throughout comparison with other registry data. This data should be the basis for the formation of Croatian Registry of Renal Biopsies.

Keywords: biopsy-proven renal disease; epidemiology; glomerulonephritis; renal biopsy, renal pathology; registry

INTRODUCTION

Renal biopsy is the definitive diagnostic test in patients with renal parenchymal disease. The epidemiology of biopsy-proven renal diseases (BPRD) provides useful information about prevalence of renal diseases and its clinicopathological correlations. Data provided by renal biopsy registries could help better understanding the etiopathological aspects of these diseases. These data also make an important foundation for further epidemiological studies aimed at identifying relevant risk factors in the development and progression of the renal diseases and in developing protocols for preventive medicine. Moreover, combining data with renal replacement therapy registries would allow us to evaluate long-term outcome of patients with kidney disease [1].

Current epidemiological data on BPRD are available from national renal biopsy registries in Italy [2, 3], Denmark [4], Brazil [5], Spain [6, 7], Czech Republic [8] and Saudi Arabia [9]. In addition, data from local or limited national registries of renal biopsy have been reported from South Korea [10, 11], Bahrain [12, 13], Brazil [14], Romania [15], China [16], Finland [17], Serbia [18], Pakistan [19] and Belgium [20]. Finally, there are also reports that include epidemiological data only on glomerular diseases from Australia [21], Macedonia [22], France [23], USA [24], Iran [25], Germany [26], Lebanon [27], Peru [28] and Poland [29]. In this study we describe the frequency and clinicopathological correlations of biopsy-proven native renal diseases in Croatian adults observed over past 15 years. In Croatia, development of national renal biopsy registry is in progress. Our centre renal biopsy registry should serve as a foundation of that registry. Dubrava University Hospital is a tertiary care centre situated in Zagreb, and adult patients from the whole country are referred to our Nephrology Unit for renal biopsy. Our Nephrology Unit has the biggest adult native renal biopsy rate among several other Nephrology Units in Croatia, where renal biopsy is performed. Preliminary results from our database have been published earlier [30].

SUBJECTS AND METHODS

We retrospectively analyzed the results of adult (≥16 years) native renal biopsies performed at our Nephrology Unit from 1996 till the February 2012. Incomplete records, inadequate biopsies (where no adequate renal tissue sample was obtained) and some rebiopsies (where the primary diagnosis remained unchanged and where there were no signs of different renal parenchymal disease in rebiopsy) were excluded from the analysis.

The data collected for each patient were the date of renal biopsy, age, sex, urine sediment, serum creatinine and maximal 24-hour proteinuria till the time of biopsy, as well as all other

important laboratory findings and underlying conditions suggesting possible association with renal disease.

The indications for renal biopsy were categorized into following clinical syndromes: nephrotic syndrome (NS), asymptomatic urinary abnormalities (AUA), acute nephritic syndrome (ANS), chronic nephritic syndrome (CNS) and unexplained renal failure (RF). NS was defined as proteinuria ≥3.5g/24 hours. AUA was defined as either hematuria or non-nephrotic proteinuria (<3.5g/24 hours) or both with normal estimated glomerular filtration rate (EGFR) and without any clinical symptoms. ANS was defined as hematuria, hypertension, oedema, oliguria and acute reduction of EGFR. CNS was defined as permanent (≥6 months) reduction of EGFR (<90ml/minute) with non-nephrotic proteinuria with or without hematuria. RF was defined as acute or chronic reduction of EGFR without proteinuria and hematuria. The biopsies were done using continuous ultrasound guidance and a 16-gauge biopsy needle (Tru-Cut) in an automated gun (Bard Biopsy System©). All the biopsies were routinely processed for light (hematoxylin and eosin, periodic acid-Schiff, Jones and Masson trichrome stains), immunofluorescence (IgG, IgM, IgA, C3, C1q, fibrinogen, albumin, kappa and lamda light chains) and also electron microscopy. Pathohistological diagnoses were classified into following categories: minimal change disease (MCD), focal segmental glomerulosclerosis (FSGS), membranous glomerulonephritis (MGN), IgA glomerulonephritis (IgAGN), membranoproliferative glomerulonephritis (MPGN), acute postinfectious glomerulonephritis (APINFGN), hereditary nephritis (HERNEF, including Alport's syndrome and thin membrane disease), glomerulonephritis associated with connective tissue diseases (CTDGN, systemic lupus erythematosus, Sjögren's syndrome, sarcoidosis, etc.), anti-GBM glomerulonephritis (AGBMGN), pauci-immune glomerulonephritis (PCIMUNGN, including focal or diffuse crescentic glomerulonephritis type III or vasculitis), thrombotic microangiopathies (TRMAGP, hemolytic-uremic syndrome, thrombotic thrombocytopenic purpura, renal scleroderma, malignant hypertension), diabetic nephropathy and metabolic diseases (DMETGN), dysgammaglobulinemia associated disorders (DYSGGN, myeloma kidney, light or heavy chain deposit disease, cryoglobulinemia), amyloidosis and other renal diseases with organized deposits (like fibrillary glomerulonephritis, AMORGDEP), nephroangiosclerosis (NAS), acute tubulointerstitial nephritis (ATIN), chronic tubulointerstitial nephritis (CTIN), acute tubular injury (ATI; also covers definitive tubular necrosis), end stage renal disease (ESRD) and miscellaneous category (including mesangioproliferative glomerulonephritis without IgA or IgM deposits, IgM glomerulonephritis, C1q nephropathy, etiologically non-differentiable nephropathies,

nephronophthisis, nephrocalcinosis, biopsy findings in suspected inherited tubular disorders like Bartter, Gitelman or Liddle's syndrome and normal histopathological findings).

Data analysis/Statistics

All analyses were performed using the SPSS statistical software package (version 17.0). Continuous variables were expressed as median with interquartile range, and categorical variables as frequency and in percentage.

RESULTS

Over the study period a total of 951 native renal biopsy records were included in our centre registry. After excluding re-biopsies where there was no change in the primary diagnosis from initial biopsy, a total of 922 biopsy records were included in our analysis (including 4 re-biopsies records). All of the patients were Caucasian and ≥16 years old. We observed a constantly increasing trend in renal biopsy rate from the year 2003 forward (Figure 1). The main clinicoepidemiological characteristics of our patients are shown in Table 1. The majority of patients were males (M:F ratio 1.4).The median age of the patients was 48 years (range 16-84 years), similar in men and women. In all the analyzed age groups there were more males than females except in the group of older than 75 years. The majority of patients were in the age group of 46-60 years (33.4%). The majority of patients had normal serum creatinine and non-nephrotic proteinuria. The most common indication for renal biopsy was NS (40.3%), followed by AUA (31.8%) and CNS (13.9%). Similar results were found in men, whereas in women the most common indication was AUA, followed by NS and CNS. Females were more prevalent in AUA, ANS and RF syndromes, as shown in Online Resource 1, which also shows age distribution according to clinical presentation. The distribution of BPRD in our patients is shown in Table 2. The most common diagnoses were IgAGN (19.3%), FSGS (15.8%), MGN (9.2%), HERNEF (8.1%) and PCIMUNGN (7.7%). In men, there was a similar distribution of BPRD, whereas in women the most common diagnosis was HERNEF (13.4%), followed by FSGS (12.9%) and CTDGN (11.6%). The subgroup of miscellaneous BPRD included 66 patients (7.2%) and showed following findings: normal renal tissue (20 patients, 2.2%), mesangioproliferative GN without IgA and IgM deposits (17 patients, 1.8%), etiologically non-differentiable focal sclerosing GN (11 patients, 1.2%), findings consistent with Gitelman, Bartter or Liddle's syndrome (5 patients, 0.6%), etiologically non-differentiable GN caused by immune complexes (4 patients, 0.4%), C1q nephropathy, nephronophthisis, nephrocalcinosis and IgM nephropathy (each with 2 patients, 0.2%). HERNEF group included 18 patients with Alport syndrome (12 men and 6 women) and 57 patients with thin membrane disease (10 men and 47 women). The distribution of the most

common diagnoses according to gender is shown in Figure 2. The BPRD distribution by age groups is shown in Online Resource 2. In age groups 16-30, 31-45 and 46-60 years, the most common diagnosis was IgAGN, in the age group of 61-75 years it was PCIMUNGN and in the age group of >75 years it was AMORGDEP. Gender and age distribution of BPRD in our patients is shown in Figure 5. Men were prevalent in most of the diseases except in MCD, HERNEF, CTDGN, DYSGGN, ATIN, CTIN and ESRD. Regarding the age distribution of the most common diagnoses, IgAGN was predominantly found in the age group of 16-30 years (31.7%), FSGS in the age group 31-45 years (24.2%) and MGN in the age group 61-75 years (31.2%). HERNEF was predominantly found in age group of 31-45 years (36.9%), while PCIMUNGN in the age group of 61-75 years (37.1%) (Online Resource 3). Serum creatinine and clinical presentation of BPRD in our study is shown in Figure 3. Clinicopathological correlations observed in our study are shown in Table 3, while the most common diagnoses according to clinical presentation are shown in Figure 4. IgAGN and HERNEF presented predominantly as AUA (48.3% and 80.0% respectively), FSGS and MGN as NS (51.4% and 82.4%), and PCIMUNGN as ANS (40.8%). In patients with NS the most common diagnoses were FSGS (20.2%) followed by MGN (18.8%) and IgAGN (10.8%). In patients with AUA the most common BPRD were IgAGN (29.4%), HERNEF (20.5%) and FSGS (13.3%). The most common diagnosis in patient with ANS was PCIMUNGN (48.3%), in patients with CNS it was IgAGN (28.9%) and in patients with RF the most common diagnosis was PCIMUNGN (17.4%), followed by ATI (14.5%) and ATIN (13.0%).

DISCUSSION

This work represents a 15 years retrospective study on BPRD in the biggest Nephrology Department for adult native renal biopsies in Croatia, providing comprehensive information about demographics, clinical syndromes and pathohistology of those diseases. In recent years there is a steadily increase in the rate of renal biopsies in all available reports, as well as in our study. This is a consequence of constantly improving technique, making serious complications rare and sparse, and also because of widening the indications for renal biopsy. There are numerous published papers describing frequency, histopathological findings and clinicoepidemiological correlations from different renal biopsy databases all over the world [2-29]. It is not always easy to compare (Online Resource 4) these results mainly because of different renal biopsy policies and practice in different countries. Some centers obtain a biopsy only when the pathology would alter the therapy, while others, like in our centre, have a relatively liberal biopsy policy. We recommend to our patients a renal biopsy in any case

where there are urinary abnormalities suggesting parenchymal renal disease and where there are no contraindications. Different renal biopsy policy concerns especially AUA syndrome. Consequently in countries where there is a strict biopsy policy, the incidence and prevalence of diseases presenting predominantly with AUA (like IgAGN and HERNEF) will be underestimated. Regarding AUA syndrome, there are also different definitions of this syndrome in different registry and database reports. In some (like ours) it includes non-nephrotic proteinuria and/or any hematuria [15, 25], while in others [2, 5, 6, 8, 18-20], macroscopic hematuria is considered as a separate syndrome. There are also different definitions of chronic nephritic syndrome and renal failure syndrome.

The second reason for discrepancies in the incidences from different countries is the non-uniform classification of BPRD. The most common glomerular diseases (IgAGN, FSGS, MGN, MCD, MPGN) are mainly uniformly defined, while the definition of other BPRD shows some difference. There are differences in defining acute postinfectious GN, poststreptococcal GN and infection related GN and also in crescentic GN and vasculitides as well as in non-inflammatory renal pathology like NAS. Then there are some reports defining entities that are not classified in majority of reports. For example, diagnosis of mesangioproliferative GN without reference to IF microscopy, and also focal segmental GN, endocapillary GN and chronic GN [4], diffuse proliferative GN, sclerosing GN, endocapillary proliferative GN and segmental proliferative GN [5, 14]. Our classification is most similar to Italian [2, 3], Spanish [6, 7] and Czech [8] report, with some minor differences. In our study, the category PCIMUNGN represents primary and secondary crescentic GN type III, because in some cases, it is difficult to separate primary from secondary forms of the disease. We also separated categories thrombotic microangiopathies (TRMAGP, including malignant hypertension) and NAS which are usually aggregated in one category of vascular diseases. All mentioned above implies the need for more uniform categorization of clinical syndromes, as well as all BPRD for reliable comparison.

Our results show that men are more prevalent (57.8%) in BPRD, like in virtually all available reports, with male prevalence ranging from 50.5% [11] to 65% [2]. The most common indication for renal biopsy in our patients was NS in total (40.3%) and also in men (42.6%), while in women it was AUA (38.8%). In most registry and database reports, NS was also the most common indication [6, 8, 14, 18, 19, 25], while in Italy [2] and in Belgium [20] it was AUA. As we stated earlier, this depends on the biopsy policy of different country or region, but also on availability of the biopsy and socio-economic status. In comparison of clinicoepidemiological data from different countries (Online Resource 4), the age of the

included population should also be considered. Some registries and databases include children and adults [2, 3, 5, 6, 8, 12, 16], while others include only adults [9, 10, 15, 18-20].
The most common BPRD in our study were IgAGN (19.3%), FSGS (15.8%) and MGN (9.2%), similar to Italy [2, 3], Spain [6], Czech Republic [8], China [16] and South Korea [11]. The distribution of BPRD also depends on several factors. First, as already mentioned, there is the age of the patients. Consequently, registries with children included, would have bigger percentage of predominantly children related BPRD, like MCD or FSGS [5, 6, 12]. The race of the included patients should also be an important factor for consideration when comparing results from different registries. The distribution of BPRD depends also on renal biopsy indications and policies, as mentioned earlier. The next important factor to consider, when comparing the BPRD distribution throughout the world, is the use of IF and electron microscopy in the analysis of renal biopsy. In some countries, there is no routine use of IF as well as electron microscopy. The diagnosis of some very common BPRD directly depends on the use of IF microscopy, like IgAGN and PCIMUNGN. In the majority of studies there is no exact report on the use of IF, except in the Spain (around 90%) [6], Denmark (78%) [4] and Serbia (84%) [18]. The use of electron microscopy is even less frequent according to available data: in Italy 38% [2], Spain 23% [6] and Brazil 9% [5]. Electron microscopy is crucial in establishing diagnosis of MCD and HERNEF, as well as in differentiating between primary and secondary FSGS. We routinely use IF and electron microscopy in the renal biopsy analysis in all our patients, and we believe that this is one of the major advantages of our study. Consequently, there is a much bigger prevalence of HERNEF (8.1%) in our study compared to some others [5, 10, 11, 14-16, 18]. Recent articles showed that electron microscopy was absolutely necessary to make a correct diagnosis in 21% of cases, while its use resulted in clinically relevant refinement of or addition to the diagnosis in another 24% of cases [31, 32].
Regarding clinicopathological correlations, the gender distribution of BPRD in our patients was as expected. In women, the most common diagnoses were HERNEF (predominantly thin membrane disease in 82.5%), FSGS and CTDGN, while in men, the most common were IgAGN, FSGS and MGN. From available data, in Italy, in men the most common BPRD were IgAGN, NAS and ATI, and in women CTDGN, MCD and FSGS [3], while in Lebanon in men and women the most common BPRD was mesangiproliferative GN (including IgAGN) and FSGS [27]. Also, in different age groups there was different distribution of BPRD, as expected (Figure 4). In patients with NS the most common diagnosis was FSGS (20.2%), followed by MGN (18.8%). In most other studies it was reversed, MGN was the most

common, followed by FSGS [2, 3, 7, 10]. This could be result of our relative liberal biopsy policy, including more patients with AUA, a more likely presentation of FSGS than MGN. In patients with AUA the most common BPRD was IgAGN, as in the majority of other studies [2, 3, 5, 7].

This report shares some limitations common to majority disease registries based on diagnostic maneuvers. The study is retrospective, the included patients were from different parts of Croatia, referred to our tertiary centre with relatively non-uniform referral policies, depending on local expertise and changing indications. However, the information obtained from this study is important contribution to the understanding the prevalence and pattern of BPRD in Croatia.

In conclusion, our centre biopsy registry, represent the first step in formation of the Croatian national registry and permits comparisons with other active renal biopsy registries in the world. It should serve as a source for nephrologists and health care providers to stimulate new analysis and investigations and to improve prevention and treatment of BPRD.

ABBREVIATIONS

AGBMGN = anti-GBM glomerulonephritis

AMORGDEP = amyloidosis and other renal diseases with organized deposits

ANS = acute nephritic syndrome

APINFGN = acute postinfectious glomerulonephritis

ATI = acute tubular injury

ATIN = acute tubulointerstitial nephritis

AUA = asymptomatic urinary abnormalities

BPRD = biopsy-proven renal disease

CNS = chronic nephritic syndrome

CTDGN = glomerulonephritis associated with connective tissue diseases

CTIN = chronic tubulointerstitial nephritis

DMETGN = diabetic nephropathy and metabolic diseases

DYSGGN = dysgammaglobulinemia associated disorders

EGFR = estimated glomerular filtration rate

ESRD = end stage renal disease

FSGS = focal segmental glomerulosclerosis

GN = glomerulonephritis

IgAGN = IgA glomerulonephritis

HERNEF = hereditary nephritis

MCD = minimal change disease

MGN = membranous glomerulonephritis

MPGN = membranoproliferative glomerulonephritis

NAS = nephroangiosclerosis

NS = nephrotic syndrome

PCIMUNGN = pauci-immune glomerulonephritis

TID = tubulointerstitial disease

TRMAGP = thrombotic microangiopathy

ACKNOWLEDGEMENTS

This study was funded by the Croatian Ministry of Science, Education and Sports, project number 198-0000000-0179 (KG) and 198-0000000-3355 (DGLJ).

DISCLOSURE STATEMENT

My statement (on behalf of all the authors) is as follows: We state that the results presented in this paper have not been published previously in whole or part, except in abstract form. We do not have any conflict of interest. We have had no involvements that might raise the question of bias in the work reported or in the conclusions, implications, or opinions stated. Ivica Horvatic

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TABLES

Table 1. Patients distribution according to age, gender, basic laboratory findings and clinical presentation

	TOTAL (N=922)	**Male (N=533; 57.8%)**	**Female (N=389; 42.2%)**
Age (year)	48.0 (36.0-59.0)	48.0 (36.0-59.0)	48.0 (35.0-60.0)
Age groups (N,Column %)			
16-30 years	145 (15.7)	79 (14.8)	66 (17.0)
31-45 years	264 (28.6)	151 (28.3)	113 (29.0)
46-60 years	308 (33.4)	192 (36.0)	116 (29.8)
61-75 years	186 (20.2)	102 (19.1)	84 (21.6)
>75 years	19 (2.1)	9 (1.7)	10 (2.6)
S-Creatinine (µmol/l)	119.0 (86.0-206.0)	129.0 (99.0-217.0)	94.0 (73.0-187.0)
S-Creatinine groups (N,Column %)			
≤100 µmol/l	418 (45.3)	200 (37.5)	218 (56.0)
111-200 µmol/l	263 (28.6)	182 (34.1)	81 (20.8)
201-400 µmol/l	144 (15.6)	92 (17.3)	52 (13.4)
401-600 µmol/l	49 (5.3)	30 (5.6)	19 (4.9)
>600 µmol/l	48 (5.2)	29 (5.4)	19 (4.9)
EGFR (ml/minute)	58.2 (28.4-83.9)	56.2 (28.6-81.4)	60.6 (27.5-87.8)
EGFR groups (N, Column %)			
≥90ml/minute	178 (19.3)	89 (16.7)	89 (22.9)
60-89 ml/minute	264 (28.6)	157 (29.5)	107 (27.5)
30-59 ml/minute	237 (25.7)	150 (28.1)	87 (22.4)
15-29 ml/minute	131 (14.3)	80 (15.0)	51 (13.1)
<15 ml/minute or dialysis	112 (12.1)	57 (10.7)	55 (14.1)
24-hour proteinuria (g)	2.25 (0.77-6.50)	2.70 (0.97-6.50)	1.80 (0.41-6.50)
24-hour proteinuria groups (N, Column %)			
<3.5 g/24 hours	560 (60.7)	312 (58.5)	248 (63.8)
≥3.5 g/24 hours	362 (39.3)	221 (41.5)	141 (36.2)
Clinical syndrome (N, Column %)			
NS	372 (40.3)	227 (42.6)	145 (37.3)
AUA	293 (31.8)	142 (26.6)	151 (38.8)
ANS	60 (6.5)	34 (6.4)	26 (6.7)
CNS	128 (13.9)	92 (17.3)	36 (9.3)
RF	69 (7.5)	38 (7.1)	31 (8.0)

Continuous variables are given as median with interquartile range and categorical variables as frequency with column percentage. EGFR = estimated glomerular filtration rate calculated according to CKD-EPI formula.

Table 2. Biopsy-proven renal disease in our patients

Diagnosis	ALL (N=922)		Male (N=533)		Female (N=389)	
MCD	27	2.9%	11	2.1%	16	4.1%
FSGS	146	15.8%	96	18.0%	50	12.9%
MGN	85	9.2%	54	10.1%	31	8.0%
IgAGN	178	19.3%	137	25.7%	41	10.5%
MPGN	22	2.4%	14	2.6%	8	2.1%
APINFGN	13	1.4%	9	1.7%	4	1.0%
HERNEF	75	8.1%	23	4.3%	52	13.4%
CTDGN	62	6.7%	17	3.2%	45	11.6%
AGBMGN	2	0.2%	2	0.4%	0	0.0%
PCIMUNGN	71	7.7%	40	7.5%	31	8.0%
TRMAGP	10	1.1%	5	0.9%	5	1.3%
DMETGN	48	5.2%	30	5.6%	18	4.6%
DYSGGN	14	1.5%	3	0.6%	11	2.8%
AMORGDEP	17	1.8%	8	1.5%	9	2.3%
NAS	27	2.9%	19	3.6%	8	2.1%
ATIN	13	1.4%	6	1.1%	7	1.8%
CTIN	25	2.7%	11	2.1%	14	3.6%
ATI	16	1.7%	10	1.9%	6	1.5%
ESRD	5	0.5%	2	0.4%	3	0.8%
Miscellaneous	66	7.2%	36	6.8%	30	7.7%

Data are given as frequency and column percentage.

Table 3. Clinicopathological correlations observed in our patients with biopsy-proven renal disease (N=922)

Diagnosis	NS			AUA			ANS			CNS			RF		
	N	Row %	Column %	N	Row %	Column %	N	Row %	Column %	N	Row %	Column %	N	Row %	Column %
MCD	23	85.2%	6.2%	4	14.8%	1.4%	0	0.0%	0.0%	0	0.0%	0.0%	0	0.0%	0.0%
FSGS	75	51.4%	20.2%	39	26.7%	13.3%	3	2.1%	5.0%	27	18.5%	21.1%	2	1.4%	2.9%
MGN	70	82.4%	18.8%	11	12.9%	3.8%	0	0.0%	0.0%	4	4.7%	3.1%	0	0.0%	0.0%
IgAGN	40	22.5%	10.8%	86	48.3%	29.4%	10	5.6%	16.7%	37	20.8%	28.9%	5	2.8%	7.2%
MPGN	19	86.4%	5.1%	1	4.5%	0.3%	0	0.0%	0.0%	2	9.1%	1.6%	0	0.0%	0.0%
APINFGN	8	61.5%	2.2%	4	30.8%	1.4%	0	0.0%	0.0%	1	7.7%	0.8%	0	0.0%	0.0%
HERNEF	8	10.7%	2.2%	60	80.0%	20.5%	1	1.3%	1.7%	5	6.7%	3.9%	1	1.3%	1.4%
CTDGN	39	62.9%	10.5%	16	25.8%	5.5%	4	6.5%	6.7%	3	4.8%	2.3%	0	0.0%	0.0%
AGBMGN	1	50.0%	0.3%	0	0.0%	0.0%	0	0.0%	0.0%	0	0.0%	0.0%	1	50.0%	1.4%
PCIMUNGN	20	28.2%	5.4%	4	5.6%	1.4%	29	40.8%	48.3%	6	8.5%	4.7%	12	16.9%	17.4%
TRMAGP	1	10.0%	0.3%	3	30.0%	1.0%	1	10.0%	1.7%	3	30.0%	2.3%	2	20.0%	2.9%
DMETGN	35	72.9%	9.4%	4	8.3%	1.4%	0	0.0%	0.0%	7	14.6%	5.5%	2	4.2%	2.9%
DYSGGN	3	21.4%	0.8%	2	14.3%	0.7%	0	0.0%	0.0%	3	21.4%	2.3%	6	42.9%	8.7%
AMORGDEP	13	76.5%	3.5%	2	11.8%	0.7%	0	0.0%	0.0%	2	11.8%	1.6%	0	0.0%	0.0%
NAS	4	14.8%	1.1%	10	37.0%	3.4%	3	11.1%	5.0%	5	18.5%	3.9%	5	18.5%	7.2%
ATIN	0	0.0%	0.0%	1	7.7%	0.3%	3	23.1%	5.0%	0	0.0%	0.0%	9	69.2%	13.0%
CTIN	0	0.0%	0.0%	3	12.0%	1.0%	2	8.0%	3.3%	14	56.0%	10.9%	6	24.0%	8.7%
ATI	1	6.3%	0.3%	2	12.5%	0.7%	3	18.8%	5.0%	0	0.0%	0.0%	10	62.5%	14.5%
ESRD	2	40.0%	0.5%	0	0.0%	0.0%	0	0.0%	0.0%	1	20.0%	0.8%	2	40.0%	2.9%
Miscellaneous	10	15.2%	2.7%	41	62.1%	14.0%	1	1.5%	1.7%	8	12.1%	6.3%	6	9.1%	8.7%
Total	372	40.3%	100.0%	293	31.8%	100.0%	60	6.5%	100.0%	128	13.9%	100.0%	69	7.5%	100.0%

NS=nephrotic syndrome; AUA=asymptomatic urinary abnormalities; ANS=acute nephritic syndrome; CNS=chronic nephritic syndrome; RF=renal failure.

LEGENDS TO FIGURES

Fig. 1 The renal biopsy rate in our centre by year

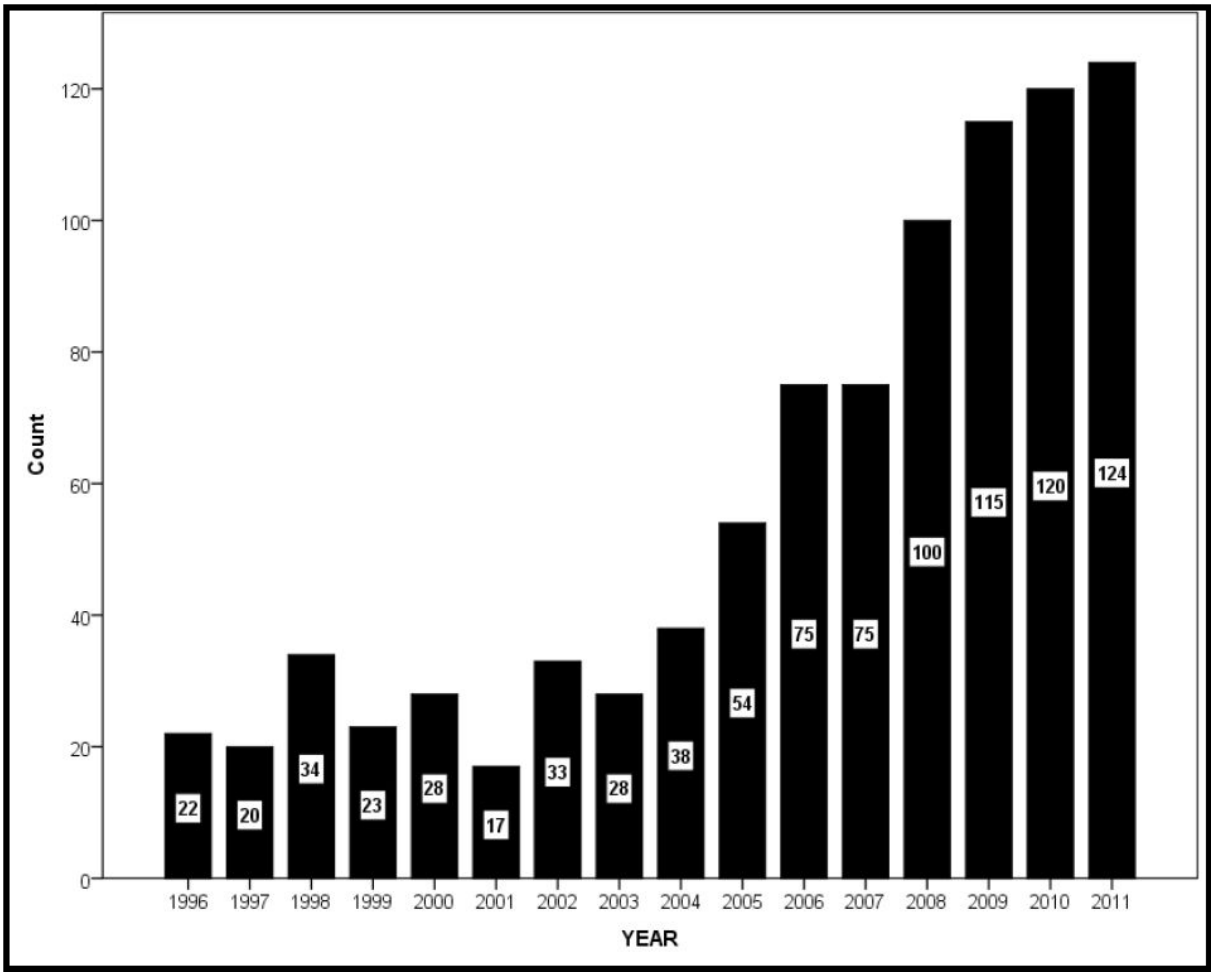

Fig. 2 The most common biopsy-proven renal disease in our patients according to gender

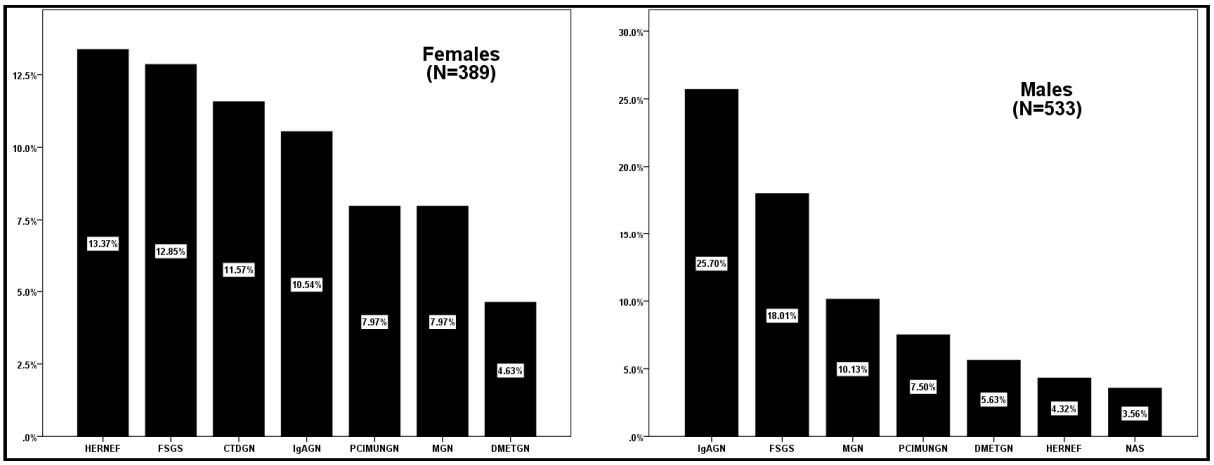

Fig. 3 Estimated glomerular filtration rate (A) and clinical presentation (B) distribution of biopsy-proven renal disease in our patients (N=922)

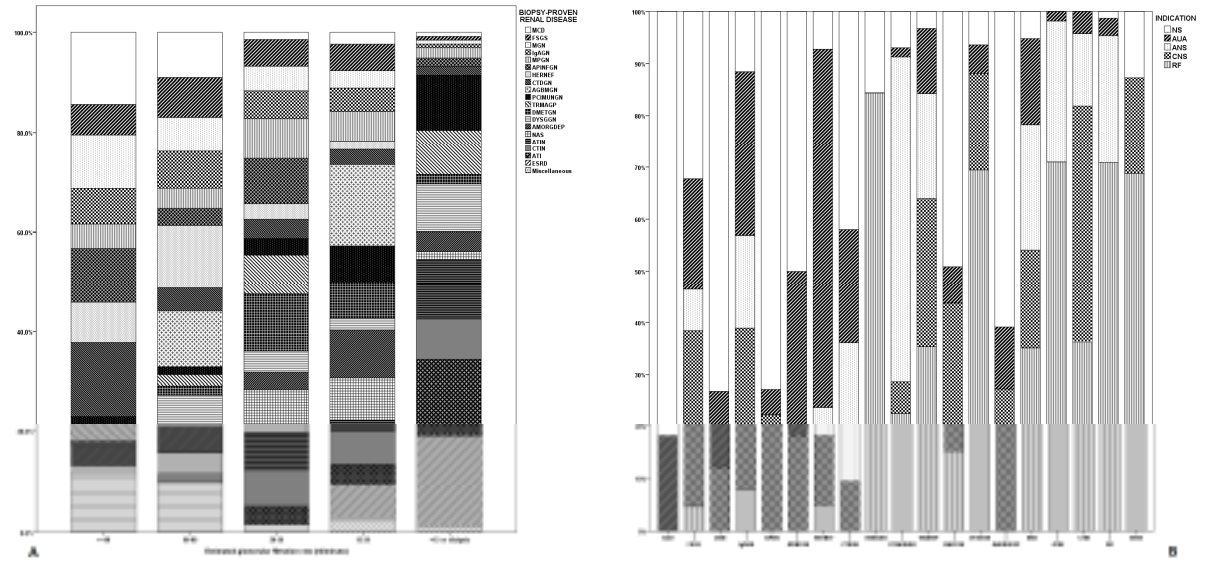

Fig. 4 The most common biopsy-proven renal disease in our patients according to clinical presentation