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Demographic and Clinical Features and Factors Associated with Survival in Patients with Primary Glomerulonephritis: Single Tertiary Center Experience

Primer Glomerülonefritli Hastalarda Demografik, Klinik Özellikler, Sağkalımı Etkileyen Özellikler: Tek Tersiyer Merkez Deneyimi

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ABSTRACT

Aim: Primary glomerulonephritis (GN) is a rare disease that has many different subtypes and is a significant health problem. Patients with primary GN (PGN) often do not achieve a complete cure, typically require immunosuppressive therapy, and can have serious co-morbidities due to the disease, which often progresses to end-stage renal disease (ESRD). The current study aimed to investigate the epidemiological, clinicodemographic characteristics and long-term outcomes of PGN patients.

Materials and Methods: The current study retrospectively evaluated the demographic characteristics and complaints as well as the physical examination and laboratory findings of PGN patients who were followed-up and treated in the nephrology department of our university hospital between January 2000 and June 2016.

Results: Of the 485 included patients, 265 were male (55%) and 220 were female (45%). The median age at diagnosis was 38.5 years (range; 18-77). The most frequent indication for biopsy was nephrotic syndrome (53.2%). The most common histopathological diagnoses were IgA nephritis (33.2%), focal segmental GN (31.1%), and membranous GN (19.6%), respectively. It was observed that male gender (p=0.01), systemic hypertension (p=0.01) at the time of diagnosis, proteinuria (p=0.001) in the nephrotic range, and histological diagnosis of crescentic GN (p=0.001) contributed negatively to renal survival. The mean follow-up duration after diagnosis was 59.1±48.5 months. The median overall survival was 153 (range; 1-197) months. Survival was significantly lower in patients with ESRD compared to those without ESRD (p=0.003). On clinical follow up, 48 patients died (9.9%), and 94 patients (19.3%) progressed to ESRD.

Conclusion: Clearly defining the etiology of PGN as well as determining the factors leading to ESRD may decrease morbidity and mortality.

Keywords: Primary glomerulonephritis, renal outcome, patient survival, immunosuppressive therapy, end stage renal disease

ÖZ

Amaç: Primer glomerülonefritler (GN), birçok farklı alt tipi olan ve önemli bir sağlık sorunu olan nadir bir hastalıktır. Primer GN'si (PGN) olan hastalar genellikle tam bir iyileşme elde edemezler. Tipik olarak immünosüpresif tedavi gerektirir ve sıklıkla son dönem böbrek yetmezliğine (SDBY) ilerleyen hastalığa bağlı ciddi komorbiditeler oluşabilir. Bu çalışma, PGN hastalarının epidemiyolojik, klinikodemografik özelliklerini ve uzun dönem sonuçlarını araştırmayı amaçladı.

Gereç ve Yöntem: Bu çalışmada Ocak 2000-Haziran 2016 tarihleri arasında üniversite hastanemiz nefroloji bölümünde takip ve tedavi edilen PGN'li hastaların demografik özellikleri ve şikayetleri ile fizik muayene ve laboratuvar bulguları retrospektif olarak değerlendirildi.

Bulgular: Çalışmaya dahil edilen 485 hastanın 265'i erkek (%55) ve 220'si kadındı (%45). Ortanca tanı yaşı 38,5 yıl idi (aralık; 18-77 yıl). En sık biyopsi endikasyonu nefrotik sendromdu (%53,2). En sık histopatolojik tanılar sırasıyla IgA nefriti (%33,2), fokal segmental GN (%31,1) ve

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membranöz GN (%19,6) idi. Erkek cinsiyet (p=0,01), tanı anında sistemik hipertansiyon (p=0,01), nefrotik düzeyde proteinüri (p=0,001) ve histolojik olarak kresentik GN (p=0,001) varlığı renal sağkalımı olumsuz etkileyen faktörlerdi. Tanı sonrası ortalama takip süresi 59,1±48,5 aydı. Ortanca genel sağkalım 153 (aralık; 1-197) aydı. SDBY olan hastalarda sağkalım, SDBY olmayanlara göre anlamlı olarak daha düşüktü (p=0,003). Klinik takipte 48 hasta (%9,9) öldü ve 94 hasta (%19,3) SDBY'ye ilerledi.

Sonuç: PGN'nin etiyolojisinin net olarak tanımlanması ve SDBY'ye yol açan faktörlerin belirlenmesi morbidite ve mortaliteyi azaltabilir.

Anahtar Kelimeler: Primer glomerülonefrit, renal sağkalım, hasta sağkalımı, immünosüpresif tedavi, son dönem böbrek hastalığı

INTRODUCTION

Glomerulonephritis (GN) refers to a group of diseases with different subtypes. GN is the third most common cause of end-stage renal disease (ESRD), following diabetes mellitus and hypertension[1-4]. However, it is the most common cause of ESRD in young adults[5]. GN can be etiologically classified as either primary or secondary. Primary GNs (PGN) are defined as diseases in which glomeruli are solely or predominantly affected by no known systemic disease or agent (e.g., vasculitis, systemic lupus erythematosus (SLE), metabolic disease, malignancy, infection, drugs). Secondary GNs are defined as diseases with glomerular damage and organ involvement due to a systemic disease or agent. The prevalence of glomerular diseases varies with race, age, geographical region, and etiological, cultural and economic differences. It is therefore important to recognize and study differences in these diseases in any geographical region[2-4].

Subtypes of PGN include IgA nephropathy (IgA-N), membranous GN (MGN), minimal change disease (MCD), focal segmental glomerulosclerosis (FSGS), membranoproliferative GN (MPGN), and crescentic GN (CGN)[1]. Although some clinical findings of these diseases are similar, they differ in their prevalence, pathological findings, clinical courses, and responses to treatment[1,3].

IgA-N is the most common form of PGN worldwide[1,2,4] and has a wide clinical spectrum. Often seen throughout the clinical course of IgA-N are macroscopic hematuria, asymptomatic isolated hematuria, and severe nephritic or nephrotic syndrome[1,6,7]. MGN is one of the most common causes of nephrotic syndrome in adults. Although MGN is frequently a primary (idiopathic) disease, it can also be due to secondary causes, such as malignancy, infection, drugs, and collagen tissue diseases[1,8]. Spontaneous remission may occur in the course of MGN[9]. MCD is the most common cause of nephrotic syndrome in pediatric patients. MCD and FSGS often present with nephrotic syndrome or asymptomatic proteinuria[1,10,11]. Histologically, the main problem in both MCD and FSGS lies in podocytes1. MPGN is mostly seen in children and young adults. Despite proper treatment, nearly 60% of adult PGN patients progress to ESRD within ten years[1,12]. CGN is known to cause renal failure, hematuria, and non-nephrotic proteinuria, with crescent formation being the classical morphological finding[1,13].

In the current study, we aimed to evaluate the demographic and clinical characteristics, survival rates, and factors affecting survival of patients who were diagnosed with PGN.

MATERIALS AND METHODS

The medical files of the PGN patients, who were treated and followed up in the nephrology department between January 2000 and June 2016, were retrospectively examined by the same researcher. Only patients aged 18 years and over were enrolled in this study. Patients were excluded from this study if they had secondary GN or inadequate data. MCD, MN, FSGS, MPGN, IgA-N, and CGN were accepted as the PGN.

Age, gender, age of diagnosis, and smoking status were recorded from the patient files. In addition, any drug use and systemic diseases (e.g., diabetes mellitus, systemic vasculitis, SLE, and amyloidosis) as well as the presence of swelling in the legs, macroscopic hematuria, high blood pressure, low back pain, oliguria, and uremia symptoms (e.g., nausea, vomiting, loss of appetite, fatigue) were also recorded.

Systolic and diastolic blood pressure values were recorded from patient files. According to the Eighth Joint National Committee (JNC 8) criteria, systolic blood pressure >140 mmHg, diastolic blood pressure >90 mmHg, or the use of antihypertensive medication was accepted as the presence of hypertension. Hypertension was defined as being 'under control' in cases where systolic blood pressure was below 140 mmHg and diastolic blood pressure was below 90 mmHg. Oliguria was defined as daily urine output of less than 400 mL/day.

The Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation was used as Estimated glomerular filtration rate (eGFR) formula. Results of microscopic examination of urine sediment were recorded. The presence of three or more erythrocytes in urine sediment at high magnification was accepted as microscopic hematuria. Patients were defined as having nephrotic syndrome if they had massive proteinuria (>3.5 g/day), edema, hypoalbuminemia, and hyperlipidemia. Patients were defined as having nephritic syndrome if they had systemic hypertension, oliguria, edema and proteinuria, and hematuria. Asymptomatic urinary analysis (AUA) was defined by non-nephrotic proteinuria and/or isolated microscopic hematuria. Rapidly progressive GN was defined by rapid deterioration of kidney function within hours-days.

Patients underwent renal biopsy if they had nephritic and/or nephrotic syndrome and/or rapid deterioration of kidney function (urea/creatinine elevation and/or oliguria within hours-days). All renal biopsy samples were examined with light microscopy and immunofluorescence by the expert pathologist. Biopsy specimens were stained with hematoxylin-eosin, periodic acid-Schiff, Masson trichrome, and Jones silver methenamine stains. The presence of IgA, IgG, IgM, C3, and C1q was assessed by immunofluorescence microscopy. The biopsy indications and biopsy results were recorded. The distribution of biopsy results according to age groups was evaluated.

Conservative treatment was defined as renin-angiotensin system blockade with angiotensin converting enzyme inhibitors or angiotensin receptor blockers, blood pressure control, statin use, diuretic therapy, control of metabolic syndrome, and protein and salt restriction in the diet. Any immunosuppressive therapies (e.g., steroids, cyclophosphamide, cyclosporine, azathioprine, mycophenolate mofetil, rituximab, etc.) and observed side effects (e.g., impaired renal function, systemic infections, Cushing's syndrome, venous thromboembolism etc.) were recorded.

ESRD was defined as the need for permanent renal replacement therapy (hemodialysis, peritoneal dialysis, renal transplantation). Renal survival was defined for those who developed and did not develop ESRD. The clinical and laboratory data of the patients with ESRD were compared with those of patients who did not develop ESRD.

Statistical Analysis

The Kolmogorov-Smirnov dispersion test was used to analyze whether the data were normally distributed. Descriptive statistical methods (frequency, percentage, mean, standard deviation) were employed in evaluating the study data. The Wilcoxon sign test was used for intra-group comparisons. The Pearson's chi-square test and Fisher's exact test were carried out to investigate the factors affecting renal survival. A Kaplan-Meier analysis was used to examine the risk factors affecting patient survival and follow-up. Results were evaluated at a 95% confidence interval, and values of $p<0.05$ were considered significant. Normally distributed variables were shown as percentage or mean±standard deviation and non-normally distributed variables as median and interquartile range.

RESULTS

There were 485 patients treated due to PGNs in this study. Of the patients, 265 were male (55%) and 220 (45%) were female. Demographic and clinical characteristics are shown in Table 1. The median age at diagnosis was 38.5 years (range; 18-77). The mean follow-up period of the patients with PGNs was 59.1±48.5 months.

In terms of complaints, 299 (61.6%) patients had swelling in the legs, 42 (8.6%) had macroscopic hematuria, 91 (18.7%) had high blood pressure, 19 (3.9%) had low back pain, and 34 (7%) had oliguria, nausea, vomiting, and loss of appetite.

Laboratory findings at the time when kidney biopsy was performed are shown in Table 2. The mean systolic blood pressure was 128.9±16.1 mmHg and the mean diastolic blood pressure was 80.7±10.5 mmHg. The mean eGFR was 91.1±34.8 mL/min in cases where renal biopsy was performed.

Renal Biopsy Results

In this study, nephrotic syndrome was the most common biopsy indication [258 patients (53.2%)]. Other biopsy indications included nephritic syndrome in 95 (19.6%) patients, nephrotic + nephritic syndrome in 59 (12.2%) patients, asymptomatic urine analysis in 54 (11.5%) patients, and RPGN in 19 (3.9%) patients (Figure 1). The most common histopathological diagnosis was IgA-N (161 patients / 33.2%). Other diagnoses included FSGS (151 patients / 31.1%), MGN (95 patients / 10.9%), MPGN (53 patients / 10.9%), CGN (18 patients / 3.7%), and MCD (7 patients / 1.4%) (Figure 2).

FSGS (46.2%) and MGN (34.9%) were the most common GN subtypes followed by MPGN (10.1%), IgA-N (6.1%), and MCD (2.3%) in patients with nephrotic syndrome. IgA-N (89.5%) was the most common GN subtype in patients with pure nephritic syndrome. IgA-N (62.7%) and MPGN (25.4%) were the most common diagnoses in patients with both nephrotic range proteinurias and nephritic findings. FSGS (42.6%) were the most common GN in patients with asymptomatic urine analysis. CGN was present in 84.2% of the patients with rapid

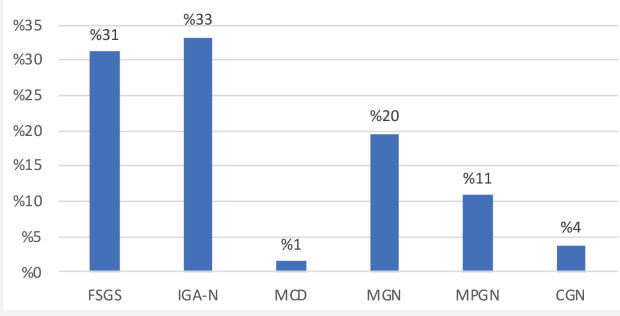

Figure 1. Diagnosis of patients according to the renal biopsy results between 2000 and 2016

CGN: Crescentic glomerulonephritis, FSGS: Focal segmental glomerulosclerosis, IgA-N: IgA nephropathy, MCD: Minimal change disease, MGN: Membranous glomerulonephritis, MPGN: Membranoproliferative glomerulonephritis

deterioration of renal function. The incidence of PGN according to year intervals (2000-2008 vs 2009-2016) is shown in Figure 3. The most common type of PGN under the age of 40 years was FSGS (41%), while MGN was (38%) in geriatric patients over the age of 65 years (Figure 4). Of the patients, 229 (49%) underwent conservative treatment and 233 (51%) received + immunosuppressive treatment in addition to conservative treatment. In terms of complications, a thromboembolic event occurred in 9 cases and 23 cases were treated with sepsis.

Renal Outcome

Ninety-four (20%) of the 459 patients with known renal outcome developed ESRD. The renal replacement therapies of these ESRD patients included hemodialysis (64 cases), peritoneal dialysis (2 cases), and renal transplantation (28 cases). When renal outcome was examined, the development of ESRD was found to be significantly higher in males than in females (p=0.011). In addition, the development of ESRD in patients with RPGN was significantly higher than in patients without RPGN (p=0.001). ESRD development was significantly higher in patients with proteinuria greater than 3.5 g/day at the time of diagnosis compared to those with proteinuria less than 3.5 g/day (p=0.001). In addition, ESRD development was significantly higher in patients with diastolic blood pressure above 90 mmHg than in those with diastolic blood pressure below 90 mmHg (p=0.011).

Table 1. Demographics and clinical characteristics of patients

Variables		n	%
Age at diagnosis; median, years (range)		38.5 (18-77)	
The mean follow-up time from diagnosis (months)		59.1±48.5	
Gender	Male	265	55
	Female	220	45
Smoker	No	359	66.6
	Current/former	126	33.4
Symptoms before diagnosis	Swelling in the legs	299	61.6
	Macroscopic hematuria	42	8.6
	High blood pressure	91	18.7
	Low back pain	19	3.9
	Oliguria and uremia symptoms	34	7
Renal biopsy indication	Nephrotic syndrome	258	53.2
	Nephritic syndrome	95	19.6
	Nephrotic and nephritic syndrome	59	12.2
	Asymptomatic urine analysis	54	11.1
	RPGN	19	3.9
Histopathology	IgA-N	161	33.2
	FSGS	151	31.1
	MGN	95	19.6
	MPGN	53	10.9
	CGN	18	3.7
	MCD	7	1.4
Renal outcome	ESRD yes	94	19.4
	ESRD no	365	75.3
	N/A	26	5.3
Renal replacement therapy in ESRD	Hemodialysis	64	13.2
	Peritoneal dialysis	2	0.4
	Kidney transplantation	28	5.7
Current status	Alive	422	87
	Exitus	48	9.9
	N/A	15	3.1

IgA-N: IgA nephropathy, CGN: Crescentic glomerulonephritis, FSGS: Focal segmental glomerulosclerosis, MGN: Membranous glomerulonephritis, MPGN: Membranoproliferative glomerulonephritis, RPGN: Rapidly progressive glomerulonephritis, MCD: Minimal change disease, N/A: Not available, ESRD: End-stage renal disease

Patient Survival

The median overall survival was 153 (range; 1-197) months (Figure 5). Within the study period, 48 of the 470 patients included died. Of them, 16 died of cardiovascular disease, 13 died of sepsis, 3 died of a thromboembolic event, and 3 died due to malignancy. The cause of death was not determined in 13 cases. When patient survival was examined, it was found that neither the presence of nephrotic range proteinuria, elevated systolic blood pressure (>140 mmHg), hematuria nor immunosuppressive treatment affected survival.

There was no significant difference in terms of survival and proteinuria (between those below and above 3.5 g/day) at diagnosis (p=0.359), systolic blood pressure (between those below and above 140 mmHg) at diagnosis (p=0.603), presence of hematuria (p=0.136). Survival was significantly lower in patients with ESRD compared to those without ESRD (p=0.003) (Figure 6).

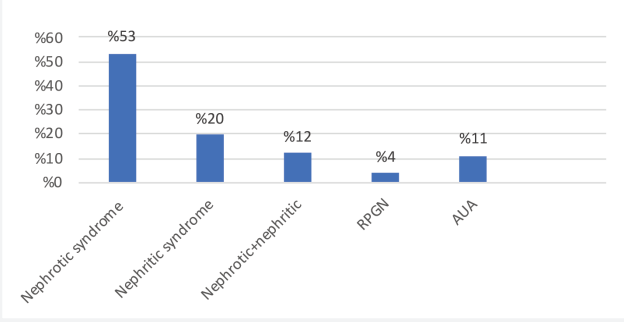

Figure 2. Indications for renal biopsy according to primary glomerulonephritis between 2000 and 2016

AUA: Asymptomatic urinary abnormalities, CGN: Crescentic glomerulonephritis, FSGS: Focal segmental glomerulosclerosis, IgA-N: IgA nephropathy, MCD: Minimal change disease, MGN: Membranous glomerulonephritis, MPGN: Membranoproliferative glomerulonephritis, RPGN: Rapidly progressive glomerulonephritis

Table 2. Laboratory findings at the time when kidney biopsy was performed

Variables	Mean±SD
Systolic blood pressure (mmHg)	128.9±16.1
Diastolic blood pressure (mmHg)	80.7±10.5
BMI (kg/m²)	27.1±9.7
Glucose (mg/dL)	96±34
BUN (mg/dL)	22±18
Creatinine (mg/dL)	1.02 (0.6-1.7)
eGFR (CKD-EPI, mL/min/1.73 m²)	91.1±34.8 mL
Triglyceride (mg/dL)	171 (115-264)
LDL-cholesterol (mg/dL)	159±78 mL
ALT (IU/L)	18 (12-26)
Calcium (mg/dL)	9.1±0.9
Serum albumin (g/dL)	3.15±0.9
Proteinuria (mg/day)	3250 (1386-7114)

BMI: Body mass index, eGFR: Estimated glomerular filtration rate, CKD-EPI: Chronic Kidney Disease Epidemiology Collaboration equation, SD: Standard deviation, BUN: Blood urea nitrogen, ALT: Alanine aminotransferase, LDL: Low-density lipoprotein

DISCUSSION

PGN is a significant health problem due to the fact that a complete cure is hard to attain, the requirement for immunosuppressive therapy is high, serious co-morbidities occur due to the disease itself, and patients often progress to ESRD. Recent epidemiological studies have shown that cases of PGN are increasing[2,3]. The distribution and frequency of the disease is better understood by the data of the GN working groups in various countries. A common result of all studies is that the ratio of histological types in PGN varies according to

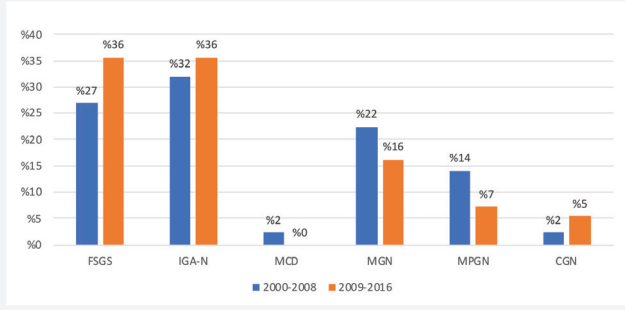

Figure 3. Diagnosis of patients according to the renal biopsy results. The incidence of primary glomerulonephritis according to year intervals (2000-2008 vs 2009-2016)

CGN: Crescentic glomerulonephritis, FSGS: Focal segmental glomerulosclerosis, IgA-N: IgA nephropathy, MCD: Minimal change disease, MGN: Membranous glomerulonephritis, MPGN: Membranoproliferative glomerulonephritis

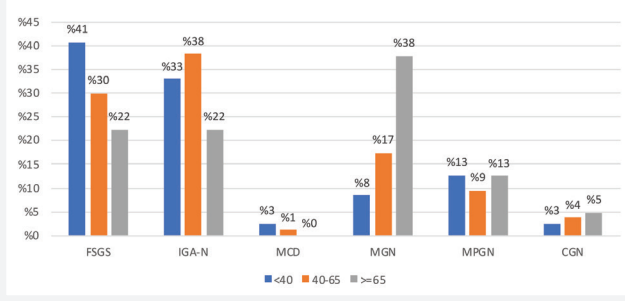

Figure 4. Distribution of primary glomerulonephritis in age groups

CGN: Crescentic glomerulonephritis, FSGS: Focal segmental glomerulosclerosis, IgA-N: IgA nephropathy, MCD: Minimal change disease, MGN: Membranous glomerulonephritis, MPGN: Membranoproliferative glomerulonephritis

race, geographic region, general characteristics of the patient group, and biopsy indication of the center[2-4].

In the current study, 485 PGN cases who were diagnosed between 2000 and 2016 were retrospectively examined. This was a single-center study with a larger number of adult patients. Another study of 293 PGN cases diagnosed between 1992 and 2000 was published from our center in 2001[14]. According to the results of the first study performed in our center, the most common PGN types were MPGN (26.6%), MGN (23.4%), and IgA-N (9.2%). However, a later study reported that

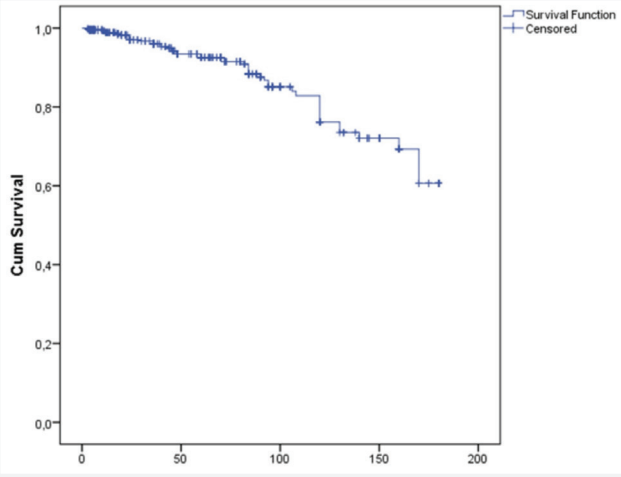

Figure 5. Overall survival curve. The median overall survival was 153 (range; 1-197) months

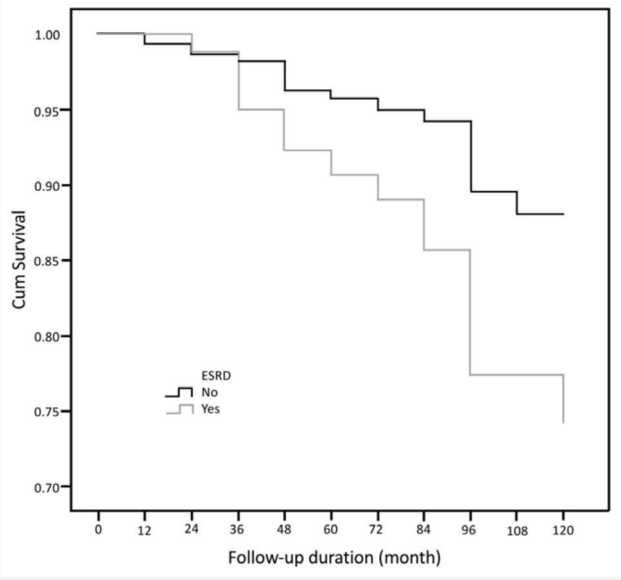

Figure 6. End-stage renal disease (ESRD) and survival curve. Survival was significantly lower in patients with ESRD compared to those without ESRD (p=0.003)

MGN was the most common, followed by FSGS and IgA-N, in Turkey. The Turkish Nephrology Association Glomerulonephritis Working Group conducted a multicenter study involving PGNs diagnosed between 1999 and 2012[15]. This study reported the most common PGNs as MGN (28.8%), FSGS (19.3%), and IgA-N (17.2%). Recently, two published studies from Turkish Society of Nephrology (TSN) GN working group show that the incidence of PGN has changed last decade in Turkey[16,17], and similar to our study, the most common PGN type was IgA-N. In the current study, IgA-N was the most common, while FSGS, MGN, MPGN were seen less frequently, respectively. As an interestingly point, the frequency of FSGS is higher in our study, unlike the studies of the TSN-GN working group. Primary FSGS occurs mostly with pure nephrotic syndrome, but in our study, a significant portion of the patients who underwent biopsy for AUA were diagnosed with FSGS. Although secondary Gn causes were excluded, considering the retrospective nature of our study, the distinction between primary and secondary FSGS may not have been fully made and it may explain this situation.

This current study had an increase in the frequency of IgA-N and FSGS, and a decrease in the frequency of MPGN may be explained by the fact that the current study had better control of secondary causes (infections) leading to glomerulopathy and/or increased biopsy frequency due to asymptomatic urine analysis.

When the distribution of histological types of PGN in the world was examined, it was found that the most common PGN type in Europe[18-20] and Asia[21,22] was IgA-N, followed by MGN, whereas in the US[23,24] and Brazil[25], it was FSGS. In a study conducted in the Czech Republic, the most common PGN was MCD. However, it should be noted that the Czech study included pediatric patients[26]. In the current study, IgA-N was the most common PGN, and FSGS was the second most common PGN, which is consistent with the European and Asian results. However, it should be noted that data after the year 2000 indicate that the frequency of FSGS is gradually increasing[2-4].

In the current study, the majority of patients underwent renal biopsy due to nephrotic syndrome, which is in parallel with international data[2-4]. Regarding studies performed in Italy[18] and Japan[22], the most common biopsy indication was asymptomatic urine analysis. The discrepancy between the current study and those in Italy and Japan may be due to the different types of urinary screening strategies. In the current study, asymptomatic urine analysis was the 4th most common biopsy indication (11.5%). This result was similar to that of the study conducted by the Turkish Nephrology Society (10.8%)[15]. Considering all patients with nephrotic syndrome in the current study, the most common diagnoses were FSGS (46.5%), MGN (34.1%), and MPGN (10.6%). Regarding GN working groups

in Italy, Spain, and Turkey, MGN was the most seen PGN in patients with nephrotic syndrome[15,18,20]. However, in Korea and Japan, MCD was the most seen GN in patients with nephrotic syndrome[22,27]. In parallel to the results of the current study, FSGS was the most common nephrotic syndrome etiology in US studies[23,24]. When the distribution of biopsy results according to age groups was evaluated in the current study, it was found that MGN was significantly higher in patients over the age of 40 years compared to younger patients. This can be explained by the fact that the peak age of MGN is in the age range of 40-60 years.

In the current study, 55% of the 485 patients diagnosed with PGN were male. The male to female ratio was about 1.2. This ratio was similar to that of the study by the Turkish Nephrology Society's Glomerulonephritis Study Group and Asia Registry. However, this ratio is slightly lower than that reported by European publications. In addition, the male to female ratio was 1.7 in the Italian GN recording system. This may be due to the fact that there is a large number of IgA-N patients in the Italian GN recording system[18].

It has been reported that having more than 1 g/day of proteinuria, hypertension (>140/90 mmHg), and severe histological lesions is significantly associated with dialysis or death in IgA-N[28]. Clinically, RPGN is characterized by a nephritic syndrome that rapidly progresses to ESRD[29]. A study conducted in the United States in 2016 reported that while ESRD was lower in women than men, there was no significant difference in mortality rates[3]. In the current study, 94 (20%) of the 459 patients with known renal output developed ESRD. Male gender, systemic hypertension at the time of diagnosis, proteinuria at the nephrotic level, and histological diagnosis of CGN were all found to negatively affect the renal outcome.

In the current study, the most common complications of nephrotic syndrome were infections (sepsis) in 13 patients and thromboembolic events in 3 patients. In a study of 1,313 cases diagnosed with nephrotic syndrome in 2012, the rate of thromboembolism was 3.3%[30]. The median overall survival time of the patients in the current study was 153±3.2 months. Within the study period, 48 of the 470 included patients died. Of these patients, 16 died of cardiovascular disease, 13 died of sepsis, 3 died of a thromboembolic event, and 3 died due to malignancy.

Study Limitations

The most important limitation of our study is that it is retrospective in nature. It may not be appropriate to infer about causality in retrospective studies, but these findings may provide a realistic picture of what is observed in daily clinical practice.

CONCLUSION

Herein, we have presented real-life data on clinical characteristic and long-term outcomes of PGN with large sample size in a single tertiary center. There are differences in the incidence and etiology of PGN in the last 2 decades. In the current study, contrary to previous studies before 2010 in Turkey, IgA-N was the most frequently observed subtype (also the most common in Asia and Europe). The difference from previous studies may be due to the increased frequency of biopsy due to asymptomatic urine analysis or better control of secondary causes (infections) that cause glomerulopathy. In conclusion, this study has revealed that male gender, systemic hypertension, proteinuria, and RPGN negatively affect kidney outcomes.

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Ethics

Ethics Committee Approval: This retrospectively study was approved by the İstanbul University-Cerrahpaşa, Cerrahpaşa Faculty of Medicine, Clinical Research Ethics Committee (no: 313708, date: 08.10.2015).

Informed Consent: Retrospective study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

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