



## Epidemiological Evaluation of Patients with Primary Glomerulonephritis in the Southeastern Anatolia Region

Ziya Öngören<sup>1</sup>, Muhammed Emre Sevim<sup>2</sup>, Emre Aydın<sup>2</sup>, Fatma Yılmaz Aydın<sup>1</sup>, Yaşar Yıldırım<sup>2</sup>, Eren Eynel<sup>3</sup>, Ulaş Alabalık<sup>4</sup>, Zülfükar Yılmaz<sup>2</sup>

*1 Dicle University Faculty of Medicine, Department of Internal Medicine, Diyarbakır, Türkiye*

*2 Dicle University Faculty of Medicine, Department of Nephrology, Diyarbakır, Türkiye*

*3 Diyarbakır Gazi Yaşargil Education Research Hospital, Department of Nephrology, Diyarbakır, Türkiye*

*4 Dicle University Faculty of Medicine, Department of Pathology, Diyarbakır, Türkiye*

*Received: 08.08.2025; Revised: 24.12.2025; Accepted: 29.12.2025*

### Abstract

**Objective:** The aim of this study was to provide information on the demographic characteristics and laboratory parameters of primary glomerulonephritis (PGN) patients diagnosed at our center and to determine the epidemiology of PGN in our region.

**Method:** 148 adult PGN cases diagnosed via percutaneous renal biopsy at our hospital were included in the study. Patients whose biopsy specimens could not be analyzed with immunofluorescence, those reported as non-diagnostic, those with a history of kidney transplantation who underwent biopsy, those who underwent biopsy with a presumptive diagnosis of malignancy, and those whose tests were unavailable were excluded from the study.

**Results:** The overall mean age of the patients was 38.5±12.9 years. 50% of the patients were female and 50% were male. Our study found that biopsies were performed for nephrotic syndrome (70.3%), asymptomatic urinary abnormalities (21.6%), and acute nephritic syndrome (8.1%) in both genders and all age groups. The most common PGN subtypes were FSGS (41.2%) and MGN (18.9%), respectively. Following these, the following were IgAN (15.5%), MPGN (14.2%), RPGN (5.4%), and MCD (4.7%). FSGS was the most common PGN subtype in patients younger than 60 years of age, and MGN in patients older than 60 years. MGN was found to be the PGN subtype with the highest mean proteinuria.

**Conclusion:** This is the first study to investigate the distribution, demographic characteristics, and laboratory parameters of primary glomerulonephritis in the Southeastern Anatolia Region and provides information about the PGN epidemiology in our region. The data obtained in our study were consistent with many studies conducted in our country and around the world.

**Keywords:** primary glomerulonephritis, nephrotic syndrome, acute nephritic syndrome, epidemiology

DOI: 10.5798/dicletip.1906358

**Correspondence / Yazışma Adresi:** Muhammed Emre Sevim, Dicle University Faculty of Medicine, Department of Nephrology, Diyarbakır, Türkiye e-mail: memrese@gmail.com

## Güneydoğu Anadolu Bölgesinde Primer Glomerülonefritli Hastaların Epidemiyolojik Değerlendirilmesi

### Öz

**Amaç:** Bu çalışmanın amacı; merkezimizde tanı alan primer glomerülonefrit (PGN) olgularının demografik özellikleri ve laboratuvar parametreleri hakkında bilgi sağlamak ve bölgemizdeki PGN epidemiyolojisini belirlemektir.

**Yöntemler:** Çalışmaya hastanemizde perkütan böbrek biyopsisi ile tanı konulan 148 erişkin PGN olgusu dahil edildi. Biyopsi örneğinden immünfloresan inceleme yapılamayan hastalar, non diagnostik olarak raporlanan hastalar, böbrek nakli öyküsü olup biyopsi yapılan hastalar, malignite ön tanısıyla biyopsi yapılan hastalar ve tetkiklerine ulaşamayan hastalar çalışmaya alınmadı.

**Bulgular:** Hastaların genel yaş ortalaması 38.5±12.9 yıl olarak saptandı. Hastaların %50'si kadın, %50'si erkekti. Çalışmamızda biyopsilerin hem her iki cinsiyette hem de tüm yaş gruplarında sırasıyla nefrotik sendrom (%70,3), asemptomatik üriner anormallikler (%21,6) ve akut nefritik sendrom (%8,1) endikasyonlarıyla yapıldığı saptandı. En sık görülen PGN alt tipleri sırasıyla FSGS (%41,2) ve MGN (%18,9) olarak saptandı. Bunlardan sonra diğer tanılarının sıklık sırası IgAN (%15,5), MPGN (%14,2), RPGN (%5,4) ve MDH (%4,7) şeklinde saptandı. En sık görülen PGN alt tipinin 60 yaşından küçük hastalarda FSGS, 60 yaşından büyük hastalarda ise MGN olduğu saptandı. En yüksek proteinüri ortalamasına sahip PGN alt tipinin MGN olduğu görüldü.

**Sonuç:** Çalışmamız, Güneydoğu Anadolu Bölgesinde primer glomerülonefritlerin dağılımları, demografik özellikleri ve laboratuvar parametreleri hakkında yapılan ilk çalışma olup bölgemizin PGN epidemiyolojisi hakkında bilgi sağlamaktadır. Çalışmamızda elde ettiğimiz veriler ülkemizde ve dünyada yapılan birçok çalışmayla uyumlu bulundu.

**Anahtar kelimeler:** primer glomerülonefritler, nefrotik sendrom, akut nefritik sendrom, epidemiyoloji.

### INTRODUCTION

Glomerulonephritis (GN) is one of the most common causes of end-stage renal disease (ESRD) worldwide. In our country, GN is the third most common cause of ESRD after diabetes mellitus (DM) and hypertension (HT)<sup>1</sup>. Its prevalence varies depending on many factors, such as race, age, gender, and geographic region.

GN is divided into two etiological categories: primary and secondary. Diseases involving the glomeruli without a history of systemic disease (SLE, infection, malignancy, vasculitis) or any other potentially causative drug are called primary glomerulonephritis (PGN). Diseases caused by any systemic disease or drug affecting the glomeruli are called secondary GN. Determining the etiology guides treatment selection and prognosis, therefore, the diagnostic approach is crucial.

A review of studies conducted in our country and worldwide reveals no common

epidemiology. Therefore, each center should conduct epidemiological studies for its own region. In our study, we retrospectively examined patients diagnosed at our hospital.

### METHODS

This study included 148 adult primary glomerulonephritis cases diagnosed via percutaneous kidney biopsy at the Nephrology Clinic of the Department of Internal Medicine at Dicle University Faculty of Medicine Hospital between January 1, 2016, and January 1, 2020, and whose data were available. Patients for whom immunofluorescence analysis could not be performed for any reason, patients whose biopsy samples were reported as non-diagnostic, patients with a history of kidney transplantation who underwent percutaneous kidney biopsy, patients who underwent biopsy with a preliminary diagnosis of malignancy, and patients for whom no data were available were excluded.

After biopsy preparations were completed, each patient was positioned face down and the necessary skin cleansing was performed with an iodine-containing antiseptic solution. After local anesthesia with lidocaine hydrochloride, at least two kidney tissue samples, each at least 2 cm long, were obtained using an ultrasound-guided automated biopsy needle, after which the patient was inhaled deeply. After the biopsy, patients were closely monitored for potential complications for 24 hours. Biopsy samples were immediately sent to the pathology laboratory. In the pathology laboratory, each biopsy sample was examined using light microscopy and immunofluorescence methods, adhering to established standards. For technical reasons, electron microscopy was not available. Each biopsy sample was reported by pathologists, adhering to international standards.

### **Biopsy indications were classified into three categories:**

1- Nephrotic syndrome (NS): Proteinuria of 3.5 g/day or more accompanied by edema and hypoalbuminemia.

2- Acute nephritic syndrome (ANS): Proteinuria of less than 3.5 g/day, glomerular hematuria, edema, hypertension, and decreased GFR.

3- Asymptomatic Urinary Abnormalities (AUA): Proteinuria of less than 3.5 g/day and/or isolated microscopic hematuria.

Our study was approved by the Dicle University Faculty of Medicine Non-Interventional Clinical Research Ethics Committee with decision number 19 dated June 4, 2020.

### **Statistical Analysis**

Statistical analyses of the results obtained in the study were conducted using the SPSS (Statistical Package for the Social Sciences) 26 statistical software package. Descriptive statistics for continuous variables were expressed as mean  $\pm$  standard deviation, minimum, and maximum values, while categorical variables were expressed as numbers and percentages. The suitability of the normal distribution was examined using visual (histogram and probability plots) and analytical methods (Shapiro-Wilk test). The chi-square test was also used in the analysis of categorical variables. Because all variables were parametric, an independent samples t-test was used for continuous variables to determine differences between groups. In all tests, a p (probability) value of less than 0.05 was considered statistically significant.

### **RESULTS**

One hundred and forty-eight patients were included in the study. Demographic and laboratory data of the patients are summarized in Table 1. The youngest patient was 18 years old, and the oldest was 74 years old. The mean age of male patients was  $39.84 \pm 14.38$ , and the mean age of female patients was  $37.31 \pm 11.18$ . The youngest patients of both genders were 18 years old. The oldest male patient was 74, and the oldest female patient was 59 years old. 31.8% of the patients were between 18 and 30 years old, 37.8% were between 31 and 45 years old, 25.7% were between 46 and 60 years old, and 4.7% were between 61 and 75 years old.

**Table I:** Demographic Characteristics and Laboratory values of Patients

	Mean ± Standard Deviation
Age (years)	38.57 ± 12.90
Male / Female (%)	50 / 50
Number of glomeruli	12.65 ± 6.76
Glucose (mg/dl)	103.60 ± 43.91
Urea (mg/dl)	51.97 ± 45.29
Creatinin (mg/dl)	1.57 ± 1.74
Uric acid (mg/dl)	6.01 ± 1.90
Total cholesterol (mg/dl)	239.84 ± 101.39
Triglyceride (mg/dl)	207.79 ± 127.49
HDL (mg/dl)	47.41 ± 25.95
LDL (mg/dl)	154.04 ± 87.24
Total protein (gr/dl)	5.90 ± 1.21
Albumin (gr/dl)	2.55 ± 0.94
Calcium (mg/dl)	8.59 ± 0.91
ALT (U/l)	19.09 ± 11.09
Hemoglobin (gr/dl)	12.84 ± 2.59
Proteinuria (mg/day)	6700.38 ± 6234.63
Pyuria (%)	29.7
Hematuria (%)	56.1
C3 deficiency (%)	8.1
C4 deficiency (%)	0.7
Presence of HT before kidney disease (%)	33.8
Presence of DM before kidney disease (%)	12.2
HbsAg positivity (%)	4.1
Anti-HCV positivity (%)	0.0

In pathological examinations, the mean number of glomeruli per biopsy was found to be 12.65±6.76. The number of glomeruli observed in biopsy samples ranged from a minimum of 3 to a maximum of 17. Biopsies were performed most frequently in patients with NS (70.3%), followed by 21.6% in AUA and 8.1% in ANS. Biopsies were most frequently performed in patients with NS. The PGN subtypes identified from the biopsies and their relationship to clinical conditions requiring biopsy are summarized in Tables 2 and 3.

**Table II:** Frequency of PGN Subtypes

PGN subtypes	n	%
FSGS	61	41.2
MGN	28	18.9
MPGN	21	14.2
IgAN	23	15.5
RPGN	8	5.4
MCD	7	4.7
<b>Total</b>	<b>148</b>	<b>100</b>

PGN: Primary Glomerulonephritis, FSGS: Focal Segmental Glomerulosclerosis, MGN: Membranous Glomerulonephritis, MPGN: Membranoproliferative Glomerulonephritis, IgAN: Immunoglobulin A Nephropathy, RPGN: Rapidly Progressive Glomerulonephritis, MCD: Minimal Change Disease

**Table III:** Distribution of Biopsy Indications According to PGN Subtypes

	FSGS		MGN		MPGN		IgAN		RPGN		MCD		p
	n	%	n	%	n	%	n	%	n	%	n	%	
NS	44	42.3	26	25	17	16.3	11	10.6	6	5.8	0	0.0	<b>&lt;0.001</b>
ANS	1	8.3	0	0.0	2	16.7	5	41.7	2	16.7	2	16.7	
AUA	16	50	2	6.2	2	6.2	7	21.8	0	0.0	5	15.6	

PGN: Primary Glomerulonephritis, NS: Nephrotic Syndrome, ANS: Acute Nephritic Syndrome, AUA: Asymptomatic Urinary Abnormalities, FSGS: Focal Segmental Glomerulosclerosis, MGN: Membranous Glomerulonephritis, MPGN: Membranoproliferative Glomerulonephritis, IgAN: Immunoglobulin A Nephropathy, RPGN: Rapidly Progressive Glomerulonephritis, MCD: Minimal Change Disease

The relationship between PGN subtypes and patient demographic and laboratory parameters is shown in Table 4. In sections where significant results were observed, the location of the difference was indicated in a footnote using post-hoc analysis.

**Table IV:** Comparison of Demographic and Laboratory Parameters of Patients According to PGN Subtypes

	FSGS (n:61)	MGN (n:28)	MPGN (n:21)	IgAN (n:23)	RPGN (n:8)	MCD (n:7)	<i>p</i>
Age (years)	38.4 ± 13.13	44.75 ± 14.65	39.62 ± 11.87	31.22 ± 7.37 <sup>b</sup>	40.13 ± 12.22	34.29 ±11.28	<b>0.009</b>
Glucose (mg/dl)	109.07 ± 63.21	103.39 ± 30.43	98.0 ± 20.08	98.61 ± 12.24	101.0 ± 18.01	93.0 ± 14.25	0.851
Urea (mg/dl)	49.05 ± 31.27	53.46 ± 66.77	62.57 ± 52.56	37.22 ± 19.81	108.00 ± 53.34 <sup>a,b,d</sup>	24.0 ± 5.13	<b>0.001</b>
Creatinin (mg/dl)	1.40 ± 1.23	1.52 ± 2.20	1.58 ± 1.44	1.12 ± 1.07	5.12 ± 2.51 <sup>d</sup>	0.68 ± 0.27 <sup>a,e</sup>	<b>&lt;0.001</b>
Uric acid (mg/dl)	6.28 ± 1.79	5.67 ± 2.04	5.78 ± 2.00	5.77 ± 1.69	7.52 ± 1.94	4.71 ± 1.65	0.056
Total cholesterol (mg/dl)	247.16 ± 105.93	262.81 ± 103.92	230.25 ± 101.86	218.95 ± 97.05	220.43 ± 85.42	206.43 ± 83.42	0.590
Triglyceride (mg/dl)	219.18 ± 118.39	251.11 ± 177.25	177.00 ± 98.31	171.00 ± 102.93	235.14 ± 112.36	124.29 ± 49.50	0.075
HDL (mg/dl)	46.42 ± 14.11	41.38 ± 9.01	56.48 ± 58.94	49.90 ± 14.39	35.43 ± 7.61	55.14 ± 15.93	0.275
LDL (mg/dl)	162.09 ± 90.88	177.23 ± 92.27	138.48 ± 81.37	133.62 ± 88.21	138.14 ± 62.85	126.14 ± 63.76	0.409
Total protein (gr/dl)	5.95 ± 1.26	5.27 ± 1.21	5.81 ± 1.25	6.20 ± 1.08	6.08 ± 0.91	6.62 ± 0.99	0.051
Albumin (gr/dl)	2.61 ± 0.96	1.98 ± 0.88 <sup>a,d</sup>	2.43 ± 0.78	3.01 ± 0.79	2.30 ± 0.69	3.41 ± 0.93	<b>&lt;0.001</b>
Calcium (mg/dl)	8.80 ± 0.85	8.15 ± 0.95 <sup>a,f</sup>	8.28 ± 1.02	8.70 ± 0.79	8.45 ± 0.70	9.35 ± 0.45	<b>0.002</b>
ALT (U/l)	18.35 ± 11.80	19.19 ± 8.54	20.11 ± 12.53	19.52 ± 12.34	18.88 ± 11.78	21.14 ± 6.49	0.984
Hemoglobin (gr/dl)	13.15 ± 2.59	12.62 ± 2.34	12.51 ± 2.98	13.43 ± 2.11	9.61 ± 1.80	13.75 ± 2.34 <sup>a,b,d</sup>	<b>0.006</b>
Proteinuria (mg/day)	6520.46 ±6456.82	9931.96 ±6971.16 <sup>d</sup>	7642.48 ±6626.28	4028.35 ±3224.69	6143.75 ±4640.30	1931.29 ± 801.30 <sup>a,b,c</sup>	<b>0.004</b>

PGN: Primary Glomerulonephritis, FSGS: Focal Segmental Glomerulosclerosis, MGN: Membranous Glomerulonephritis, MPGN: Membranoproliferative Glomerulonephritis, IgAN: Immunoglobulin A Nephropathy, RPGN: Rapidly Progressive Glomerulonephritis, MCD: Minimal Change Disease

a:  $p < 0.05$  compared to FSGS, b:  $p < 0.05$  compared to MGN, c:  $p < 0.05$  compared to MPGN, d:  $p < 0.05$  compared to IgAN, e:  $p < 0.05$  compared to RPGN, f:  $p < 0.05$  compared to MCD.

## DISCUSSION

In our study, 50% of the patients were female and 50% were male. In studies conducted worldwide over the past 10 years, the gender ratios of patients diagnosed with PGN were found to be 50% female and 50% male in Singapore, 45.7% female and 54.3% male in the

United States, and 34.5% female and 65.5% male in Germany<sup>2-4</sup>. A study conducted in our country with 4399 patients from 47 different centers found that 43.6% of the patients were female and 56.3% male<sup>5</sup>. When looking at data from both the world and our country, it was observed that PGN is more common in men, and

in our study, the male to female ratio was found to be equal, similar to the study conducted in Singapore.

In our study, the mean age of the patients was found to be  $38.57 \pm 12.90$  years. The mean age was found to be  $41.5 \pm 14.9$  years in a multicenter study from Turkey,  $50.6 \pm 16.7$  years in the USA, and  $47.9 \pm 13.5$  years in Singapore<sup>2,3,5</sup>.

Our study was found to be consistent with many studies conducted in our country and abroad in terms of the frequency of biopsy indications. Among biopsy indications, the rate of nephrotic syndrome was found to be 45% in Singapore, 45% in Italy, 41.5% in Brazil, and 51.7% in a multicenter study in our country<sup>2,5-7</sup>. In many studies conducted in Turkey and abroad, the most common biopsy findings in patients undergoing biopsy with NS indications were focal segmental glomerulosclerosis (FSGS) and membranous glomerulonephritis (MGN), in those undergoing biopsy with ANS indications, IgA nephropathy (IgAN), and in those undergoing biopsy with AUA indications, IgAN and FSGS. Our study was consistent with the literature data<sup>5-8</sup>.

In our study, FSGS was found to be the most common PGN subtype in both sexes and between the ages of 18 and 60. A large study using data from 22 Arab countries and studies conducted in the USA and Brazil found FSGS to be the most common PGN subtype, consistent with our study<sup>3,7,9</sup>. The second most common type of MGN is also consistent with the literature<sup>6,7</sup>. Similarly, in studies conducted in South Korea and China, MGN was found to be the most common PGN subtype in patients older than 60 years of age, similar to our study<sup>10,11</sup>. The third most common PGN subtype, IgAN, was found to be 15.5%. In a study conducted in our country between 2009 and 2012 with data from 25 different centers, IgAN was also found to be the third most common PGN subtype, as in our study<sup>12</sup>. 95.6% of patients diagnosed with

IgAN were younger than 45 years of age. Similar to our study, studies conducted in our country and the USA found that the PGN subtype with the lowest average age was IgAN<sup>3,5</sup>.

In our study, the mean proteinuria in the MGN patient group was found to be  $9931 \pm 6971$  mg/day. This value indicated that the PGN subtype with the highest mean proteinuria was MGN. Studies conducted in our country and the USA have found that the PGN subtype with the highest mean proteinuria is MGN, consistent with our study<sup>3,5,13</sup>.

This study has some limitations. First, the retrospective and single-center design of the study limits the generalizability of the findings. The low number of patients in some primary glomerulonephritis subgroups reduces the statistical power of subgroup comparisons. Finally, treatment approaches and long-term clinical outcomes were not evaluated in the study.

In conclusion, our study, the first to examine PGN cases in our region, provides information on the distribution, demographic characteristics, and laboratory parameters of PGN cases in our region. Our study is consistent with many studies conducted in our country and internationally.

**Ethical Approval:** Our study was approved by the Dicle University Faculty of Medicine Non-Interventional Clinical Research Ethics Committee with decision number 19 dated June 4, 2020.

**Conflict of Interest:** The authors declared no conflicts of interest.

**Financial Disclosure:** The authors declared that this study has received no financial support.

## REFERENCES

1. Süleymanlar G, Ateş K, Seyahi N. Türkiye'de Nefroloji, Diyaliz ve Transplantasyon. Türk Nefroloji Derneği Yayınları 2019;13.
2. Woo KT, Chan CM, Lim C, et al. A Global Evolutionary Trend of the Frequency of Primary

Glomerulonephritis over the Past Four Decades. *Kidney Dis (Basel)*2019 Oct;5(4):247-258.

3. Sim JJ, Batech M, Hever A, et al. Distribution of Biopsy-Proven Presumed Primary Glomerulonephropathies in 2000-2011 Among a Racially and Ethnically Diverse US Population. *Am J Kidney Dis* 2016 Oct;68(4):533-544.

4. Zink CM, Ernst S, Riehl J, et al. Trends of renal diseases in Germany: review of a regional renal biopsy database from 1990 to 2013. *Clin Kidney J.* 2019 Dec; 12(6): 795–800.

5. Türkmen A, Şumnu A, Cebeci E, et al. Epidemiological features of primary glomerular disease in Turkey: a multicenter study by the Turkish Society of Nephrology Glomerular Diseases Working Group. *BMC Nephrol.* 2020 Nov 14;21(1):481.

6. Gesualdo L, Di Palma AM, Morrone LF, et al. Italian immunopathology group ISON. The Italian experience of the national registry of renal biopsies. *Kidney Int.* 2004;66(3):890–894.

7. Malafronte P, Mastroianni-Kirsztajn G, Betônico GN, et al. Paulista registry of glomerulonephritis: 5-year data report. *Nephrol Dialysis Transplantation.* 2006;21(11):3098–3105.

8. Özdemir E. Fırat Üniversitesi Hastanesinde Perkütan Böbrek Biyopsisi Yapılan Hastaların Retrospektif İncelenmesi. Tıpta Uzmanlık Tezi 2017.

9. Nasar Yousuf Alwahaibi NY, Issaei HK, Dhahli BS. Spectrum of glomerular diseases in Arab countries: A systematic review. *Saudi J Kidney Dis Transpl.* Nov-Dec 2018;29(6):1256-1266.

10. Yim T, Kim S, Park S, et al. Patterns in renal diseases diagnosed by kidney biopsy: A single-center experience. *Kidney Research and Clinical Practice* 2020 Mar; 39(1): 60-69.

11. Hou J-H, Zhu H-X, Zhou M-L, et al. Changes in the Spectrum of kidney diseases: an analysis of 40,759 biopsy-proven cases from 2003 to 2014 in China. *Kidney Dis.* 2018;4(1):10–9.

12. Ozturk S, Sumnu A, Seyahi N, et al. Demographic and clinical characteristics of primary glomerular diseases in Turkey. *Int Urol Nephrol.* 2014 Dec;46(12):2347- 55.

13. Koç L. 2002-2010 Yılları Arasında Farabi Hastanesi'nde Erişkin Hastalarda Uygulanmış Olan Böbrek Biyopsilerinde Gözlenen Glomerulonefritlerin Dağılımı. Tıpta Uzmanlık Tezi 2012.