Original Research Paper

Nephrology

A STUDY OF CLINICAL PRESENTATION AND CORRELATIVE HISTOPATHOLOGICAL PATTERNS IN GLOMERULAR DISEASES IN A TERTIARY CARE CENTRE IN NORTHEAST INDIA.

Dr. Miranda Pegu	Assistant professor, Department of Nephrology, Gauhati Medical college and hospital.
Dr. Tonmoy Das	Chief consultant, Department of Nephrology, Apollo hospital Guwahati.
Dr. Mitul Bora	Consultant, Department of Nephrology, Apollo hospital Guwahati.
Dr. Dhruvajyoti Choudhury	Consultant, Department of Nephrology, Apollo hospital Guwahati.

ABSTRACT
Background : The prevalence of biopsy-proven renal disease varies with geographical regions as well as within the same country and and with demographic factors such as age, gender, race, socioeconomic status and indications for renal biopsy. Thus, there is a great variation in the presentation of Glomerular disease across the globe and the disease spectrum has also been changing over the last few decades. **Objectives:** 1) To determine the spectrum and clinical profile of different glomerular diseases. 2) To look for correlation between clinical features to final histopathological diagnosis. **Methodology:** This was single center cross sectional prospective observational study done over 1 year period. Clinical presentation and histopathological correlation of 125 kidney biopsies for adult glomerular diseases were analysed. **Results:** The average age of patients was 39.27±15.43 years. 55.2% of them belong to the age group 31-60 years. Females predominate and comprises 56% of cases. Most common clinical syndrome observed was nephrotic syndrome (31.2%) followed by rapidly progressing renal failure (20%), nephrotic nephritic syndrome (13.6%), acute nephritic syndrome (12.8%), acute kidney injury (8.8%), asymptomatic urinary abnormalities (8%) and chronic kidney disease (5.6%). Lupus nephritis (24%) was the most common histological diagnosis followed by crescentic GN (15.2%), IgAN (13.6%), minimal change disease (8.8%) and FSGS (8.8%). Lupus nephritis was also the most common biopsy diagnosis in the age group of 18 to 30 years, while crescentic GN was the most common histological diagnosis in the elderly group >60 years. 30 cases (24%) required dialysis, at the time of biopsy, 60% of them belong to RPRF group with average serum creatinine of 8.51 mg/dl. Primary GD was seen in 53.6% cases and the most common primary GD was IgAN (25.4%). Secondary GD was seen in 46.4% of the cases and lupus nephritis (51.7%) was the most common cause. IgAN, MCD, MN, FSGS were seen more in males while lupus nephritis, crescentic GN and fibrillary GN were more common in females. Most common glomerular disease presenting as nephrotic syndrome was MCD (28.2%) followed by FSGS (17.9%). Most common biopsy diagnosis in RPRF category was crescentic GN (60%) followed by IgAN (12%) and in the nephrotic nephritic syndrome and AUA group lupus nephritis contributed the most. 20 cases (16%) were diabetic and the most common biopsy diagnosis in them was diabetic nephropathy followed by IgAN. Lupus class IV was the commonest lesion observed followed by class IV+V in lupus nephritis patients.

KEYWORDS : Glomerular diasease, Renal biopsy, IgA nephropathy, Nephrotic syndrome, Rapidly progressive renal failure

INTRODUCTION

Glomerular disease (GD) is one of the most common forms of renal diseases and can have many different clinical presentations. It can present as nephrotic syndrome (NS), nephritic syndrome, rapidly progressive renal failure (RPRF), acute kidney injury (AKI), chronic kidney disease (CKD), macroscopic haematuria (MH), recurrent disease in the posttransplant kidney, as well as isolated proteinuria or haematuria.[1] Renal diseases are caused by a wide variety of insults and may frequently show nonspecific presentation, hence renal biopsy assumes importance in achieving a diagnosis where the clinical picture is confounding. The prevalence of biopsy-proven renal disease (BPRD) varies with geographical regions as well as within the same country and with demographic factors such as age, gender, race, socioeconomic status and indications for renal biopsy.

The pattern of GD has also changed with time. Renal biopsy is a valuable tool for specific diagnosis of renal disease and assessment of disease activity and is helpful in determining the therapy, disease course, and prognosis. In one of the largest reports of 6469 biopsies with GD from the University of North Carolina, FSGS was the most common GD (14.22%) followed by membranous nephropathy (MN) (13.09%).[2] IgA nephropathy (IgAN) is one of the common primary glomerular diseases (PGDs) in East Asia [1,2] as well as in native Europeans and Americans. [3,4] In contrast, FSGS is the most common GD among African-Americans, South Americans, and in the Middle East.[5-7] The change in the spectrum of GD over the last few decades has been demonstrated in many studies. There are a limited number of studies from India and most of them are from Southern and Northern Indian centres.[7-10]

In light of the paucity of data from North eastern Eastern India, this study was taken up with the following.

AIMS AND OBJECTIVES.

1) To determine the spectrum and clinical profile of different glomerular diseases.

2) To look for correlation between clinical features to final histopathological diagnosis.

Methodology

This study commenced after approval of the protocol by the Instituitional Ethics Committee. It is a prospective study of glomerular diseases in native kidneys of patients >18 years for which renal biopsies were performed during the period of January 2020 to december 2020 evaluated at Department of Nephrology, Apollo Hospitals, Guwahati. The demographic profile, clinical presentation, laboratory investigation and histopathological data were collected and analysed.

Inclusion Criteria:

1) Patients with clinical features suggestive of glomerular disease
2) Unexplained renal failure
3) Rapidly progressive renal failure
4) Asymptomatic urinary abnormalities
5) AKI with no obvious cause and AKI with delayed recovery
6) CKD patients with preserved corticomedullary differentiation and normal kidney size and high suspicion of a Glomerular disease.

Exclusion Criteria:

1) Age less than 18 years
2) Established chronic kidney disease 5 on dialysis
3) Obstructive uropathy
4) Patient who do not show a conclusive histopathological finding / insufficient biopsy sample / diseases other than glomerular pathology
5) Pregnancy
6) Post renal transplant patients
7) Non availability of consent

Clinical diagnosis at presentation ascertained. Standard definitions were used for classifying the clinical syndromes. Patients were classified into 7 categories: Nephrotic syndrome (NS), Acute nephritic syndrome (ANS), Nephrotic nephritic syndrome (NNS), Acute kidney injury (AKI), Rapidly progressive renal failure (RPRF),

Asymptomatic urinary abnormalities (AUA) and Chronic kidney disease (CKD). Two cores taken in each case, one for light microscopy and other for immunofluorescence examination.

Statistical Analysis

All data were noted down in a predesigned study proforma. Results and observation presented in a textual, tabular and graphical form. Qualitative data were represented in the form of frequency and percentage. Quantitative data were represented using Mean ± SD. The data were analysed with Statistical package for social sciences version 21.0.

RESULTS

The clinical, laboratory and histopathological data of 125 cases of glomerular diseases were analysed. The patients were in the age range of 18 to 78 years. Mean age of the patients was 39.27±15.43 years. 56% of the cases were female and 44% were male and male to female was 0.79:1

Table 1: Distribution Of Cases In Various Age Group

Age Group in years	Number	Percentage
18-30	44	35.2%
31-60	69	55.2%
>60	12	9.6%
Total	125	100.0%

Table 2: Distribution Of Cases In Various Clinical Syndrome

Clinical syndrome	Number	Percentage
Acute kidney injury (AKI)	11	8.8%
Acute nephritic syndrome (ANS)	16	12.8%
Asymptomatic urinary abnormalities (AUA)	10	8%
Chronic kidney disease (CKD)	7	5.6%
Nephrotic nephritic syndrome (NNS)	17	13.6%
Nephrotic syndrome (NS)	39	31.2%
Rapidly progressive renal failure (RPRF)	25	20%
Total	125	100%

Table 3: Distribution Of Clinical Syndrome In Various Age Group

Clinical syndrome	18-30 yrs (N=44)	31-60 yrs (N=69)	>60 yrs (N=12)
AKI	3 (6.8%)	6 (8.7%)	2 (16.7%)
ANS	6 (13.6%)	9 (13%)	1 (8.3%)
AUA	8 (18.2%)	2 (2.9%)	0
CKD	0	5 (7.2%)	2 (16.7%)
NNS	11 (25%)	6 (8.7%)	0
NS	10 (22.7%)	26 (37.7%)	3 (25%)
RPRF	6 (13.6%)	15 (21.7%)	4 (33.3%)
Total	44	69	12

AKI-acute kidney injury, ANS-acute nephritic syndrome, AUA-asymptomatic urinary abnormalities, CKD-chronic kidney disease, NNS-nephrotic nephritic syndrome ,NS-nephrotic syndrome, RPRF-rapidly progressive renal failure

Table 4: Baseline Characteristics Of Patients In Each Clinical Syndrome

Variable	NS (N=39)	RPRF (N=25)	NNS (N=17)	ANS (N=16)	AKI (N=11)	AUA (N=10)	CKD (N=7)
Mean Age	39.35	44.96	29.00	38.06	43.18	29.3	54.28
Gender M/F %	53.8/46.2	40/60	29.5/70.5	31.2/68.7	63.7/36.3	20/80	71.4/28.5
HTN %	43.58	68	70.58	75	27.2	12.8	85.7
Mean S.creat mg/dl	1.26	8.51	3.30	2.95	4.82	1.06	8.06
Mean S.albumin gm/dl	2.03	2.89	2.19	2.93	3.29	2.92	3.06
Mean Hb gm/dl	10.70	8.80	8.52	9.58	10.34	9.54	8.79
Mean 24hr Urine protein (gm)	7	1.46	4.58	1.41	1.32	2.35	2.40
Microhaematuria %	12.8	96	100	100	90.9	10	85.7
Dialysis %	0	72	11.76	6.25	36.3	0	71.4

AKI-acute kidney injury, ANS-acute nephritic syndrome, AUA-asymptomatic urinary abnormalities, CKD-chronic kidney disease, NNS-nephrotic nephritic syndrome ,NS-nephrotic syndrome, RPRF-rapidly progressive renal failure, HTN-hypertension

Table 5: Spectrum Of Various Glomerular Histologies In Each Clinical Syndrome

Biopsy diagnosis	NS	RPRF	NNS	ANS	AKI	AUA	CKD
MCD	11(28.2%)	0	0	0	0	0	0
FSGS	7(17.9%)	0	2(11.8%)	0	0	2(20%)	0
MN	8(20.5%)	0	0	0	1(9.1%)	0	0
IgA	1(2.6%)	3(12%)	2(11.8%)	5(31.3%)	3(27.3%)	1(10%)	2(28.6%)
MPGN	0	2(8%)	1(5.9%)	0	0	0	0
CresGN	0	15(60%)	0	2(12.5%)	1(9.1%)	0	1(14.3%)
LN	8(20.5%)	1(4%)	11(64.7%)	4(25%)	0	6(60%)	0
DN	1(2.6%)	1(4%)	0	0	2(18.2%)	0	2(28.6%)
LCDD	0	1(4%)	0	1(6.3%)	1(9.1%)	0	0
Amyloidosis	3(7.7%)	0	0	0	0	0	0
Fibrillary GN	0	1(4%)	0	0	0	0	1(14.3%)
Infection associated GN	0	0	0	4(25%)	2(18.2%)	0	0
MesPGN	0	1(4%)	0	0	0	1(10%)	0
C3GN	0	0	1(5.9%)	0	0	0	0
Chronic GS	0	0	0	0	0	0	1(14.3%)
Cortical necrosis	0	0	0	0	1(9.1%)	0	0

AKI-acute kidney injury, ANS-acute nephritic syndrome, AUA-asymptomatic urinary abnormalities, CKD-chronic kidney disease, NNS-nephrotic nephritic syndrome ,NS-nephrotic syndrome, RPRF-rapidly progressive renal failure, HTN-hypertension, MCD-minimal change disease, FSGS-focal segmental glomerulosclerosis, MN-membranous nephropathy, IgA-IgA nephropathy, MPGN-membranoproliferative glomerulonephritis, CresGN-crescentic glomerulonephritis, LN-lupus nephritis, DN-diabetic nephropathy, LCDD-light chain deposition disease, GN-glomerulonephritis, MesPGN-mesangioproliferative glomerulonephritis,C3GN-c3 glomerulonephritis, Chronic GS-chronic glomerulosclerosis

Table 6: Gender Distribution In Various Glomerular Diseases

Glomerular disease	Female (N=70) 56%	Male (N=55) 44%
Amyloidosis	1(1.4%)	2(3.6%)
C3GN	0	1(1.8%)
Chronic GS	1 (1.4%)	0
Cortical necrosis	1(1.4%)	0
Crescentic GN	14(20%)	5(9.1%)
Diabetic nephropathy	1(1.4%)	5(9.1%)
Fibrillary GN	2(2.9%)	0
FSGS	5(7.1%)	6(10.9%)
IgA nephropathy	8(11.4%)	9(16.4%)
Infection associated GN	2(2.9%)	4(7.3%)
LCDD	2(2.9%)	1(1.8%)
Lupus nephritis	28(40%)	2(3.6%)
MCD	3(4.3%)	8(14.5%)
MesPGN	1(1.4%)	1(1.8%)
Membranous nephropathy	1(1.4%)	8(14.5%)
MPGN	0	3(5.5%)

C3GN-C3 glomerulonephritis, Chronic GS-chronic glomerulosclerosis, CresGN-crescentic glomerulonephritis, FSGS-

focal segmental glomerulosclerosis, GN-glomerulonephritis, LCDD-light chain deposition disease, MCD-minimal change disease, MesPGN-mesangioproliferative glomerulonephritis, MPGN-membranoproliferative glomerulonephritis.

Table 7: Glomerular Disease Spectrum According To The Age Of Presentation

Glomerular disease	18-30 yrs (N=44)	31-60 yrs (N=69)	>60 yrs (N=12)
Amyloidosis	0	2(2.9%)	1(8.3%)
C3GN	1(2.3%)	0	0
Chronic GS	0	1(1.4%)	0
Cortical necrosis	0	1(1.4%)	0
Crescentic GN	4(9.1%)	11(15.9%)	4(33.3%)
Diabetic nephropathy	0	5(7.2%)	1(8.3)
Fibrillary GN	0	2(2.9%)	0
FSGS	5(11.4%)	5(7.2%)	1(8.3%)
IgA nephropathy	5(11.4%)	11(15.9%)	1(18.3%)
Infection associated GN	3(6.8%)	2(2.9%)	1(8.3%)
LCDD	0	1(1.4%)	2(16.7%)
Lupus nephritis	19(43.2%)	11(15.9%)	0
MCD	5(11.4%)	6(8.7%)	0
MesPGN	1(2.3%)	1(1.4%)	0
Membranous nephropathy	0	8(11.6%)	1(8.3%)
MPGN	1(2.3%)	2(2.9%)	0

C3GN-C3 glomerulonephritis, Chronic GS-chronic glomerulosclerosis, CresGN-crescentic glomerulonephritis, FSGS-focal segmental glomerulosclerosis, GN glomerulonephritis, LCDD-light chain deposition disease, MCD-minimal change disease, MesPGN-mesangioproliferaive glomerulonephritis, MPGN-membranoproliferative glomerulonephritis

Table 8: Frequencies Of Primary (PGD) And Secondary Glomerular Diseases (SGD)

Biopsy diagnosis	Total (N=125)	PGD (N=67) 53.6%	SGD (N=58) 46.4%
Amyloidosis	3	0	3(5.2%)
C3GN	1	1(1.5%)	0
Chronic GS	1	0	1(1.7%)
Cortical necrosis	1	0	1(1.7%)
Crescentic GN	19	16(23.9%)	3(5.2%)
Diabetic nephropathy	6	0	6(10.3%)
Fibrillary GN	2	0	2(3.4%)
FSGS	11	11(16.4%)	0
IgA nephropathy	17	17(25.4%)	0
Infection associated GN	6	0	6(10.3%)
LCDD	3	0	3(5.2%)
Lupus nephritis	30	0	30(51.7%)
MCD	11	11(16.4%)	0
MesPGN	2	2(3%)	0
Membranous nephropathy	9	9(13.4%)	0
MPGN	3	0	3(5.2%)

C3GN-C3 glomerulonephritis, Chronic GS-chronic glomerulosclerosis, CresGN-crescentic glomerulonephritis, FSGS-focal segmental glomerulosclerosis, GN-glomerulonephritis, LCDD-light chain deposition disease, MCD-minimal change disease, MesPGN-mesangioproliferaive glomerulonephritis, MPGN-membranoproliferative glomerulonephritis

Table 9: Mean Values Of Serum Creatinine, Albumin, Haemoglobin And 24hr Urinary Protein In Glomerular Diseases

Glomerular ds	Mean S. creatinine mg/dl	Mean S. albumin gm/dl	Mean Haemo globin gm/dl	Mean 24 hr urine protein gm
Amyloidosis	1.43	1.83	9.63	5.20
C3GN	1.20	2.70	9	6
Chronic GS	5.40	3.10	10	1.50
Cortical necrosis	8	2.90	10	2
Crescentic GN	8.71	3.04	8.74	1.35
Diabetic nephropathy	6.98	3.32	9.22	2.85
Fibrillary GN	6.65	2.65	7.75	1.20
FSGS	1.64	1.99	11.05	6.35
IgA nephropathy	3.47	3.11	10.16	1.75
Infection associated GN	5.79	3.17	10.47	1.37
LCDD	4.49	2.77	7.03	1.33
Lupus nephritis	2.22	2.35	8.34	4.23
MCD	1.35	1.68	11.98	7.55
MesPGN	4.80	3.45	8.75	2
MN	1.07	2.32	11.88	6.82
MPGN	6.40	2.17	8.93	2.43

C3GN-C3 glomerulonephritis, Chronic GS-chronic glomerulosclerosis, CresGN-crescentic glomerulonephritis, FSGS-focal segmental glomerulosclerosis, GN-glomerulonephritis, LCDD-light chain deposition disease, MCD-minimal change disease, MesPGN-mesangioproliferaive glomerulonephritis, MPGN-membranoproliferative glomerulonephritis

Table 10: Clinicopathologic Correlation Of Glomerular Diseases In Adults

Glomerular Disease	Clinical Syndrome	Gender	HTN	Mean s.creat	Mean Hb %	Mean Albumin	24 hr urine protein
LN (n=30)	NNS-11(36.6%) NS-8(26.6%) AUA-6(20%) ANS-4(13.3%) RPRF-1(3.3%)	M-2 F-28	16(53.3%)	2.22	8.34	2.35	4.23
Cres GN (n=19)	RPRF-15(79%) ANS-2(10.5%) AKI-1(5.3%) CKD-1(5.3%)	M-5 F-14	14(73.7%)	8.71	8.74	3.04	1.35
IgA (n=17)	ANS-5(29.4%) AKI-3(17.6%) RPRF-3(17.6%) NNS-2(11.7%) CKD-2(11.7%) NS-1(5.8%) AUA-1(5.8%)	M-9 F-8	11(6.47)	3.47	10.16	3.11	1.75
MCD (n=11)	NS-11(100%)	M-8 F-3	3(27.3%)	1.35	11.98	1.68	7.55
FSGS (n=11)	NS-7(63.6%) NNS-2(18.2%) AUA-2(18.2%)	M-6 F-5	3(27.3%)	1.64	11.05	1.99	6.35
MN (n=9)	NS-8(88.9%) AKI-1(11.1%)	M-8 F-1	2(22.2%)	1.07	11.88	2.32	6.82
DN (n=6)	CKD-2(33.3%) AKI-2(33.3%) RPRF-1(16.7%) NS-1(16.7%)	M-5 F-1	5(83.3%)	6.98	9.22	3.32	2.85

Infection Associated GN(n=6)	ANS-4(66.7%) AKI-2(33.3%)	M-4 F-2	3(50%)	5.79	10.47	3.17	1.37
MPGN (n=3)	RPRF-2(66.7%) NNS-1(33.3%)	M-3 F-0	2(66.7%)	6.40	8.93	2.17	2.43
LCDD (n=3)	RPRF-1(33.3%) ANS-1(33.3%) AKI-1(33.3%)	M-1 F-2	3(100%)	4.49	7.03	2.77	1.33
Amyloidosis (n=30)	NS-3(100%)	M-2 F-1	3(100%)	1.43	9.63	1.83	5.20
Fibrillary GN(n=2)	RPRF-1(50%) CKD-1(50%)	M-0 F-2	2(100%)	6.65	7.75	2.65	1.20
MesPGN (n=2)	RPRF-1(50%) AUA-1(50%)	M-1 F-1	0	4.80	8.75	3.45	2
C3GN (n=1)	NNS-1(100%)	M-1 F-0	0	1.7	9	2.7	6
Cortical Necrosis (n=1)	AKI-1(100%)	M-0 F-1	0	8	10	2.90	2
Chronic GS (n=1)	CKD-1(100%)	M-0 F-1	1(100%)	5.4	10	3.1	1.50

AKI-acute kidney injury, ANS-acute nephritic syndrome, AUA-asymptomatic urinary abnormalities, CKD-chronic kidney disease, NNS-nephrotic nephritic syndrome ,NS-nephrotic syndrome, RPRF-rapidly progressive renal failure, HTN-hypertension, MCD-minimal change disease, FSGS-focal segmental glomerulosclerosis, MN-membranous nephropathy, IgA-IgA nephropathy, MPGN-membranoproliferative glomerulonephritis, CresGN-crescentic glomerulonephritis, LN-lupus nephritis, DN-diabetic nephropathy, LCDD-light chain deposition disease, GN-glomerulonephritis, MesPGN-mesangioproliferaive glomerulonephritis,C3GN-c3 glomerulonephritis, Chronic GS-chronic glomerulosclerosis

In this study we have observed that, lupus nephritis can have varied presentation from AUA to RPRF. However the most common presentation was NNS (36.6%) followed by NS (26.6%). RPRF was the most common (79%) presentation of Crescentic GN followed by ANS (10.5%). Amongst all glomerular disease, IgAN can be seen in all the 7 clinical syndromes, however its presentation as ANS was the most common (29.4%). MCD exclusively presented as nephrotic syndrome.
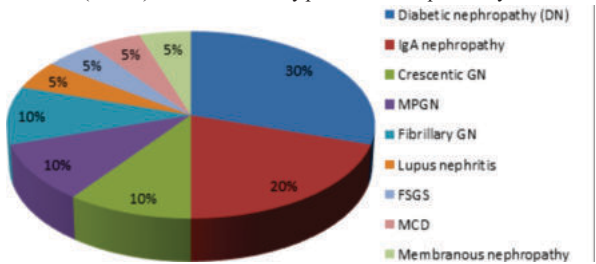
Diabetic nephropathy (DN)
IgA nephropathy
Crescentic GN
MPGN
Fibrillary GN
Lupus nephritis
FSGS
MCD
Membranous nephropathy

GN-glomerulonephritis, MPGN-membranoproliferative glomerulonephritis, FSGS-focal segmental glomerulosclerosis, MCD-minimal change disease
Figure 1: Spectrum Glomerular Diseases In Diabetic Patients.

Table 11: ISN/RPS Classification Of Lupus Nephritis

Lupus class (ISN/RPS)	Number(%)
Lupus class IV	14 (46.7%)
Lupus class IV+V	9 (30%)
Lupus class V	3 (10%)
Lupus class III	2 (6.7%)
Lupus class III+IV	1 (3.3%)
Lupus class II	1 (3.3%)
Total	30 (100%)

ISN/RPS-International society of nephrology/renal pathology society

DISCUSSION
In the current study, we analysed the clinical, laboratory and histopathological data of 125 cases of glomerular disease diagnosed between January 2020 to December 2020 in a single centre in north eastern region in India.

The average age of the patients was 39.27±15.43 years and male: female ratio was 0.79:1, female slightly outnumbered males, this can be explained by the fact that lupus nephritis cases comprises 24% of study population. This is similar to the study done by Jamil M et al.[11] from northeast India where they have analysed a total of 102 patients of which 25 (24.5%) were male and 77(75.5%) were female with M: F ratio of 0.32:1. The mean age of presentation was 30.6 years in their study.

Most of the cases belong to the age group of 31-60 years (55.2%), followed by 18-30 years (35.2%) only 9.6% of cases belong to >60 years. In the study conducted by V.Golay et al.[12]3.6% of their study population were ≥60 years.

The most common clinical syndrome was Nephrotic syndrome (31.2%) followed by RPRF (20%), Nephrotic Nephritic syndrome (13.6%), Acute nephritic syndrome (12.8%), Acute kidney injury (8.8%%), Asymptomatic urinary abnormalities (8%) and Chronic kidney disease (5.6%). These data is comparable to study done by Modugumudi AS et al.[13] where they have also observed that most common indication of renal biopsy was Nephrotic syndrome (65.5%) followed by RPRF (24.8%), Acute nephritic syndrome (6.6%), Chronic renal failure (2.9%) and isolated proteinuria (0.7%). In other studies by Zhou et al. [3], Rychlik I et al.[14], Polito MG et al.[6], Das U et al.[8], Balakrishnan et al.[9], Narasimhan B et al.[10], Reshi AR et al.[15], Garyal and kafle et al.[16] noted that contribution of nephrotic syndrome to kidney biopsies ranged from 34% to 60%.

Asymptomatic urinary abnormalities contributed to 8% of kidney biopsy which is comparable to study done by V.Golay et al.[12] where they have also reported 7.8% of AUA in their biopsy series. In Indian study contribution of AUA to kidney biopsy is less compared to other parts for of the world. Conversely AUA are more common than NS in the Italian and Czech registry due to local practice of routine screening or greater acceptance of performance of renal biopsies for evaluation of asymptomatic haematuria or proteinuria.

Out of 125 cases, 30 cases (24%) required dialysis, 60% of them belong to RPRF group with average serum creatinine of 8.51 mg/dl. Most of them were females with a biopsy diagnosis of crescentic GN in 60% cases. This shows that patients presenting with RPRF developed advanced renal failure requiring dialysis and the most expected glomerular histology in such cases was crescentic GN.

The most frequently diagnosed lesion in our patient with nephrotic syndrome was minimal change disease (28.2%) followed by membranous nephropathy (20.5%), lupus nephritis (20.5%), FSGS (17.9%), amyloidosis (7.7%), IgA (2.6%) and DN (2.6%). Incidence of various glomerular disease in Nephrotic syndrome group by V. Golay et al. [12]were MCD 31.46%, MN 16.09%, Lupus nephritis 7.8%, FSGS 25%, IgA 6%, amyloidosis 0.98% and DN 0.24%. Contribution of lupus nephritis to nephrotic syndrome in our study was comparatively higher due to increase prevalence of the disease. Even though IgAN (25.4%) was the most common primary GD in this study, it contributed to only 2.6% of nephrotic syndrome.

The incidence of MesPGN was 1.6% in this study which is comparable to study done by Dogra PM et al.[17], V. Golay et al.[12] and Jamil et al.[11] where they reported the incidence of MesPGN in 2.3% ,0.6% and 3.9% respectively. In comparison to other studies by Das U et al.[8], Balakrishnan et al.[9], and Narasimhan B et al.[10] where they observed a higher incidence of MesPGN in 5.94%, 7.91% and 20.2% respectively. This could be due to the fact that these were comparatively older studies and improvement in Immunofluorescence

technique, reporting and interpretation could have led to lesser diagnosis of non IgA MesPGN.

There was slight male predominance in most of the glomerular diseases except in the case of lupus nephritis, crescentic GN and fibrillary GN. This is comparable to the data observed by V. Golay et al.[12] where they have also reported higher percentage of male patients in IgAN, FSGS, MCD and MN and higher number of female patient in lupus nephritis and crescentic GN.

IgAN (25.4%) was the most common primary glomerular disease noted in adults followed by crescentic GN (23.9%), FSGS (16.4%), MCD (16.4%), and MN (13.4%). This is comparable to data observed in studies done by Dogra PM. et al.[17], and Lakshminarayana et al.[18] where they have also reported IgAN to be the most common Primary GD. They observed IgAN as the commonest PGD followed by FSGS, MN, MCD and Crescentic GN. This finding of IgAN to be the prevalent PGD in eastern India, is substantiated by studies from other eastern countries such as China, South korea and Japan.[3,4,19]

V. Golay et al.[12] from kolkata evaluated 666 renal biopsies and reported MCD (20.1%) to be the commonest primary GD across all ages whereas LN (73.38%) was the most common SGD and it is uniformly the commonest cause of SGD worldwide. Jamil et al.[11] from shillong analysed 102 renal biopsies and reported MCD (11.8%) as the most frequent primary GD followed by MPGN (10.8%), MN, (5.8%), IgAN (5.8%) and FSGS (5.8%).

In our study Secondary GD constituted 46.4% of the cases, this is similar to the study conducted by Jamil et al., Agarwal et al. and lingaraju et al.[11,20,21] where they reported an incidence of SGD in 52%, 41.5%, and 42.5% respectively. Lupus nephritis (51.7%) was the commonest SGD followed by DN (10.3%), infection associated GN (10.3%), amyloidosis (5.2%) and LCDD (5.2%). Similar observation was seen in Dogra PM et al.[17] where they reported LN (52.2%) to be the commonest SGD followed by DN (23.9%), LCDD (13%).

In our study, class IV LN (46.7%) was the most common lesion, followed by class V+V (30%), class V (10%), class III (6.7%), class III+IV (3.3%), class II (3.3%). In the study by Dogra PM et al.[17], they reported Class IV LN (54.2%) as the commonest, followed by Class III LN (20.8%), Class V LN (16.7%) and Class-III +V LN (8.3%). Similarly Lakshminarayana et al.[18] too reported Class IV as the most common type, followed by Class III and Class IV+V.

Our study reported DN as the second most prevalent secondary GD, concordant with various Indian studies whereas, certain other Indian data revealed DN as the dominant secondary GD.[10,15,22,20,18]This variability is because of the prevalence of diabetes in those parts of India. Similar variability in prevalence of secondary GD has been world-over where LN was common in Chinese, Korean and European studies, while DN predominated in data from Czech Republic, Japan, and Scotland.

There were 20 (16%) cases with type 2 DM in our study. The prevalence of NDRD was 11.2% in type 2 diabetic patients which is similar to study conducted by Prakash J et al.[23] where they have reported an incidence of 12.35%. NDRD was seen in 70% diabetics who underwent a renal biopsy. similar observation was noted by Balakrishnan et al.[9] where they reported NDRD in 72% diabetics undergoing renal biopsy.

Out of 125 cases, 19 had a diagnosis of crescentic GN (15.2%), of which 42% (n=8) were pauci-immune crescentic GN, 26.3%(n=5) were IgA crescentic GN, 21% (n=4) were Anti GBM disease and 10.5% (n=2) were immune complex crescentic GN. We had a slightly higher percentage of Anti GBM disease 3.2% (n=4) compared to other study done by V.Golay et al.[12] and Dogra P M et al.[17] where they

observed an incidence of 0.3% and 0.34% respectively.

Table 12: Comparison Of Glomerular Lesions Among Nephrotic Syndrome In Adults In Different Asian Studies

Reference	Kazi et al.[24]	Garyal and kafle.[16]	Chang et al.[4]	Zhou et al.[3]	Present study
Country	Pakistan	Nepal	Korea	China	India
Sample size	316	137	1818	1374	125
MCD %	14.8	10.2	15.5	25.3	28.2
FSGS%	39.9	8	5.6	6	17.9
MN%	26.6	42.3	12.3	29.5	20.5
IgA%	2.5	2.2	28.3	20	2.6
MPGN%	4.3	21.9	4	1.5	0

MCD-minimal change disease, FSGS-focal segmental glomerulosclerosis, MN-membranous nephropathy, IgA-IgA nephropathy, MPGN-membranoproliferative glomerulonephritis

The pattern of GD seen in this study is similar to East Asian countries where IgAN was the most prevalent primary GD and LN was the commonest secondary GD. Males dominated the primary GD whereas females dominated secondary GD.

Table 13: Comparison Of Kidney Biopsy Data From Eastern India Depicting Intra-regional Variation In Glomerular Disease

Authors	Dogra PM et al.[17]	V.Golay et al.[12]	Jamil et al.[11]	Present study
Place	Kolkata	Kolkata	Shillong	Guwahati
Period	2013-2015	2010-2012	2013-2015	2020 jan-dec
N	290	666	102	125
Mean age	40.8±14.1	28±14.6	30.6	39.27±15.43
NS%	26.2	61.5	57.8	31.2
ANS/Sb NP%	15.5	6	31.4	12.8
AKI%	8.6	6	5.9	8.8
RPRF%	10	19.5	-	20
CKD%	39.3	4.5	2.9	5.6
PGD%	78.5	79.13	45.1	53.6
SGD%	21.4	20.87	52	46.4
MCD%	12.1	20.12	11.8	8.8
FSGS%	8.9	18.02	5.8	8.8
MN%	9.3	12.01	5.8	7.2
IgA%	32.2	8.1	5.8	17.6
MPGN%	0.9	5.25	10.8	2.4
MesPGN%	2.3	0.6	3.9	1.6
CresGN%	5.6	7.51	-	15.2
ScGN%	2.9	3	2.9	0.8
LN%	11.2	15.32	41.2	24
DN%	5.2	0.15	2.9	4.8
LCDD%	2.8	1.65	0.98	2.4
IRGN%	0.5	4.95	-	4.8
Amyloidosis%	-	1.2	-	2.4
C3GN%	-	-	-	0.8
Fibrillary GN%	-	-	-	1.6

NS-nephrotic syndrome, ANS-acute nephritic syndrome, SbNP-subnephrotic proteinuria, AKI-acute kidney injury, RPRF- rapidly progressive renal failure, CKD-chronic kidney disease, PGD-primary glomerular disease, SGD-secondary glomerular disease, MCD-minimal change disease, FSGS-focal segmental glomerulosclerosis, MN-membranous nephropathy, IgA-IgA nephropathy, MPGN-membranoproliferative glomerulonephritis, MesPGN-mesangioproliferative glomerulonephritis, ScGN- sclerosing glomerulonephritis, LN-lupus nephritis, DN-diabetic nephropathy, LCDD-light chain deposition disease, IRGN-infection related glomerulonephritis, C3GN-C3 glomerulonephritis

Table 14: Comparison Of Kidney Biopsy Data From Various Parts Of India Depicting Inter-regional Variation In Glomerular Diseases

Region	West India		North India			South India		Northeast India
Authors	Beniwal et al.[22]	Agarwal et al.[20]	Rathi et al.[25]	Reshi et al.[15]	Narsimhan et al.[10]	Balakrishnan et al.[9]	Lakshminarayana et al.[18]	Present study
Place	Jaipur	New Delhi	Chandigarh	Srinagar	Vellore	Hyderabad	Kerala	Assam
Period	2008-2013	1987-1998	2002-2007	1987-2000	1986-2002	1990-2008	2009-2016	2020jan-dec 2020
N	622	14796	324	290	5415	1615	271	125
Mean age	30.3±7.1	38.6±15.5	31.5±11	25.4±13.7	-	32.2±18.3	41.98±14.96	39.27±15.43
NS%	66.7	15.03	100	100	65.7	100	36.2	31.2

ANeS/SbNP	11.9	4.6	-	-	15.7	-	-	12.8
RPRF%	8	-	-	-	3.4	-	4	20
AKI%	4.7	1.9	-	-	1.8	-	7.3	8.8
CKD%	4	47.8	-	-	10.2	-	52.4	5.6
PGD%	79.4	58.5	89	91.73	71	79.23	77.78	53.6
SGD%	14.5	41.5	11	8.27	29	20.77	12.22	46.4
MCD%	21.1	38	14.8	43.79	10.8	17.28	5.9	8.8
FSGS%	10.5	20	30.6	16.89	16.8	12.07	13.7	8.8
MGN%	15	20	24.4	13.4	9.5	7.99	7.8	7.2
IgAN%	7.4	11.2	1.8	1.37	8.4	5.02	23.3	17.6
MPGN%	9.6	11.6	17.9	-	2.9	4.52	1.5	2.4
MsPGN%	6.4	-	-	2.06	7.3	5.94	2.6	1.6
CresGN%	2.6	-	-	-	-	5.14	4.1	15.2
ScGN%	1.9	-	3.7	-	-	7.68	4.4	0.8
LN%	7.6	3.4	7.7	3.1	6.9	16.72	5.2	24
DN%	0.6	22	0.3	4.48	2.8	1.36	5.9	4.8
LCDD%	5.9	6.6	3.7	0.68	1	1.67	0.4	2.4
IRGN%	-	-	-	-	13.5	5.33	-	4.8

NS-nephrotic syndrome, ANS-acute nephritic syndrome, SbNP-subnephrotic proteinuria, AKI-acute kidney injury, RPRF- rapidly progressive renal failure, CKD-chronic kidney disease, PGD-primary glomerular disease, SGD-secondary glomerular disease, MCD-minimal change disease, FSGS-focal segmental glomerulosclerosis, MN-membranous nephropathy, IgA-IgA nephropathy, MPGN-membranoproliferative glomerulonephritis, MesPGN-mesangioproliferative glomerulonephritis, ScGN- sclerosing glomerulonephritis, LN-lupus nephritis, DN-diabetic nephropathy, LCDD-light chain deposition disease, IRGN-infection related glomerulonephritis, C3GN-C3 glomerulonephritis

CONCLUSION

Our study gives an insight into the incidence of various glomerular disease, its spectrum and clinical profile. IgA nephropathy was the most common primary glomerular disease followed by crescentic GN. IgA nephropathy can have wide range of presentation.

Most common clinical syndrome for indication of renal biopsy was nephrotic syndrome. Lupus nephritis contributed substantial percentage in this study due to high prevalence of SLE in this part of country. It can have wide range of presentation from AUA to RPRF.

Limitations Of The Study

This study was a single centre, conducted in a one year period only with small sample size and also exclusion of less than 18 years population. Electron microscopy was not done which would have help to better characterise the glomerular disease. Furthermore, the fact that our institute caters mainly to the population of northeast India, these results may not be applicable to other parts of the country.

REFERENCES

1. Nachman PH, Jennette JC, and Falk RJ. Primary glomerular disease. In: Brenner BM, editor. Brenner and Rector's The Kidney. 8th ed. Philadelphia: Saunders; 2008. p. 1101-91.
2. Jennette JC, Falk RJ. Glomerular clinicopathologic syndromes. In: Greenberg A, Cheung AK, Coffman TM, Falk RJ, Jennette JC, editors. Primer on Kidney Diseases. 5th ed. Philadelphia: Saunders; 2009. p. 148-59.
3. Zhou FD, Zhao MH, Zou WZ, Liu G, Wang H. The changing spectrum of primary glomerular diseases within 15 years: A survey of 3331 patients in a single Chinese centre. Nephrol Dial Transplant 2009;24:870-6.
4. Chang JH, Kim DK, Kim HW, Park SY, Yoo TH, Kim BS, et al. Changing prevalence of glomerular diseases in Korean adults: A review of 20 years of experience. Nephrol Dial Transplant 2009;24:2406-10.
5. Braden GL, Mulhern JG, O'Shea MH, Nash SV, Ucci AA Jr, Germain MJ. Changing incidence of glomerular diseases in adults. Am J Kidney Dis 2000;35:878-83.
6. Polito MG, de 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;25:490-6.
7. Mitwalli AH, Al Wakeel J, Abu-Aisha H, Alam A, Al Sohaibani M, Tarif N, et al. Prevalence of glomerular diseases: King Khalid University Hospital, Saudi Arabia. Saudi J Kidney Dis Transpl 2000;11:442-8.
8. Das U, Dakshinamurty KV, Prayaga A. Pattern of biopsy-proven renal disease in a single center of south India: 19 years experience. Indian J Nephrol 2011;21:250-7.
9. Balakrishnan N, John GT, Korula A. Spectrum of biopsy proven renal disease and changing trends at a tropical tertiary care centre 1990-2001. Indian J Nephrol 2003;13:29-35.
10. Narasimhan B, Chacko B, John GT, Korula A, Kirubakaran MG, Jacob CK. Characterization of kidney lesions in Indian adults: Towards a renal biopsy registry. J Nephrol 2006;19:205-10.
11. Jamil M, Bhattacharya PK, Raphael V, Khonglah Y, Lyngdoh M, Roy A. Spectrum of Glomerular Diseases in Adults: A Study from North Eastern India. J Assoc Physicians India. 2018 Aug;66(8):36-39. PMID: 31324082.
12. Golay V, Trivedi M, Abraham A, Roychowdhary A, Pandey R. The spectrum of glomerular diseases in a single center: A clinicopathological correlation. Indian J Nephrol 2013;23: 168-75.
13. Modugumudi AS, Venkata PB, Bottla SK, Kottu R, Nandyala R, Patnayak R, Chowhan AK, Yadgiri LA. A study of primary glomerular diseases in adults; clinical, histopathological and immunofluorescence correlations. J Nephropharmacol. 2015 Oct 3;5(2):91-97. PMID: 28197510; PMCID: PMC5297573.
14. Rychlík I, Jancová E, Tesar V, Kolsky A, Lácha J, Stejskal J, et al. The Czech registry of renal biopsies. Occurrence of renal diseases in the years 1994-2000. Nephrol Dial Transplant 2004;19:3040-9.
15. Reshi AR, Bhat MA, Najar MS, et al. Etiological profile of nephrotic syndrome in Kashmir. Indian J Nephrol. 2008;18(1):9-12. doi:10.4103/0971-4065.41281
16. Garyal, Kafle RK. Hisopathological spectrum of glomerular disease in Nepal: A seven-year retrospective study. Nepal Med Coll J 2008;10:126-8.
17. Dogra, PM, Shanmugraj, G., Jana, S., Hooda, A., & Sharma, A. (2019). Adult glomerular diseases in east zone and zonal prevalence in India: an Omnium Gatherum. International Journal Of Community Medicine And Public Health, 6(7), 3038-3048
18. Lakshminarayana RG, Sudakaran I, Nalumakkal SV, Narayanan R, Vareed BM. Spectrum of Biopsy Proven Renal Diseases: A Single Center Experience. Saudi J Kidney Dis Transpl. 2018;29:392-400
19. Li LS, Liu ZH. Epidemiologic data of renal diseases from a single unit in China: Analysis based on 13,519 renal biopsies. Kidney Int. 2004;66:920–3.
20. Agarwal SK, Dash SC. Spectrum of Renal Diseases in Indian Adults. J Assoc Physicians India, 2000;48:594-600
21. Lingaraju U, Varma SS, Satishkumar MM, Leelavati V, Shreedhar CG. Spectrum of glomerular diseases-clinicopathological observations from a state-run tertiary care centre. Int J Res Med Sci. 2015;3:2004-13.
22. Beniwal P, Pursnani L, Sharma S, Garsa RK, Mathur M, Dharmendra P, Malhotra V, Agarwal D. A clinicopathologic study of glomerular disease: A single-center, five-year retrospective study from Northwest India. Saudi J Kidney Dis Transpl. 2016 Sep-Oct;27(5):997-1005. doi: 10.4103/1319-2442.190876. PMID: 27752010.
23. Prakash J, Sen D, Usha, Kumar NS. Non-diabetic renal disease in patients with type 2 diabetes mellitus. J Assoc Physicians India. 2001 Apr;49:415-20. PMID: 11762610.
24. Kazi JI, Mubarak M, Ahmed E, Akhter F, Naqvi SA, Rizvi SA. Spectrum of glomerulonephritides in adults with nephrotic syndrome in Pakistan. Clin Exp Nephrol. 2009 Feb;13(1):38-43. doi: 10.1007/s10157-008-0075-0. Epub 2008 Aug 7. PMID: 18685922.
25. Rathi M, Bhagat R L, Mukhopadhyay P, Kohli H S, Jha V, Gupta K L, Sakhuja V, Joshi K. Changing histologic spectrum of adult nephrotic syndrome over five decades in north India: A single center experience. Indian J Nephrol 2014;24:86-91.