Histopathological Analysis of Biopsy-proven Glomerulonephritis in Pediatric Patients

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Abstract

Glomerulonephritis appears as an autoimmune reaction against patient's own antigens or might occur secondary to antigen attacking endogenously or exogenously or any infectious agent or malignancy or any metabolic disorder. There is a global rise in glomerulonephritis among children with serious morbidity. The current study aimed to analyze the histopathological pattern of renal diseases on renal biopsy in pediatric patients of glomerulonephritis. A descriptive cross-sectional study was conducted from March 2016 to July 2022 at the pediatric ward of Peoples university of medical and health sciences, Nawabshah. Ultrasound, baseline investigations and liver function test was performed prior starting the procedure. International protocols were followed for biopsy procedure. Diagnosis of glomerulonephritis was carried out by using Haas grading system. Statistical Package for the Social Sciences (SPSS) version 20 was used to analyze the data. The mean age of the study participants was 9.2 ± 2.7 years with male predominance. Majority of patients were reported with pathology of focal segmental glomerulosclerosis (41.7%) followed by mesangial proliferative glomerulonephritis (20.5%) while very few of the patients were having pathological characteristics of diffuse proliferative glomerulonephritis (5%). Diffuse proliferative glomerulonephritis, minimal change disease and mesangial proliferative glomerulonephritis were more common in less than 5 years of age while focal segmental glomerulosclerosis, membranous nephropathy and membrano-proliferative glomerulonephritis were more common in 6 to 10 years of age and Lupus nephritis was only found with higher frequency in 11-14 years of age group. It can be concluded that the most common type of glomerulonephritis in pediatric age group is focal segmental glomerulosclerosis followed by mesangial proliferative glomerulonephritis.

Keywords: Nephropathy, Glomerulonephritis, Focal segmental glomerulosclerosis

Introduction

Glomerulonephritis is an immune mediated kidney response, characterized by glomerular inflammation (1). There are two pathological theories behind glomerular inflammation, first theory states that the patient produce antibodies against the glomerular basement membrane so it damages the glomerular basement membrane, besides that also destroy the circulating non-glomerular antibodies (2). According to this theory antibody is the main culprit leading to severe rapidly

progressive disease or sometimes mild slowly developing reaction, the severity depends upon the stage of antigen-antibody reaction and the number of chemical mediators involving in the disease process (3). There is a bit confusion regarding the etiology of glomerulonephritis because the pathogenesis of various renal diseases overlapped and collectively termed as glomerulonephritis (4).

Glomerulonephritis appears as an autoimmune reaction against patient's own antigens or might occur secondary to antigen attacking endogenously or exogenously or any infectious agent or malignancy or any metabolic disorder (5, 6). Literature review revealed that majority of studies done on adult patients, very few of the studies focused pediatric age group, out of them majority of studies are retrospective, a few are prospective (7-9). There is a global rise in glomerulonephritis among children with serious morbidity. The current study aimed to analyze the histopathological pattern of renal diseases on renal biopsy in pediatric patients of glomerulonephritis.

Material and Methods

A descriptive cross-sectional study was conducted from March 2016 to July 2022 at the pediatric ward of Peoples university of medical and health sciences, Nawabshah. Study got ethical approval from the concerned institute. Sample size was calculated by using the Open-Epi calculator and was 280. Non-probability consecutive sampling technique was used. Those renal biopsies were included in which nephropathy or the renal injury was suspected.

Before taking biopsy, Desmopressin 0.4ug/kg was administered in patients whose urea level was ≥50mg/dl. Ultrasound, baseline investigations and liver function test was performed prior starting the procedure. International protocols were followed for biopsy procedure. Tissue sectioning and paraffin embedding was done an expert histopathologist who was unaware of study objective. Diagnosis of glomerulonephritis was carried out by using Haas grading system. Statistical Package for the Social Sciences (SPSS) version 20 was used to analyze the data. Mean and standard deviation was calculated for numerical variables while frequency and percentages for categorical variables. p-value less than 0.05 was considered as significant.

Results

The mean age of the study participants was 9.2 ± 2.7 with the age range of infancy to the age of 14 years. Males were predominant (54.3%) as compared to their female counterpart (45.7%). Majority of patients were reported with pathology of focal segmental glomerulosclerosis (41.7%) followed by mesangial proliferative glomerulonephritis (20.5%) while very few of the patients were having pathological characteristics of diffuse proliferative glomerulonephritis (5%) as mentioned in Table 1.

Table 1 Histopathological findings of glomerulonephritis in study population

Characteristics	**n= 280 (%)**
Diffuse proliferative glomerulonephritis	14 (5.0)
Focal segmental glomerulosclerosis	117 (41.7)
Lupus nephritis	17 (6.1)
Minimal change disease	32 (11.4)
Membranous nephropathy	27 (9.7)
Mesangial proliferative glomerulonephritis	57 (20.5)

Membrano-proliferative glomerulonephritis	16 (5.7)

Majority of male patients were younger than 5 years of age while female patients were in between the age of 6-10 years and a strong significant association was noted. Diffuse proliferative glomerulonephritis, minimal change disease and mesangial proliferative glomerulonephritis were more common in less than 5 years of age while focal segmental glomerulosclerosis, membranous nephropathy and membrano-proliferative glomerulonephritis were more common in 6 to 10 years of age and Lupus nephritis was only found with higher frequency in 11-14 years of age group as mentioned in Table 2.

Table 2 Age-wise distribution of histopathological findings of glomerulonephritis

Parameters	Study group A (≤5 years) n=104	Study group B (6-10 years) n=114	Study group C (11-14 years) n=62	p-value
Gender				
Male	65 (62.5)	49 (43.0)	38 (61.3)	0.001
Female	39 (37.5)	65 (57.0)	24 (38.7)	
Diagnosis				
Diffuse proliferative glomerulonephritis	7 (6.7)	5 (4.4)	2 (3.2)	0.792
Focal segmental glomerulosclerosis	36 (34.6)	55 (48.2)	26 (41.9)	
Lupus nephritis	1 (0.9)	4 (3.5)	12 (19.4)	
Minimal change disease	17 (16.4)	9 (7.9)	6 (9.7)	
Membranous nephropathy	3 (2.9)	15 (13.2)	9 (14.5)	
Mesangial proliferative glomerulonephritis	33 (31.8)	18 (15.8)	6 (9.7)	
Membrano-proliferative glomerulonephritis	7 (6.7)	8 (7.0)	1 (1.6)	

Discussion

Incidence rate of renal disease including both acquired as well as congenital, is increasing day by day globally which increased the disease burden so increased the concern of health care sector worldwide (9). It is a group of renal diseases comprising of minimal change renal disease to rapidly proliferating glomerulosclerosis or even up to end-stage renal disease (10). The risk of severity of renal disease and the mortality is increased because of delayed or misdiagnosis. Early diagnosis and timely cure of the disease are very important to prevent its progress to chronic kidney disease and to avoid disability that either needs dialysis or renal transplantation (11, 12).

The mean age of the participants in the current study was 9.2 ± 2.7 and the same is favored by Mubarak et.al., in his study the mean age was 9.79±4.59 (13). Current study reported that out of total 280 renal biopsies, the focal segmental glomerulosclerosis was the most common one (41.7%). Focal segmental glomerulosclerosis is an inflammatory condition in which portion of

renal glomerulus get damage leading to sclerosis (14). There is a higher prevalence of focal segmental glomerulosclerosis, in comparison to previous studies done in last 20 years. AlFaadhel et.al. performed a study in Saudi Arabia and found that among all types of glomerulonephritis, the majority of patients were having focal segmental glomerulosclerosis but he reported lower incidence rate than current study i.e. 21%. (15) while Mubarak et.al. found minimal change disease as the most common nephropathy with incidence of 43.8% followed by focal segmental glomerulosclerosis (38.14%) (13). On the other hand, one of the recent study done in Pakistan favored this finding by reporting incidence of focal segmental glomerulosclerosis up to about 40% (16). Madni et.al. conducted a study in Iran and found slightly higher incidence of minimal change disease than focal segmental glomerulosclerosis with frequwncy of 27.2% and 25.2% respectively (17). But these are the incidence rate from previous studies but now the trend has been changed from minimal change disease to focal segmental glomerulosclerosis (18). The exact reason behind this changing trend is unknown.

In 2018, a reterospective study was conducted on pediatric patients, in which histopathological data of renal biopsies from last 6 years was analyzed and the study results reported that the incidence of membrano-proliferative glomerulonephritis was 7% (9) but the current study favord this finding by reporting 5.7% incidence of membrano-proliferative glomerulonephritis in pediatric patients. The study limitation was that the data used was single center so it is recommended to perform the study on a larger scale.

Conclusion

It can be concluded that the most common type of glomerulonephritis in pediatric age group is focal segmental glomerulosclerosis followed by mesangial proliferative glomerulonephritis while diffuse proliferative glomerulonephritis is the least common.

Reference

1. Chadban SJ, Atkins RC. Glomerulonephritis. The Lancet. 2005;365(9473):1797-806.
2. Dixon FJ. The pathogenesis of glomerulonephritis. The American journal of medicine. 1968;44(4):493-8.
3. Bikbov B, Purcell CA, Levey AS, Smith M, Abdoli A, Abebe M, et al. Global, regional, and national burden of chronic kidney disease, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. The lancet. 2020;395(10225):709-33.
4. Kambham N, Troxell M. Glomerulonephritis Associated with Other Bacterial Infections. Bacterial Infections and the Kidney: Springer; 2017. p. 63-85.
5. Rafik H, El Amrani M, El Kabbaj D. Membranoproliferative glomerulonephritis associated with a human immunodeficiency virus infection. Indian Journal of Nephrology. 2017;27(4):319.
6. Akhtar SZ, Adeeb H, Bibi H, Ullah I. GLOMERUONEPHRITIS;: DISTRIBUTION OF BIOPSY PROVEN GLOMERUONEPHRITIS IN KHYBER PAKHTUNKHWA PROVINCE OF PAKISTAN, A SINGLE CENTRE STUDY. The Professional Medical Journal. 2019;26(05):787-94.
7. Farideh S, Ramin Roohani F, Mohd R B. Acute glomerulonephritis in children. 1994.
8. Malik SI, Idrees MK, Naseem K, Sadiq S, Raza SH. Pattern of biopsy-proven kidney diseases: experience of a teaching hospital in Bahawalpur, Pakistan. Saudi Journal of Kidney Diseases and Transplantation. 2019;30(5):1144.
9. Khatri S, Bajeer IA, Tresa V, Hashmi S, Mubarak M, Lanewala AA. Short-term outcome of clinical and histopathologic variants of mesangiocapillary glomerulonephritis in children: A retrospective analysis from a tertiary care center. JPMA. 2018;68(1199).
10. Miller WG, Jones GR. Estimated glomerular filtration rate; laboratory implementation and current global status. Advances in chronic kidney disease. 2018;25(1):7-13.

11. Gebreyesus LG, Aregay AF, Gebrekidan KG, Alemayehu YH. Factors associated with treatment outcome of acute post streptococcal glomerulonephritis among patients less than 18 years in Mekelle City, Public Hospitals, North Ethiopia. BMC Research Notes. 2018;11(1):1-6.
12. Nataprawira HM, Sapartini G, Indriani K. Delayed Diagnosis of Tuberculoma in a Child with Nephritis due to Systemic Lupus Erythematosus. Turkish Thoracic Journal. 2018;19(3):153.
13. Mubarak M, Lanewala A, Kazi JI, Akhter F, Sher A, Fayyaz A, Bhatti S. Histopathological spectrum of childhood nephrotic syndrome in Pakistan. Clinical and experimental nephrology. 2009 Dec;13(6):589-93.
14. Nataprawira HM, Sapartini G, Indriani K. Delayed Diagnosis of Tuberculoma in a Child with Nephritis due to Systemic Lupus Erythematosus. Turkish Thoracic Journal. 2018 Jul;19(3):153.
15. Nagata M, Kobayashi N, Hara S. Focal segmental glomerulosclerosis; why does it occur segmentally?. Pflügers Archiv-European Journal of Physiology. 2017 Aug;469(7):983-8.
16. Ayranci U, Akgün Y, Unluoglu I, Kiremitci A. Antibiotic prescribing patterns for sore throat infections in a university-based primary care clinic. Annals of Saudi Medicine. 2005 Jan;25(1):22-8.
17. Madani A, Fahimi D, Esfehani ST, Mohsseni P, Atayee N, Ahmadi M, Elmi F, Haddadi M. Glomerular diseases in Iranian children: clinico-pathological correlations. Pediatric Nephrology. 2003 Sep;18(9):925-8.
18. Trivedi M, Pasari A, Chowdhury AR, Abraham-Kurien A, Pandey R. The spectrum of focal segmental glomerulosclerosis from Eastern India: Is it different?. Indian Journal of Nephrology. 2018 May;28(3):215.