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Original Research Article

Retinopathy in Chronic Kidney Disease: A Hospital Based Study

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Abstract

Introduction: Eye and kidney have structural, developmental and organizational and pathogenic similarities and retinal vessels may reflect renal disease. In our present hospital-based study, we find out the prevalence of retinopathy, the relation of fundus changes with grades of retinopathy and factors associated with retinopathy.

Materials and Methods: It was a retrospective study conducted at Hi-tech Medical College and hospital where data of 152 consecutive patients diagnosed as chronic kidney disease was collected and analyzed. The parameters included their ocular examination details and biochemical parameters. Relation was established between the grades of kidney disease and severity of retinopathy.

Results: After accounting for both conventional and unconventional risk factors, lower estimated glomerular filtration rate (eGFR) was linked to more severe retinopathy. Lower eGFR was also related to a higher incidence of vascular anomalies often linked to hypertension. No significant correlation between average arteriolar or venular calibres and eGFR was discovered.

Conclusion: After adjusting for both conventional and unconventional risk factors for CKD, the results reveal a significant correlation between the severity of retinopathy, its characteristics, and kidney function, indicating that retinovascular pathology mirrors renal illness.

Keywords: Creatinine, eGFR, Diabetic Retinopathy, Hypertensive Retinopathy.

Introduction

Chronic kidney disease (CKD) has emerged as a leading cause of morbidity and mortality worldwide affecting nearly 843.6 million people. [1] According to The Indian CKD Registry diabetic nephropathy is the commonest cause, followed by CKD of undetermined etiology, chronic glomerulonephritis and hypertensive nephrosclerosis. [2]

Eye and kidney have structural, developmental and organizational and pathogenic similarities and retinal vessels

may reflect renal disease. [3-3b] Studies have concluded that retinal microvascular abnormalities are significantly associated with renal function deterioration. [4-7] Ocular morbidity in persons with CKD and end-stage kidney disease may be due to risk factors like diabetes, hypertension, metabolic disorders associated with CKD, uremia, anemia and CKD treatment. [8] Qualitative and quantitative changes in the retinal vasculature are associated with markers of renal dysfunction and damage. [9-10]

Various population based studies have found strong association of visual impairment (VI) and ocular fundus pathology with CKD and have emphasized the importance of ocular screening in such patients. [11-13] In another study by Deva et al, retinal abnormalities like diabetic retinopathy, microvascular retinopathy and macular degeneration have been found to be more severe in patients with CKD stage 3 to 5. [14]

In a study conducted in Cuttack district in the state of Odisha, India the prevalence of CKD was 14.3% but we could not find any data regarding prevalence of retinopathy in Odissa. [15] In our present hospital-based study, we find out the prevalence of retinopathy, the relation of severity of retinopathy with grade of CKD and factors associated with retinopathy.

Aim of the Study

1. To determine the prevalence of different type of retinopathy in chronic kidney disease patients.
2. To study the relation between grades of chronic kidney disease and severity of retinopathy.
3. To study the relation between biochemical parameters (urea, creatinine, sodium, potassium, haemoglobin, lipid profile and retinopathy).

Method and Materials

It was a hospital-based prospective study conducted on the patients presenting to Medicine Department, Hi-Tech Medical College and Hospital, Rourkela, District Sundergarh, Odisha during the period January 2021 to June 2022. The study was carried out on patients older than 20 years who had been diagnosed with chronic kidney disease for a minimum of 3 months. For the study, patients with estimated glomerular filtration rate (eGFR) less than 60 ml/min/1.73m^2 was defined as chronic kidney disease. It was a combined study done by ophthalmology and medicine department of the institute.

Study was conducted after due approval from institutional ethics committee.

The demographic details, examination findings and for patient requiring dialysis the pre-dialysis laboratory parameters were considered.

The patients were subjected to detailed ophthalmic examination including visual acuity, subjective and objective refraction, slit lamp examination, direct and indirect ophthalmoscopy, 90D slit-lamp bi-microscopy and OCT wherever required. Laboratory investigations included kidney function test, serum lipid profile, haemoglobin estimation and serum electrolytes. Patients who have undergone kidney transplant were excluded from study. Exclusion criterion also included patients with vision impairment or documented retinopathy prior to diagnosis of CKD. Those who have undergone previous retinal surgery, retinal laser procedure or intravitreal injections for retinopathy were also excluded

International Clinical Disease Severity Scale was used for grading Diabetic Retinopathy, Wong and Mitchell Classification for Hypertensive Retinopathy, and for Age-related Macular Degeneration, NICE recommendation to Modified International Criteria was used. [16-19] Retinal findings which could not be included or classified among the three

major heads were considered in and as Non-specific Retinopathy. In a patient with bilateral retinopathy, eye with more severe retinopathy was taken for consideration.

Results

Data was collected from hospital database of 152 consecutive patients with CKD during the period January 2022 to June 2022.

There were 69 females and 83 males in this study. Figure 1 Shows the distribution among the patients based on gender.

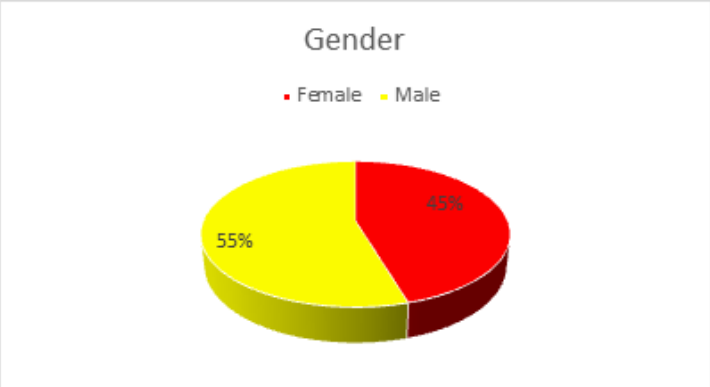

Figure 1: Distribution of Patients based on gender

Table 1 shows distribution of CKD grade amongst the two gender. CKD Grade 4 was the most prevalent in males (58.8%) and females (47.7%), followed by Grade 3 (Male:24.6%; Females 36.5%) and Grade 5 (male:16.6%; Female:15.8%).

Table 1: Gender distribution of grades of ckd patients

Grade of CKD	Male (n%)	Female (n%)	P-value
Grade 3	29 (24.6%)	24 (36.5%)	<0.002
Grade 4	38 (58.8)	34 (47.7%)	
Grade 5	19 (16.6%)	11 (15.8%)	

Of the total 152 patients, Diabetes mellitus was found in 64 patients, while no diabtes mellitus was found in 88 patients and Hypertension was found in 78 patients while no hyoertension was found in 78 patients. However, out of 152 patients, only 21 patients had both diabetes and hypertension, while 131 had either present or both absent [Figure 2].

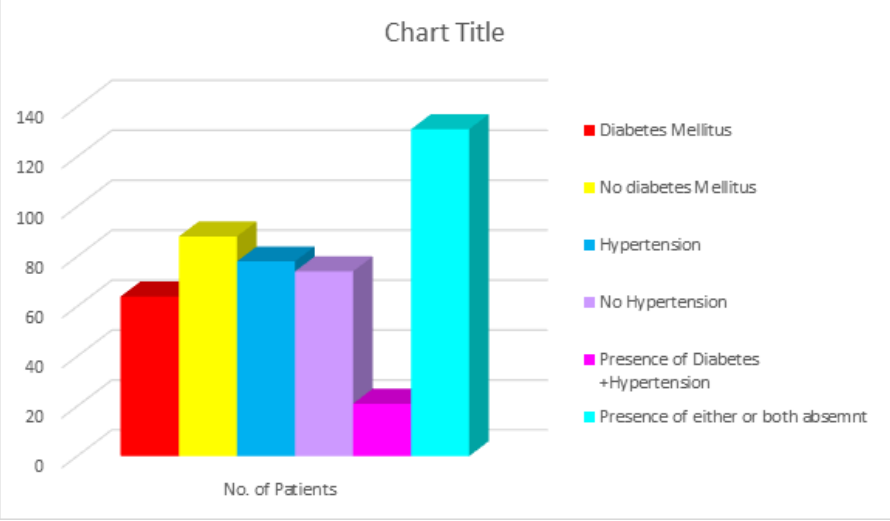

Figure 2: Prevalence of Retinopathy in CKD Patients

Table 2: Shows the prevalence of types of retinopathy in patients

Category	No. of Patients
Diabetes Retinopathy	
DR 1	5
DR 2	5
DR 3	6
DR 4	4
Hypertensive Retinopathy	
HTN 1	7
HTN 2	10
HTN 3	20
HTN 4	7
DR3P (MOD NDPR+ Molecular Edema)	6
ARD	6
ARD 1	4
DR6	1
Non-Specific Retinopathy	16
No Retinopathy	55

Hypertensive retinopathy 3 was most prevalent in patients, followed by Hypertensive retinopathy 2 and equal patients in Hypertensive retinopathy 1 and Hypertensive retinopathy 4. Non-specific retinopathy was seen in 16 patients, whereas, no retinopathy was seen in 55 patients.

Table 3 shows the distribution of fundus changes according to grades of CKD.

Table 3: Distribution of Fundus according to CKD Grades

Category	No. of Patients
Cotton Wool Spots	
Cotton wool spots	32
No cotton wool spots	120
AV Changes	
AV changes	45
No AV Changes	107
Hard Exudates	
Hard Exudates	45
No Hard Exudates	107
Retinal Hemorrhage	
Retinal Hemorrhage	48
No Retinal Hemorrhage	104
Micro-aneurysm	
Micro-aneurysm	27
No Micro-aneurysm	125
Molecular Edema	
Molecular Edema	17
No molecular Edema	135
Disc Edema	
Disc Edema	10
No Edema	142

Retinal hemorrhage was the most commonly seen fundus, whereas, Disc edema was the least seen fundus.

Discussion:

The retinal pathology in this cohort of CKD patients with a variety of kidney dysfunction is the subject of the first in-depth investigation. According to our research, lower eGFR and worse ETDRS retinopathy scores are significantly correlated. When controlling for both conventional and non-conventional CKD risk variables, this link is still substantial, indicating that the severity of retinopathy adds to our understanding of the severity of CKD. The correlation is higher among those who have had a diabetes diagnosis in the past. Participants without diabetes who have retinopathy have reduced eGFR, but not statistically significantly. Without accounting for the substantial number of risk factors taken into account in our analysis, other studies have demonstrated relationships between retinal and kidney illness [16].

Inflammatory processes and endothelial dysfunction in the retina are linked to pathologic characteristics that include impaired vascular responsiveness and circulatory abnormalities [17, 18]. Basement membrane [19] and muscle layer thickness, as well as increased leakage, are features of both retinopathy and nephropathy [20]. The impact of these pathologic and hemodynamic anomalies on the retinal vasculature may serve as effective indicators of accumulative microvascular damage from processes such as hypertension, inflammation, diabetes, and other conditions [21]. Additionally, a recent study has revealed that diabetes patients may share common hereditary susceptibilities to retinopathy and CKD [22].

The advancement of diabetic retinopathy, inadequate glycemic management, obesity, inflammation, and endothelial dysfunction have all been linked to retinal venular dilatation [23].

No significant correlation between eGFR and venular calibres was found, suggesting that the effects of impaired kidney function may balance the effects of diabetes mellitus on vascular diameter. Arteriolar narrowing has been linked to both current and previous blood pressure in numerous investigations [24]. Both kidney and cardiac arterioles have undergone similar modifications [25,26].

Conclusion

In conclusion, this study shows a considerable correlation between retinopathy and impaired kidney function, emphasising the importance of eye examinations in CKD patients. Due to the cross-sectional character of our investigation, our data are compatible with the theory that renal vascular pathology may reflect retinovascular pathology but do not prove this association. Further research is required to determine whether the presence of retinopathy in CKD patients provides predictive information about the quickening loss of renal function.

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