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Correlation between the Severity of Diabetic Retinopathy in Patients with End Stage Renal Disease

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ABSTRACT:

Background: The aim of this study was to assess the severity of fundus findings in patients with End Stage Renal Disease (ESRD) in a tertiary hospital in South India. Materials and Methods: One hundred and forty eight eyes of 74 patients with ESRD were enrolled in the study after obtaining the informed consent. Complete history was taken, ocular examination including visual acuity and Intraocular pressure were recorded. Anterior segment examination using slit lamp bio microscopy, fundus examination using indirect ophthalmoscope and slit lamp biomicroscopy with 90 D lens were performed. Fundus photograph was captured. Data was analysed using SPSS v 25.0.0.0.

Results: In this study, 25% were females while 75% were males. 24% of the males had PDR while none of the females had PDR. Six percent of the males had mild to moderate NPDR, while 11% of females had mild to moderate NPDR.(P =0.043). Younger patients with end stage renal disease were found to have a higher propensity of having proliferative diabetic retinopathy (p=0.014). Patients who were undergoing dialysis for 5 years or more, had an incidence of PDR of 30%, while those undergoing dialysis for less than 5 years had an incidence of PDR of 15% (p= 0.468). Ten percent of those with 5 years or more of dialysis had mild-moderate NPDR, while 6.8% of those with less than 5 years of dialysis had mild-moderate NPDR. In our subset of patients, dialysis was performed either twice or thrice a week. Those with the former, had an incidence 10. 9% of PDR, while those with the latter had an incidence of 31.8% of PDR. (p=0.156). Patients who had undergone cataract surgery had a higher incidence of diabetic retinopathy changes, especially proliferative diabetic retinopathy (p=0.00).

Conclusion: The presence and severity of retinopathy intimately associates with CKD progression among all diabetes patients with chronic kidney diseases. Routine follow-up and management of ocular and retinal disorders in CKD patients with diabetes would be important for aggressive management of diabetic retinopathy and prevention of CKD progression among these patients.

INTRODUCTION

Chronic kidney disease(CKD) is emerging as a major health problem worldwide which is associated with markedly reduced quality of life and increased mortality. 1 Diabetes Mellitus followed by hypertensive nephropathy is the most common cause of CKD.[2]

Diabetic retinopathy and nephropathy are major diabetic microvascular complications. 3 We assess the severity of diabetic retinopathy in patients with End Stage Renal Disease(ESRD). CKD and diabetic retinopathy also share common risk factors such as smoking, poor glycaemic control, hypertension and dyslipidaemia. Since both CKD and diabetic retinopathy have similar pathogenesis and micro vascular lesions, the development of diabetic retinopathy may predict development and progression of CKD.

Retinal signs mirror those in the kidney due to similarities in the microvascular structures of both. The blood retinal barrier and the glomerular filtration barrier are similar in embryology and structural features. This includes the ciliated epithelial cells, basement membranes comprising collagen IV, and the extensive capillary beds seen in the choroid capillaries and glomerulus. 4–7 This study, attempted to document the fundus changes in ESRD, in order to assess whether severity of the kidney disease correlated with the severity of signs in the retina

2. Materials and Methods After obtaining approval from the Institutional Review Board, this study was conducted. This was a prospective, cross-sectional, observational, single centre study done between March 2017 and August 2017. One hundred and forty-eight eyes of patients with end stage renal disease were included, after obtaining informed consent from the patients. Complete history was obtained, with details regarding duration of CKD, hypertension or diabetes. Also, details regarding ocular history were noted. Best corrected visual acuity was recorded using Snellen's chart. Intraocular pressure was measured using Goldmann Applanation tonometer. Anterior segment evaluation was done using a slit lamp biomicroscope. Dilated fundus was examined using an indirect ophthalmoscope and slit lamp biomicroscopy with 90 D lens.

Inclusion criteria

1. Patients of chronic kidney disease on maintenance haemodialysis.

Exclusion criteria

1. Cases of reversible kidney injury. 2. Patients who refused to give consent

Statistical Analysis

Data was entered in Microsoft excel and analysed with SPSS version 25.0.0.0. Mean and percentage were used to interpret the study. The chi square test was used, and a p value of less than 0.05 was considered as statistically significant.

RESULTS

In this study we found that 25% were females while 75% were males. 24% of the males had PDR while none of the females had PDR. Six percent of the males had mild to moderate NPDR, while 11% of females had mild to moderate NPDR.(P value=0.043).

Table 1

Age group	No DR	Mild NPDR	Moderate NPDR	PDR
41-50	2(33.3%)	0	0	4(67%)
51-60	20(83.3%)	2(8.3%)	0	2(8.3%)
61-70	19(67,9%)	0	3(10.7%)	6(21.4%)
>70	8(1100%)	0	0	0

P=0.014

The age of the patient was compared with the severity of diabetic retinopathy and the results were as shown in Table 1.

Hence younger patients with end stage renal disease had a higher propensity of having proliferative diabetic retinopathy.

Table 2

Duration of DM	No DR	Mild DR	Moderate NPDR	PDR
0-5	6	0	0	0
6-10	13(81.2%)	0	0	3(18.8%)
11-15	14(58.3%)	0	3(12.5%)	7(29.2%)
>15	18(81.8%)	2(9.1%)	0	2(9.1%)

P=0.089

The duration of diabetic retinopathy was compared with the severity of diabetic retinopathy and the results were as shown in Table 2.

Table 3

Duration of HT	No DR	Mild DR	Moderate DR	PDR
0-5	8(80%)	0	1(10%)	1(10%)
6-10	13(65%)	2(10%)	2(10%)	3(15%)
10-15	6(50%)	0	0	6(50%)
>15	16%	0	0	0

P=0.042

When the presence of hypertension was compared with the severity of diabetic retinopathy, it was found that twenty five percent of those without hypertension had PDR, while 16% of those with Hypertension had PDR. This was found to be statistically significant. The findings are tabulated in Table 3.

Table 4

Cataract surgery	No DR	Mild DR	Moderate DR	PDR
yes	45(88.2%)	0	1(2%)	5(9.8%)
No	6(35.3%)	2(11.8%)	2(11.8%)	7(41.2%)

P=0.00

Patients who were undergoing dialysis for 5 years or more, had an incidence of PDR of 30%, while those undergoing dialysis for less than 5 years had an incidence of PDR of 15%, though this was found not to be statistically significant (p= 0.468). Ten percent of those with 5 years or more of dialysis had mild-moderate NPDR, while 6.8% of those with less than 5 years of dialysis had mild-moderate NPDR.

In our subset of patients, dialysis was performed either twice or thrice a week. Those with the former, had an incidence 10. 9% of PDR, while those with the latter had an incidence of 31.8% of PDR. Though this was not statistically significant (p=0.156) this could allude to the fact that the microangiopathy in the kidney reflected that in the eye. We assessed whether cataract surgery had a bearing on the severity of diabetic retinopathy and found that patients who had undergone cataract surgery had a higher incidence of diabetic retinopathy changes, especially proliferative diabetic retinopathy. This is shown in Table 4.

4. Discussion Diabetic retinopathy is an important cause of ocular morbidity in patients with Chronic Kidney Disease. Hence, it is not only necessary to assess such patients for evidence of diabetic retinopathy, but also to keep them under stringent follow up. Since the renal and retinal microvasculature are similar, and assessing renal vasculature requires invasive procedures, retinal examination provides for indirect examination of the renal microvasculature. 8,9

Kajiwara et al. found that the female gender was an independent risk factor for the development of proliferative diabetic retinopathy. 10 But, in our study where all patients were undergoing dialysis, none of the females had PDR. We found that the presence of hypertension had a bearing on the severity of diabetic retinopathy, as was similarly found in the study conducted by Bano et al. 11 Rouf et al. also found that hypertension was associated with CKD in 79.5%. Hence, hypertension is a risk factor in the progression of diabetic retinopathy. 12 Kamedo et al. found that hemodialysis was not associated with an increased incidence of vitreous haemorrhage in patients with Diabetic Retinopathy. In our study we found that incidence of PDR was more in patients undergoing dialysis more than 5 years.

Also, we found that those undergoing dialysis more frequently had an increased incidence of PDR, though this was statistically not significant. Krepler et al. found that progression of retinopathy occurred in 12% of eyes after cataract surgery and in 10.8% of non-operated fellow eyes which was similar to our study. Pollack et al., found that in the eyes operated for cataract there was progression of non-proliferative changes in 85.3% and development of proliferative diabetic retinopathy in

14.7%. 13 Eight percent of patients in our study had Proliferative Diabetic Retinopathy. Grunwald et al., showed a considerable association between severity of retinopathy and level of kidney function, suggesting that retinovascular pathology reflects renal disease. 14 Lee et al. showed that proliferative diabetic retinopathy is associated with microalbuminuria and DR is associated with overt nephropathy in Korean DM patients. The findings suggested that when diabetic retinopathy is present, timely evaluation of the patient's renal status should be recommended.

5. Conclusion The presence and severity of retinopathy intimately associates with CKD progression among all diabetes patients with chronic kidney diseases. Routine follow-up and management of ocular and retinal disorders in CKD patients with diabetes would be important for aggressive management of diabetic retinopathy and prevention of CKD progression among these patients. It is mandatory for patients with ESRD to undergo complete ophthalmological examination, including examination of the retina.

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