



## Original Research Article

## To study ocular findings in chronic kidney disease patients attending a tertiary care hospital in Maharashtra

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## ABSTRACT

**Aim:** We aim to assess the association of ocular manifestations with chronic kidney disease and correlating it with the stages of chronic kidney disease.

**Materials and Methods:** It was a cross-sectional study carried out in tertiary medical college in Central Maharashtra. A total of 84 patients were examined over a period of 18 months. Detailed ocular and systemic examinations were undertaken. Dilated fundus evaluation was done with slit lamp biomicroscopy and indirect ophthalmoscopy. Positive anterior and posterior segment findings were noted.

**Results:** Out of 168 eyes of 84 patients, 111 eyes had posterior segment involvement, 25 eyes had anterior segment involvement and 22 eyes had both anterior and posterior segment involvement. Most common posterior segment pathology was hypertensive retinopathy followed by diabetic retinopathy. Anterior segment findings did not correlate with the stage of the disease whereas severe stage of diabetic retinopathy was present in later stages of chronic kidney disease.

**Conclusion:** Present study showed a strong association of ocular manifestation in chronic kidney disease. Ocular involvement in CKD patients if not detected early can lead to permanent and irreversible visual loss, therefore pressing the need for ophthalmic examination in such cases.

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### 1. Introduction

Chronic kidney disease is a rising global medical issue.<sup>1</sup> The prevalence<sup>2,3</sup> of 17.2% is documented in India. It is an irreversible<sup>4</sup> and a progressive process which ultimately results in end stage renal disease. Being much more common than actually documented<sup>5</sup> it often goes undetected and undiagnosed until the disease is well advanced and kidney failure is fairly imminent.

Ocular comorbidities<sup>6,7</sup> may be due to the causes leading to chronic renal failure; namely HTN,<sup>8</sup> diabetes, uraemia, anaemia or due to effects of haemodialysis.<sup>8,9</sup> Decrease in visual function is because of severity of hypertensive or diabetic retinopathy, ischemic optic neuropathy,<sup>9</sup> focal retinal vein impediment and so on.

Retinopathy is frequently asymptomatic<sup>9</sup> in its most treatable stage; delay in diagnosis can result in critical increment in the patient's probability of vision loss. Ocular condition reveals the metabolic control of the disease process. Very commonly an obscure case of chronic renal failure with its visual complexities may initially present to an ophthalmologist.

This study is to assess the ocular comorbidities associated with CKD, and also to highlight the importance of timely ocular examination. Screening of patients with CKD will enable early detection of potential visual threatening manifestations so that appropriate treatment can be initiated before irreversible visual loss can occur.

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## 2. Materials and Methods

Our cross sectional study was conducted at a tertiary care medical college in Central Maharashtra. Approval was obtained from the Institutional Ethical Committee. Estimated sample size (n) of 84 was calculated based on known prevalence rates. The time period for the study was December 2016 - May 2018. Chronic kidney disease patients attending ophthalmology OPD irrespective of age and gender were included in this study after obtaining a written informed consent. Patient with history of kidney transplant and those not willing to undergo dilated fundus examinations were excluded.

Ocular examination was done by Snellen chart for distant vision, Jaeger's chart for near vision. Dry eye evaluation was done by Schirmer's test and intraocular pressure taken by applanation tonometer. Dilatation of both pupils was done by eye drop tropicamide 1%. Anterior segment examination by slit lamp, dilated fundus examination by direct / indirect ophthalmoscopy and slit lamp biomicroscopy with 90D. Fundus photo was taken in patients who showed positive retinal findings by fundus camera.

Hypertensive retinopathy was graded according to Keith & Wagener classification. Diabetic retinopathy and macular oedema was classified according to Early Treatment Diabetic Retinopathy Study (E.T.D.R.S.).

Systemic investigations like Complete blood count, serum urea, serum creatinine, serum calcium, serum phosphate, serum electrolytes, urine routine and microscopy, fasting blood sugar, post prandial blood sugar, ultrasound abdomen were noted if already done.

## 3. Results

A total of 168 eyes of 84 patients were examined over a period of 18 months from December 2016 to May 2018. Our study showed a male preponderance (64. 28%) with a male to female ration of 1.8 : 1. Maximum patients were seen in the age group of 46-60 years (34.52%) with mean age of  $44.21 \pm 13.89$ . (Table 1)

Table 1 shows distribution of CKD patients requiring dialysis and presence of ocular involvement in patients who required dialysis. We found that out of the 17 patients (20.23%) who were on dialysis maximum patients (76.5%) showed ocular involvement. 46 patients (54.76%) had history of hypertension followed 15 (17.85%) patients who had both the comorbidities. DM was present as a single comorbidity in 9 (10.71%) patients. Table 2 shows the almost equal distribution of patients in various stages of CKD. All the 84 patients had normal intra – ocular pressure. Dry eye evaluation done by Schirmer type 1 test was divided into normal, mild, moderate and severe category. Maximum number of the eyes fell in the normal category (Table 4). Posterior segment involvement was documented in 66.1% eyes (Figure 2). Diabetic retinopathy was seen in 45% of

the patients of end stage renal disease (ESRD) with 'p' value 0.012 which was statistically significant (Table 3). The grade of hypertension as well as DM did not correlate with stages of CKD. Table 4 shows the various anterior segment findings reported in our study but no significant association to CKD could be drawn.

**Table 1:** Distribution of CKD patients according to their age

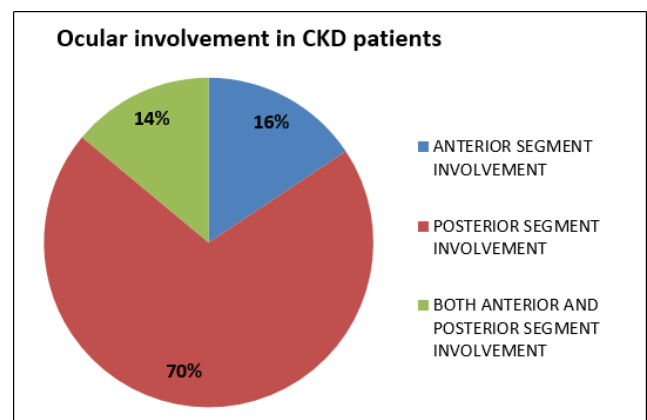
Age (In years)	No. of Patients	Percentage (%)
1-18	0	0%
19-30	17	20.83%
31-45	26	30.94%
46-60	29	34.52%
>60	12	14.28%
Total	84	100%

**Table 2:** Correlation between CKD patients on dialysis with coexisting ocular involvement

		No of patients	Percentage
Dialysis	Required	17	20.23%
	Not required	67	79.76%
Patient on dialysis	Ocular involvement present	13	76.5%
	Ocular involvement absent	4	23.5%

**Table 3:** Distribution of CKD patients according to stage of CKD

Stage of CKD	No. of patients	Percentage %
Mild	21	25%
Moderate	25	29.76%
Severe	19	22.61%
ESRD	20	23.8%
<b>Total</b>	84	100%



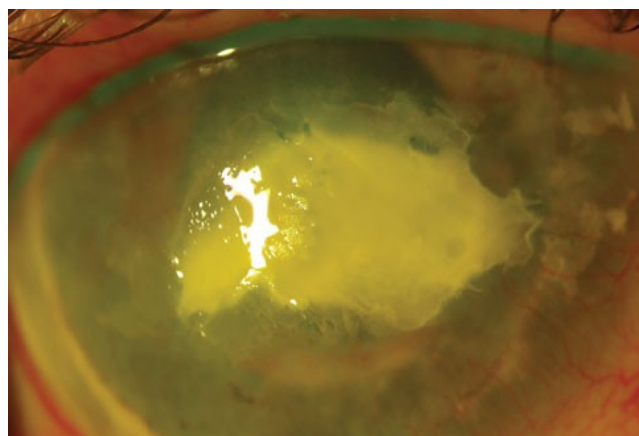
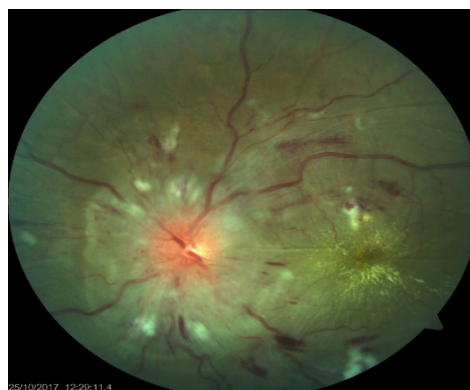
**Fig. 1:** Ocular involvement in CKD patients

**Table 4:** Distribution of posterior segment findings according to stage of CKD

S. No.	Stage of CKD	Mild (21 cases)	Moderate (25 cases)	Severe (19 cases)	ESRD (20 cases)	Total 84	'P' value
	<b>Posterior segment finding</b>						
1)	Diabetic retinopathy	2(9.5%)	3(12%)	7(36.8%)	9(45%)	21(25%)	0.012*
2)	HTN retinopathy	14(66.6%)	17(68%)	11(57.9%)	14(70%)	56(66.6%)	0.862
3)	Vitreous haemorrhage	0	0	0	1(5%)	1(1.2%)	0.342
4)	Retinal detachment	0	0	0	1(5%)	1(1.2%)	0.342
5)	Disc oedema	0	1(4%)	0	0	1(1.2%)	0.506
6)	BRVO(IT)	0	0	0	1(5%)	1(1.2%)	0.342
7)	CSME	0	0	0	1(5%)	1(1.2%)	0.342
8)	Macular edema	0	1(4%)	0	0	1(1.2%)	0.506

**Table 5:** Distribution of anterior segment findings according to stage of CKD patient

Stage of CKD	Mild(21)	Moderate (26)	Severe (19)	ESRD(20)	Total (84)	'P' value
<b>Anterior segment Ocular finding</b>						
Lid oedema	0	0	1(5.26%)	1(5.0%)	2(2.38%)	0.481
Pinguecula	1(4.7%)	2(7.6%)	2(10.52%)	2(10%)	7(8.33%)	0.904
Pterygium	2(9.5%)	1(3.8%)	1(5.26%)	0	4(4.76%)	0.541
Cataract	4(19.04%)	4(15.3%)	0	3(15%)	11(13.1%)	0.288
Band shaped keratopathy	0	1(3.8%)	0	0	1(1.1%)	0.506

**Fig. 2:** Band shaped keratopathy**Fig. 3:** Grade 4 HTN retinopathy

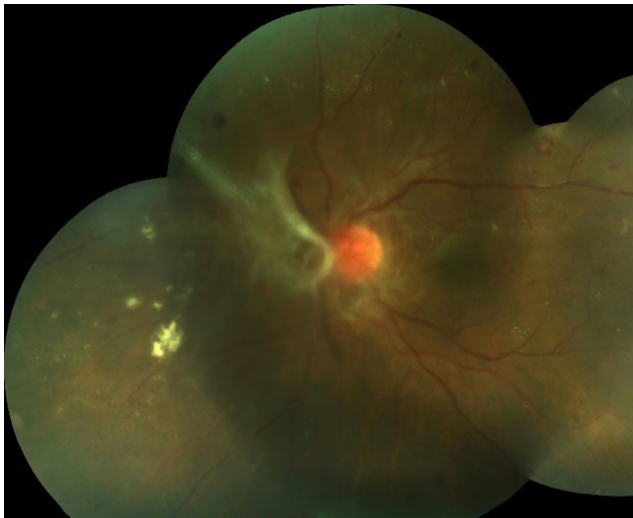
#### 4. Discussion

A total of 158 eyes of 84 patients were examined, which showed male preponderance which was similar to SEEK (screening and early evaluation of kidney disease), where they found CKD to be higher in male population. Similar results were found in study done by Navdeep Gupta et al,<sup>10</sup> 'An eye on chronic kidney disease' a total of 106 patients were included in which 69 patients were males and 37 patients were females (M: F=1.9:1).

We showed a higher prevalence of CKD in older age groups. Our finding was similar to Gao et al.<sup>5</sup> in their study

of "Ocular fundus pathology and chronic kidney disease in a Chinese population", in which the average age of 9644 participants was  $52.8 \pm 16.0$  years, which was similar to our study.

Our study out of 84 CKD patients only 17 patients (20.23%) required dialysis and out of which 13 patients (76.5%) had ocular involvement in form of lid edema, pterygium, 6 (46.15%) hypertensive retinopathy, 3(17.64%) diabetic retinopathy, 1(0.5%) vitreous haemorrhage, 1(0.5%) retinal detachment and 1(0.5%) had branch retinal vein occlusion (BRVO). This could be as dialysis is generally required in severe CKD and ESRD, also dialysis per se causes significant metabolic changes.



**Fig. 4:** Proliferative diabetic retinopathy with retinal detachment

Similar results by B.Malleswari et al,<sup>11</sup> in study of “Eye Findings in Chronic Renal Failure Patients Undergoing Haemodialysis”, included total 64 patients. Pterygium was found in 9 (14%) patients, pinguecula in 2 patients (3%), conjunctival congestion in 4 patients (6%) and cataracts in 24 patients (38%) They also found BRVO in 1(2%) patient. Diabetic retinopathy was found in 20 patients (31%), 13 with NPDR (20%), and PDR in 4 patients (6%), diabetic maculopathy in 3 patients (5%) and glaucomatous optic atrophy in 2(3%) patients. Hypertensive Retinopathy was found in 28 patients (44%). This finding was similar to our study wherein 46.15% had hypertensive retinopathy.

We found a higher association of HTN (54.76%) than Diabetes (10.71%). Navdeep Gupta et al, in their study also noted that the most common systemic association of CKD was hypertension in 51 patients (48.12%) followed by diabetes in 26 patients (24.53%). Similar results were found in study conducted by Dahal P et al.,<sup>9</sup> Ahmed E. Khatatbeh et al.<sup>12</sup>

Our study showed maximum number of patients i.e 29.76% had moderate stage of CKD followed by 21 patients(25%) had mild disease, followed by 20 patients(23.8%) had end stage renal disease and least number i.e 19 patients (22.61%) had severe disease. The study by Dahal P et al.,<sup>9</sup> noted 80 cases of mild stage of CKD(26.67%), 84 cases of moderate stage of CKD (28%), 75 cases of severe stage of CKD (25%) and 61 (20.33%) cases of end stage renal disease. In our study also 25(29.76%) patients had moderate stage of CKD. Study conducted by L Bajracharya et al,<sup>13</sup> and Navdeep Gupta et al.,<sup>9</sup> also showed the similar results.

Our study showed posterior segment findings are more than anterior segment. Whereas, Study by B. Malleshwari et al,<sup>11</sup> found proportion of patients with anterior segment findings was 72%, Posterior segment findings were present

in 59%.

Manjula Devi et al,<sup>14</sup> in her study reported lid edema and conjunctival involvement in 44% and 54% of total cases respectively and most of these findings were associated with severe and ESRD. In our study 10.52% patients with pinguecula had severe stage of CKD, pterygium was present in 4.76% of patients irrespective of stage of CKD. In 3% of patients in ESRD group, corneo-conjunctival calcium deposits were present. 28 cases had cataract.

Anterior segment findings noted in our study were similar to those noted in other studies. However, incidence of anterior segment findings was comparatively less in our study and the findings did not correlate with stage of CKD.

Diabetic retinopathy was seen in 45% of patients of ESRD with ‘p’ value 0.012 which was statistically significant ( $p < 0.05$ ). Devi M, Krishmurthy H. Naik G et al,<sup>14</sup> in their study of 100 patients with CRF, 32 out of 56 diabetic patients (57.14%) with CRF had diabetic retinopathy. 32 (47.06%) patients out of total 68 hypertensives with CRF had hypertensive retinopathy. Both diabetic retinopathy and hypertensive retinopathy were associated with ESRD.

They also noted ARMD in 5 eyes (2.5%), 1eye (0.5%) had Optic neuropathy and 2 eyes had vitreous haemorrhage. In their study 2 (1%) patients had bilateral exudative type of retinal detachment associated with moderate and ESRD and this finding was similar to our study where 1(5%) with serous retinal detachment had ESRD.<sup>14</sup>

Our study showed 61(72.61%) patients had history of hypertension. Of these 61 patients, 56(85.60%) patients had hypertensive retinopathy which was statistically significant ( $P < 0.05$ ). We then graded the hypertensive retinopathy according to stage of CKD and found that grade 3 hypertensive retinopathy (27%) was most prevalent in CKD. Dahal P et al,<sup>9</sup> in his study the grade 3(22.6%) & grade 4(24.59%) hypertensive retinopathy was most commonly seen in severe and end stage chronic kidney disease. The study by Rosu George Mathew et al,<sup>11</sup> found hypertensive retinopathy in 39% of patients, among which 44.1% had grade 1 hypertensive retinopathy. In our study only 15.4% had grade I hypertensive retinopathy.

Out of 84 patients, 26(30.9%) patients had a history of diabetes mellitus. 21(80.76%) patients had diabetic retinopathy. Maximum number had moderate NPDR which was 10.7%. We observed that more severe stages of diabetic retinopathy like severe NPDR and PDR with NVE was noted in later stages of CKD. This correlates with most of the other studies. B.Malleswari et al,<sup>11</sup> in their study noted Diabetic retinopathy in 31% patients. In total 31% of diabetic retinopathy, NPDR was seen in 20%, PDR in 6%. In our study also NPDR was seen in 22.6% patients and PDR in 2.38% of CKD patients.

## 5. Conclusion

Chronic kidney disease is an irreversible multisystem disorder which also involves the eye. Diabetes mellitus and hypertension are two main disorders associated with chronic kidney disease which also leads to impairment of vision. Most of the advanced stages of CKD patients are referred to an ophthalmologist when they develop ocular symptoms. Ocular involvement in CKD patients if not detected early can lead to permanent and irreversible visual loss. Hence, it is necessary to do ocular examination in all CKD patients at an early stage to ensure timely intervention and also to prevent vision loss and ocular morbidities.

## 6. Source of Funding

None.

## 7. Conflict of Interest

The authors declare that there is no conflict of interest.

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