Ocular Findings in Patients with Chronic Kidney Disease: A Hospital Based Cross-Sectional Study

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ABSTRACT

Introduction: Chronic kidney disease affects every organ system including the eye. **Aims:** To study the prevalence of anterior and posterior segment ocular findings in patients with chronic kidney disease. **Methods:** This was a hospital based cross-sectional study conducted among 86 patients of chronic kidney disease of all ages and either gender from June 2024 to November 2024. Standard proforma was used to collect socio-demographic and clinical variables of the patients. Detailed ocular examination including fundus evaluation was done and diabetic retinopathy and hypertensive retinopathy was graded according to the Early Treatment of Diabetic Retinopathy Study (ETDRS) classification and Keith-Wegener-Barker classification respectively. **Results:** The mean age of the study sample was 60.73 (±14.80) years with male preponderance (62.79%). The commonest cause of chronic kidney disease was both (diabetes and hypertension) (45.35%) followed by hypertension (40.70%). The most prevalent anterior segment ocular finding was pingecula (60.47%) followed by eyelid edema (36.05%), cataract (31.40%) and conjunctival pallor (27.91%). Retinopathy (72.09%) was the most prevalent posterior segment ocular finding. Among retinopathy, the prevalence of hypertensive retinopathy, diabetic retinopathy and both retinopathy (hypertensive and diabetic retinopathy) was 51.61%, 30.64% and 17.74% respectively. The prevalence of vitreous haemorrhage, tractional retinal detachment and maculopathy was 1.16%, 2.33% and 9.67% respectively. **Conclusion:** There is high prevalence of ocular findings in the chronic kidney disease. Regular ocular examination is mandatory for early detection and treatment to prevent ocular morbidity and blindness in chronic kidney disease.

Keywords: Chronic kidney disease, Cross- sectional studies, Diabetic retinopathy, Hypertensive retinopathy, Morbidity

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INTRODUCTION

Chronic kidney disease (CKD) is defined as decreased kidney function or presence of kidney damage for three or more months. Chronic kidney disease is an irreversible[1] and progressive process which ultimately results in end stage renal disease. It is associated with several diseases, including hypertension[2] and diabetes mellitus.[3] The eyes are the window to various systemic conditions in the body. The kidney and retina develop during the same embryonic stage around the fourth to sixth week of gestation, thus sharing a strong correlation between eye and kidney diseases.[4] The kidney and eye share developmental, structural, physiological, and pathological pathways.[5-7] Chronic kidney disease affects almost all organs of the body including eyes.[8] The various ocular findings in the chronic kidney disease are lid edema, conjunctival pallor, conjunctival and corneal calcification[9], inflammatory reactions of conjunctiva, episclera,[10,11] pingecula,[12] recurrent subconjunctival hemorrhage, rubeosis iridis, cataract, diabetic retinopathy and hypertensive retinopathy.[13,14] Deterioration of vision in CKD is due to worsening of hypertensive or diabetic retinopathy, ischemic optic neuropathy, central retinal vein occlusion and cortical blindness.[15] Limited studies of ocular findings in chronic kidney disease have been conducted in Nepal. The findings of this study would help for future planning to reduce the burden of ocular morbidities and blindness among CKD patients. The objective of this study was to determine the prevalence of anterior and posterior segment ocular findings in patients with chronic kidney disease.

METHODS

This was a hospital based cross-sectional study conducted in Ophthalmology Outpatient Department (OPD) of Manipal Teaching Hospital, Pokhara, Nepal from June 2024 to November 2024. Ethical approval was taken from the Institutional Review Committee of the Manipal College of Medical Sciences, Pokhara (Reference number: MCOMS/IRC/624). Informed consent was taken from all the patients. The sample size was calculated by using the formula 3.84 pq/d^2 ((Where, n=sample size, p= prevalence=94.05[16] q=100-p=5.95, d= desired level of precision i.e., 5% for this study). The sample size according to this formula was 85.95. Hence, this study was conducted among 86 respondents.

Non-probability convenient sampling method was used for the selection of cases. The inclusion criteria were the patients with chronic kidney disease of all ages and either gender who presented to Ophthalmology OPD or referred from Nephrology Unit of Internal Medicine. Patients of acute kidney injury were excluded from the study. Those patients who do not give consent were also excluded from the study. Predesigned proforma was used to collect the sociodemographic and clinical variables of the patients. Detailed ocular examination was done including recording of visual acuity using Snellen's letter chart or E-chart. Anterior segment was assessed with slit lamp. Fundus examination was done under mydriasis with tropicamide 1% with direct ophthalmoscope and slit lamp biomicroscope using +90D lens. Diabetic retinopathy and hypertensive retinopathy was graded according to the Early Treatment of Diabetic Retinopathy Study (ETDRS) classification[17] and Keith-Wegener-Barker classification[18] respectively.

The entry and analysis of the data was done in Epi-info version 7. The statistical methods used were mean, frequency and percentage.

RESULTS

A total of 86 chronic kidney disease patients were included in this study. Our study showed male preponderance 54 (62.79%) as compared to female 32 (37.21%). The mean age was 60.73 (±14.80) years. The commonest cause of chronic kidney disease was both (diabetes and hypertension) 39 (45.35%) followed by hypertension 35 (40.70%) and diabetes 12 (13.95%). More than half 61 (70.93%) patients were on treatment, 31 (50.82%) drugs and 30 (49.18%) dialysis while 25 (29.07%) were not on treatment. Majority of patients had normal vision 66 patients (76.74%) followed by impaired vision 10 (11.63%) and legally blind 10 (11.63%).

Table I showed that Pingecula 52 (60.47%) was the commonest anterior segment ocular finding followed by eyelid edema 31 (36.05%), cataract 27 (31.40%), conjunctival pallor 24 (27.91%).

Majority of the CKD patients had retinopathy 62 (72.09%). Among retinopathy, hypertensive retinopathy was found in 32 (51.61%), diabetic retinopathy in 19 (30.64%) and both retinopathy (hypertensive and diabetic retinopathy) in 11 (17.74%). The prevalence of vitreous haemorrhage, tractional retinal detachment and maculopathy was 1.16%, 2.33% and 9.67% respectively (Table II).

Table III showed that Grade II hypertensive retinopathy 20 (46.51%) was most prevalent. Table IV showed that out of total of 30 diabetic retinopathy patients, NPDR was noted in 25 (83.33%), PDR in 5 (16.66%). Majority had moderate NPDR 13 (43.33%).

Anterior segments ocular findings	Number (%)
Eye lid edema	31 (36.05%)
Conjunctival congestion	4 (4.65%)
Conjunctival pallor	24 (27.91%)
Pingecula	52 (60.47%)
Pterygium	7 (8.14%)
Rubeosis iridis (NVI)	4 (4.65%)
Cataract	27 (31.40%)
Pseudophakia	14 (16.28%)

Table I: Frequency of anterior segment ocular findings in CKD patients

Posterior segment ocular findings		Number (%)
Retinopathy	Hypertensive retinopathy	32 (51.61%)
	Diabetic retinopathy	19 (30.64%)
	Both retinopathy	11 (17.74%)
	Total	62 (72.09%)
Maculopathy		6 (9.67%)
Vitreous haemorrhage		1 (1.16%)
Tractional retinal detachment		2 (2.33%)

Table II: Frequency of posterior segment ocular findings in CKD patients

Grade of hypertensive retinopathy	Number (%)
Grade I	17 (39.53%)
Grade II	20 (46.51%)
Grade III	6 (13.95%)
Grade IV	0
Total	43 (100%)

Table III: Frequency of hypertensive retinopathy in CKD patients

Classification of diabetic retinopathy		Number (%)
Non-proliferative diabetic retinopathy (NPDR)	Mild NPDR	9 (36.00%)
	Moderate NPDR	13 (52.00%)
	Severe NPDR	3 (12.00%)
	Very severe NPDR	0
	Total	25 (83.33%)
Proliferative diabetic retinopathy (PDR)		5 (16.66%)
Total		30 (100%)

Table IV: Frequency of diabetic retinopathy in CKD patients

DISCUSSION

In this study, the mean age of the study sample was 60.73 years. Different other studies noted the mean age of patients as 45.2 years, 55.9 years, 48.3 years and 50.95 years.[19,20,21,23]

In the current study, male had more prevalence of chronic kidney disease (CKD) as compared to female. Similarly, other studies also supported this finding.[16,19,20,21] However, two different studies noted CKD was high in female.[22,23] This variation may be explained by differential distribution in risk factors (e.g. genetic predisposition, dietary factors and lack of physical activities). High prevalence of CKD in male could be because the kidney function in males have faster rate of deterioration.

76.74% of the total cases had normal vision. Different other studies also noted the similar findings.[19,20,21,23] However, vision is not only the indicator of the ocular status even in the severe form of diabetic retinopathy and hypertensive retinopathy may have normal vision until macula is involved.[24] In our study, the prevalence of eyelid edema was 36.05%. Our results showed higher prevalence of eyelid edema than reported in Maharashtra, India (2.38%)[16] and Kerala, India (3.5%).[20] However, our study noted lower prevalence of eyelid edema than reported in Bharatpur, Nepal (60.67%)[19] and Kathmandu, Nepal (63.0%).[21] The possible cause of eyelid edema might be deranged renal function which prevents efficient excretion of salt and water from the body thus causing retention.[20] The fluid retention leads to generalized swelling comprising of pedal edema, facial puffiness and lid edema. In the present study, the prevalence of conjunctival pallor was 27.91%. Two studies conducted in India and Nepal showed the high prevalence of conjunctival pallor as 56.9% and 75.6% respectively.[20,21] Conjunctival pallor might be due to low haemoglobin level in chronic kidney disease patients.

The prevalence of cataract was 31.40% in our study. Different other studies found the prevalence of cataract as 13%, 18% and 61.4% respectively.[19,21,23] The possible cause of cataract might be due trapping of urea in the lens with subsequent chronic accumulation and development of an osmotic cataract.[25] The other mechanism can be due to oxidative stress in CKD patients may lead to carbamylation of lens protein.[26]

This study showed the prevalence of pingecula as 60.47%. Our study found the high prevalence of pingecula than reported in India (12.2%),[20] Bharatpur, Nepal (30.67%)[19] and Kathmandu, Nepal (39.4%).[21] Pingecula might be related to inflammatory reactions of conjunctiva which is associated with an increase in calcium.[26]

Our study showed that majority of chronic kidney disease patients had retinopathy. Among retinopathy, the prevalence of hypertensive retinopathy was high followed by diabetic retinopathy and both retinopathy (hypertensive and diabetic retinopathy). The studies conducted in Nepal, India and Bangladesh also showed the similar finding as ours.[19,20,28] However, one study conducted in Kathmandu, Nepal found that the prevalence of diabetic retinopathy was high.[21] The high prevalence of hypertensive retinopathy could be due the effects of retained nitrogen products.

In our study, among hypertensive retinopathy patients, Grade II hypertensive retinopathy was most prevalent. Many other studies have supported this findings.[20,28,29] However, two different studies conducted in Bharatpur, Nepal and Kathmandu, Nepal showed high prevalence of grade I and grade III hypertensive retinopathy respectively.[19,21]

We found that the prevalence of Non- proliferative diabetic retinopathy (NPDR) was more than Proliferative diabetic retinopathy (PDR) and among NPDR, the prevalence of moderate NPDR was high. Different studies have also found the similar findings.[19,21] However, two different studies have showed the high prevalence of mild NPDR.[20,29]

LIMITATIONS

The causal association could not be measured due to cross-sectional design of the study. The result of this study could not be generalized as this is a single hospital based study. Hence, further large scale analytical study in different centers with large sample size is required.

CONCLUSION

There is high prevalence of anterior and posterior segment ocular findings in chronic kidney disease patients. There is a need to educate the chronic kidney disease patients about need to have regular ocular examination for the early diagnosis and treatment of ocular abnormalities to prevent ocular morbidities and blindness. The study recommends holistic management of chronic kidney disease patients jointly by physician, nephrologists and ophthalmologist to improve the quality of life.

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