Journal of Clinical and Biomedical Sciences

Original Article

# Ocular abnormalities in patients with chronic renal failure on haemodialysis: A study from a rural tertiary care teaching institute.

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**Abstract**

**Background**: Chronic Renal Failure (CRF) affects every organ system, including the eye. Potential vision-threatening ocular complications among patients with CRF can lead to irreversible visual impairment.

**Aims**: We assess and report ocular abnormalities in patients with chronic renal failure on hemodialysis in a rural setup.

**Settings and Design**: This is a cross-sectional hospital-based study conducted in a rural tertiary care institute.

**Methods and Material**: One hundred twenty subjects undergoing dialysis in our institute for a period of 2 years were included in the study by convenient sampling.

**Statistical analysis used**: Data were analyzed using Microsoft excel and represented using mean, standard deviation, ratio, and percentages.

**Results**: Among the subjects, 16.7% of total eyes had vision <6/60, and 35% had < 6/24. The causes for visual impairment were maculopathy in 31 eyes, cataract in 20 eyes followed by proliferative diabetic retinopathy in 11 eyes. Lid edema was present in 22.5%, conjunctival pallor in 30.8%, and corneal calcification in 2.4% of total eyes. Retinopathy was the most important finding. Hypertensive retinopathy was present in 93 out of a total of 120 patients (98%). Diabetic retinopathy was present in 49 out of 85 diabetic subjects (72.3%). Seventeen out of 93 patients of hypertensive retinopathy and 11 out of 49 subjects of diabetic retinopathy were detected for the first time.

**Conclusions**: This study highlights the importance of ocular examination in patients with metabolic disorders like Diabetes and Hypertension. Vision threatening complications in CRF patients were detected easily without any complicated procedures and any cost. And even screening was possible in bedridden patients. In this study, the patient was recognized to have the renal disease by looking at the ocular abnormalities and was referred to a physician in the same visit. This signifies easy accessibility of changes in the eye, to know disease in the other organs like kidney.

**Keywords**: Chronic renal failure, retinopathy, corneal calcification, haemodialysis.

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Conflict of Interest: None
Financial Aid: Nil

## Introduction

Chronic renal failure (CRF) is an irretrievable and continuing process that results in an end-stage renal disease where the patient has to be dependent on heamodialysis/ renal replacement therapy for survival.[1-2] The most common cause of CRF is diabetic nephropathy, followed by hypertensive nephroangiosclerosis. Pathological changes of many organs could be the consequences of these diseases and/or dialysis per se. Association of

blindness with the renal disease was found much earlier in 1836 by Richard Bright.[2] Chronic renal failure patients have had a wide range of ocular findings like lid edema, Xanthelasma, corneal and conjunctival calcifications, Pinguecula, dry eye, recurrent subconjunctival hemorrhage, Rubeosis iridis, early cataract.[2-4] Important vision-threatening ocular conditions related to chronic renal failure are retinopathy, central retinal vein occlusion,branch vein occlusion, glaucomatous optic atrophy, and neovascular glaucoma, more commonly seen with limited chance of treatment.[4]

Retinal microvascular abnormalities are common because hypertension and diabetes account for more than half of all patients with renal failure and also represent "traditional" risk factors for macro and microvascular diseases.[4-7] In this rural setup, the commonest causes for chronic renal failure are uncontrolled Diabetes and Hypertension. Since the compliance for dialysis is also good, screening for ocular abnormalities in these patients can provide useful information on causes for deteriorating eyesight in progressing stages of Renal failure.

A literature search shows the paucity of studies focusing on ocular abnormalities in CRF patients among the South Indian population. Hence this study has been carried out to screen patients reported to rural tertiary care institute for any potential visual threatening condition associated with CRF of metabolic causes. So that necessary treatment and or advice can be given before they become irreversibly visually impaired.

## Material and Methods

This cross-sectional study was conducted among patients with chronic renal failure on hemodialysis in a rural tertiary care institute catering to the population of tri-states of South India (Andhra Pradesh, Karnataka, and Tamil Nadu).

The sample size was calculated considering the prevalence of visual impairments in CRF patients on dialysis reported in a similar descriptive study which was 33% and a precision of 8.5%.[2] One hundred and twenty patients with chronic renal failure who were on haemodialysis during the period of 2 years from October 2012 to September 2014, were included.

**1. Inclusion Criteria**

Previously diagnosed patients of type 2 diabetes mellitus, hypertensive, dyslipidemia with Severe chronic renal failure and end-stage renal disease on hemodialysis aged between 25 years to 70 years were included.

**2. Exclusion Criteria**

Hereditary causes of CRF**,** reversible causes of renal failure**,** patients with renal transplants were excluded.

**Procedure:** Ethical clearance was obtained from the Institutional Human Ethics Committee. After taking informed consent, patients from the dialysis room who had undergone basic renal profile investigations were included in the study. Following investigations were the baseline workup for involving the patients into the study, like

(1) Hemoglobin with complete blood count (CBC)
(2) Serum urea, serum creatinine, 24-hour urinary creatinine, and urinary volume,
(3) Serum electrolytes,
(4) USG abdomen,
(5) Urine routine and microscopic examination and
(6) lipid profile. These pupils were subjected to de Tailed examination, i.e., history, general examination, and systemic examination.

The ocular examination consisted of 1. Best Corrected Visual Acuity recorded (BCVA). 2. Intraocular pressure 3.Examination of the anterior and posterior segment. The pupil was dilated with Tropicamide for Indirect ophthalmoscopy with a 20 diopter lens. Diabetic retinopathy and hypertensive retinopathy were classified based on Early Treatment Diabetic Retinopathy Study Classification and Keith-Wagener classification, respectively.

Data were analyzed using Microsoft excel software and represented as mean, standard deviation, ratio, and percentages.

## Results

In the present study, the mean age was 51.64 years, with a standard deviation of 5.40 years. 42.5% of the patients in this age group of were males (Male to Female ratio (1.84:1).

The proportion of patients undergoing dialysis for more than six months, less than six months, and the first time were 58.4%, 32.5%, and 9.1%, respectively. Among these patients, blurring of vision (Decrease in good vision) was the most common symptom, as 36% of them presented with significant vision loss. Patients with Good vision (> 6/18) were about 68.3%, Impaired vision (6/60-6/24) was about 18.3%, Legally blind (<6/60) were 16.7%.

This study showed Maculopathy (12.9%) as the most prevalent cause for visual impairment, followed by Cataract (8.3%), Proliferative Diabetic Retinopathy (4.6%), Corneal scars (2.1%), Retinal detachment (1.7), Optic neuropathy (0.8%), and others like age-related macular degeneration and vitreous

hemorrhage in 1.7% patients.

In this study, 35 patients were Hypertensive, and 25 patients had Diabetes Mellitus type II. 60 patients had coexisting Diabetes Mellitus type II and Hypertension. Seventeen hypertensive patients and 11 diabetes patients reported first to the ophthalmology department with visual complaints and then were referred to the nephrology unit. Out of 85 Diabetic patients, 62 had Diabetic retinopathy of different grades.

Vital anterior segment signs were lid edema 22.5%, causing significant pain and hindering vision. 30.8% of eyes had conjunctival pallor, 8.3 % with dry eye, 2.5% of eyes had corneal calcification with substantial visual loss. Other findings like Pinguecula 3.7%, Pterygium 0.8%, red eyes 5.8%, and Cataract 5% were also found.

**Table 1: Number of eyes with different grades of hypertensive retinopathy.**

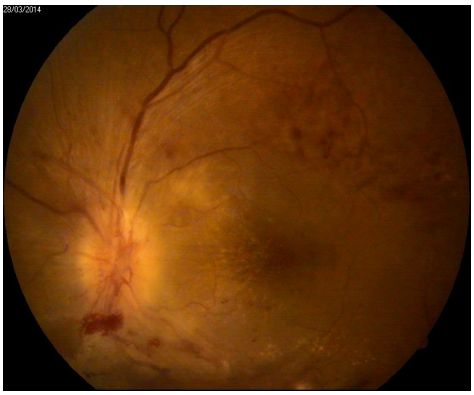
| Hypertensive Retinopathy Grades | Number of eyes(N=93) |
|---|---|
| I | 15 |
| II | 36 |
| III | 36 |
| IV | 06 |

**Table 2: Number of eyes with different grades of diabetic retinopathy.**

| Diabetic Retinopathy Grades | Number of eyes (N=83) |
|---|---|
| Mild | 13 |
| Moderate | 13 |
| Severe | 11 |
| Very Severe | 12 |
| Proliferative Diabetic Retinopathy | 7 |
| Proliferative Diabetic Retinopathy with High Risk Characters | 4 |

**Figure 1**: Proliferative diabetic retinopathy with grade III hypertensive retinopathy (mixed retinopathy).

**Figure 2:** Grade IV hypertensive retinopathy with disc edema



## Discussion

Patients with end-stage renal disease undergoing haemodialysis represent a specific group of patients who have more than one disease and, therefore, should be carefully examined. It involves every organ system, including the eye. Both vision threatening and non vision-threatening eye complications are seen.[9]

Ocular complications like retinopathy, which are microvascular complications, are innocuous in onset, progressively destructive in their course, and are remediable only to a point. Unfortunately, most often, they are symptomatically evident, only after considerable damage has occurred, and restoration of anatomical and physiological function is impossible. [10, 11]

Different studies were done by Bajracharya L, et al. Malleshwari, et al. and Mithun et al. revealed HTN as the major cause of CKD.73% of patients who gave a history of CRF for less than one year. 57% of patients have never had an eye check-up before. Only 43% had a previous history of ocular

examination, which showed the lack of awareness about the associated ocular complications. Higher percentage of patients in ESRD (64.7% compared to 38% in the moderate group) had an eye check-up in the past, which indicates ocular problems associated with advancing renal disease.33% of the total eyes had visual acuity of less than 6/18. [2,7,12]

Here it should be noted that patients above 45 years are more prone to develop metabolic disorders like diabetes mellitus and Hypertension, which leads to nephropathy and deteriorates to end-stage of chronic renal failure, so the ocular abnormalities. In the present study, male preponderance was seen. The reason for this could be due to a faster rate of deterioration of kidney function in males with some forms of glomerulonephritis and polycystic kidney disease. Arteriolar hyalinosis, which occurs as a physiological change with the advancement of age and its association with hypertension leads to capillary closure downstream and pathological changes in retinal and renal vasculature.[13, 14] This is enhanced in Diabetes Mellitus. Hence this study confirms a close relationship between renal dialysis, Diabetes Mellitus, Hypertension, and life span of patients in chronic renal failure. This also shows ocular changes, which lead to ocular complications. In this study duration of diabetes mellitus and hypertension ranged from one year to 20 years, and the duration of visual loss ranged from one week to ten years. Even with advanced Diabetic Retinopathy and Hypertensive Retinopathy, it may have good central vision until macula is involved.[15, 16] In this study, 20 out of 36 grades III Hypertensive Retinopathy and 4 out of 12 very severe Non-Proliferative Diabetic Retinopathy had quite good vision, but they were at risk of visual loss.

Hypertensive retinopathy was the most common (98%) finding and was more prevalent as the renal disease progressed, also with the duration of Hypertension. 4 out of 6 eyes with grade IV Hypertensive Retinopathy presented first with visual complaints, evaluated further and were known to have End-Stage Renal Disease.

70% of total Diabetics in the study had Diabetic Retinopathy. Eleven cases presented first to our unit with visual complaints with visual threatening grades of Diabetic Retinopathy. This signifies that Diabetic Retinopathy is invariably present in cases of diabetic nephropathy and that more severe forms of retinopathy are detected as the renal disease progresses.

The severity of diabetic retinopathy, Hypertension is seen due to the unique histological structure and metabolic activity of the retina, which is susceptible to noxious stimuli resulting from hypertensive and uremic changes of diabetic nephropathy in chronic renal failure and renal dialysis.[16, 17]

Metastatic calcification occurs as a result of biochemical abnormalities of calcium and phosphate. In patients with chronic renal failure, it is usually a consequence of secondary hyperparathyroidism.[18] Common ocular sites of calcium deposition include the conjunctiva (a cause of red eyes in renal patients), and Bowman's membrane (band keratopathy). Posterior segment calcification is less common and tends to affect the sclera and choroid. Theoretically, the patient's ischemic fundal changes may be attributed to both hypertensive retinopathy and the extensive deposition of calcium in the retinal arterioles.[19,20]

Ocular complications are still not reduced in spite of newer advances in the treatment of diabetic retinopathy and end-stage renal disease. This is due to the longevity of patients with chronic renal failure and the advancing stages of the disease. It requires a thorough biochemical and renal workup for the management of diabetic retinopathy and its complications.[21, 22]

In this study, all the ocular complications were adequately studied and documented. A vision-threatening complication in CRF patients was detected easily without any complicated procedures and any cost. This was even possible in unstable patients. In this study, the patients were recognized to have renal disease, by looking at the ocular abnormalities and was referred to a physician in the same visit. This signifies easy accessibility of changes in the eye to know the severity of the conditions like microvascular disease in other organs.

The limitation of this study is that it is not a prospective study. This study did not identify any previously undiagnosed hereditary renal disease based on the retinal features, possibly because the renal diagnosis was likely to be known by adulthood, many abnormalities in acquired disease resolve after the presentation, and some diagnostic abnormalities are demonstrated only with peripheral retinal photographs or special techniques such as optical coherence tomography.

In conclusion, moderate-severe microvascular retinopathy, proliferative diabetic retinopathy, and grade 3 to grade 4 hypertensive retinopathy are more severe, and vision-threatening as the CKD progresses from stage 1 to ESRD. Early recognition, monitoring, and intervention will result in a better visual outcome for these patients. Regular interventions in the form of laser therapy, intravitreal injections can halt the worsening of vision loss (retinopathy), and monitoring can prevent complications.

Early referral of patients with chronic kidney disease may bring a retinal lesion to surface. An ophthalmologist's intervention and appropriate management of which may prevent loss of vision. Care of CRF patients is a demanding task and requires intense attention to multiple details. In addition to members of the dialysis team, representatives of other specialties (for example, vascular surgery, neurologist, and utmost ophthalmologist) are needed.

CRF patients should be educated about disease progression and told the importance of ocular examination. Patients should be periodically screened and detect the ocular abnormalities at the treatable stage and effectively treated with all possibilities to preserve good vision. It should be done with the dedication of the patient and ophthalmologist.

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