

Ocular findings in the chronic renal failure

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ABSTRACT

BACKGROUND

The aim of the study was to evaluate the ocular signs in chronic renal failure (CRF) in diabetes and hypertensive patients.

MATERIALS AND METHODS

Two hundred and thirty eight cases were enrolled in the study from the nephrology unit of College Of Medical Science, Bharatpur, Nepal and examined in the department of Ophthalmology. The study duration was carried out over 2 years from January 2011 to December 2012.

RESULT

The number of cases in each grade of CRF were mild 80 (26.67%), moderate 84 (28%), severe 75 (25%), end stage renal disease 61 (20.33%). In all the groups the commonest cause of CRF were Hypertension(HTN) 123 out of 300(41%) and diabetes 98(32.67%). The commonest ocular symptoms in CRF was blurring of vision 68%.

CONCLUSION

Many important ocular findings like vitreous haemorrhage, retinal detachment, neovascular glaucoma and cataract are the presentation in chronic renal failure, which can cause marked vision loss. Hence proper awareness should be provided to the people in time to prevent these ocular complications.

Keywords: Chronic renal failure, End stage renal disease, Hypertension, Diabetes.

INTRODUCTION

Hypertension and diabetes are common systemic diseases in out-patients and are known to cause many pathological changes in the eye. A thorough ocular examination can uncover ocular findings of the disease processes and thus prevent further damage leading to visual impairment. The ophthalmoscope which was invented by Hermann von Helmholtz¹ in 1850 allowed for the clinical correlation of retinal changes with many systemic diseases such as hypertension, diabetes mellitus, hyperlipidemia, thyroid disease, vascular disease and systemic infection.² Although ocular signs are not disease specific (signs seen in hypertensive patient are also seen in Diabetic patient), early recognition of these signs can help to prevent the unnecessary vision threatening blindness.³ Among many ocular changes associated with systemic diseases, this article focuses on the retinal findings associated with the common diseases diabetes mellitus and hypertension.⁴ Chronic renal failure is an irreversible and progressive process that results in end stage renal disease (ESRD) where patient has to be dependent on renal replacement therapy for survival.⁵ Chronic renal failure affects every organ system including eye. Deterioration of eyesight is due to worsening of hypertensive or diabetic retinopathy.⁶ Various ocular findings are related to renal like the lid oedema, conjunctival pallor and xanthelasma which is associated with increased serum lipids. Conjunctival and corneal calcification may occur due to hyperparathyroidism.⁷ Inflammatory reactions of conjunctiva and episclera can be associated with sudden, marked rise in serum calcium.^{8,9} Conjunctival degenerative changes e.g. pinguecula are more frequently seen in CRF.¹⁰ Goblet cell density is decreased.⁹ Recurrent subconjunctival hemorrhage can occur in sclerosed conjunctival vessels secondary to HTN.¹⁰ Rubeosis iridis and neovascular glaucoma occur due to posterior segment pathology which are less common than these anterior segment

findings but are dreadful. Rising concentration of intracellular calcium might contribute to early cataractogenesis and calcium deposition in lens.

Hypertensive retinopathic changes are particularly severe in renal failure. This has been attributed to the effects of retained nitrogen products.¹¹ Accelerated hypertension can result in optic disc edema.¹² The ophthalmic appearance is of value in determining the efficacy of the antihypertensive therapy.¹³ The retina is accessible to monitor status of blood pressure control.¹¹ Blindness due to proliferative retinopathy or maculopathy is approximately five times more common in diabetic patients with nephropathy compared with normoalbuminuric patients.¹⁴ Diabetic retinopathy (DR) tends to deteriorate with falling renal function, poorly controlled blood pressure^{15,16} and in patients without any retinal treatment given before.^{17,18} Several cases of bullous retinal detachment have been reported in CRF which could be from deranged metabolism, uncontrolled blood pressure and retinal pigment epithelium dysfunction.^{19,20} Both anterior and posterior optic neuropathy can occur in CRF. When haemoglobin level falls below 5gm%, retinopathic features like retinal haemorrhage, hard and soft exudates, and pallor of optic discs (ischemic optic neuropathy) could be present. The retinal arterioles look pale, the veins distended. Retinopathy is often asymptomatic in its most treatable stage; delay in diagnosis can result in significant increase in the patient's risk of vision loss.^{21,22} Ocular condition is also an indicator of the metabolic control of the disease process.²³ Many times an unknown case of chronic renal failure, with its ocular complications, may first present to an ophthalmologist. This study is an attempt to assess the ocular status/complications associated with CRF and also to highlight the importance of ocular examination, to screen patients for any potential visual threat so that necessary treatment and/or advice can

be given at the proper time before irreversible visually loss can occur.

METHODOLOGY

The study was done in the ophthalmology department of College of medical Sciences and Teaching Hospital, Bharatpur-10, Chitwan. Cases who were diagnosed as CRF in the Nephrology department were included and informed consent was taken from each patient. Cases of reversible renal failure were excluded. A non interventional descriptive hospital based study was conducted for 24 months from January 2011 to December 2012 All the cases diagnosed with CRF was included and cases of reversible renal failure were excluded for the study. A Cross sectional, non-interventional, descriptive, hospital based was conducted. Cases that had undergone following investigations were collected: (1) hemoglobin, total leukocyte count, differential leukocyte count, erythrocyte sedimentation rate, (2) serum urea, serum creatinine, 24 hour urinary creatinine and urinary volume, (3) serum calcium, (4) serum phosphate, (5) serum electrolytes, (6) USG abdomen, (7) urine routine and microscopic examination and (8) lipid profile. These investigations are performed biochemistry laboratory of college of medical science. Glomerular filtration rate (GFR) was calculated using the formula UV/P where $U=24$ hour urinary creatinine, $V=24$ hour urinary volume and $P=$ serum creatinine.^{24,25} Cases were classified as mild, if GFR is between 30-50 ml/min; moderate if between 10-29 ml/min; severe if less than 10 ml/min and ESRD if GFR is less than 5ml/min. Systemic history was taken from cases. General examination and systemic examination was done and recorded.

Also ocular examination of the cases in ophthalmology opd of nephrology department was done. History taking and best corrected visual acuity was recorded, intraocular pressure was measured, detail examination of anterior and posterior segments was done. Pupil was dilated with tropicamide for (a) Indirect ophthalmoscopy with 20 diopter lens followed by (b) evaluation under slit lamp with 90 diopter lens. Hypertensive retinopathy (HR) was graded on the basis of Keith and Wagener classification. DR and macular edema was classified on the basis of early treatment diabetic retinopathy study. Other investigations were done according to need like (i) fundus fluorescein angiography, (ii) goldman perimetry (iii) fundus photography (iv) Schirmer tests.

RESULTS

Three hundred patients were included from the Nephrology unit of COMS. The no of cases in each grade of CRF were mild 80 (26.67%), moderate 84 (28%), severe 75 (25%), ESRD 61 (20.33%) cases. While the male female ratio was 2.5:1 and the mean age was 45.2+-13.8 years. The commonest cause of CRF was HTN 123 (41%) and diabetes 98(32.6%) out of 300 cases. Seventy eight percent of the patients gave the history of CRF within one or less than one year. Most important ocular symptoms in CRF were blurring of vision 68%, most of it was gradual 44% in nature. Other symptoms were foreign body sensation 31%, red eye 13.2%. Most of them did not have previous eye checkup, as there was no mark diminution of vision was 51.2%. Only 31% of cases had detailed eye check up including fundus evaluation in the past. Ocular findings in patients with CRF are shown in different tables given below.

Table 1: Best corrected visual acuity in the eyes among different grades of CRF

		Mild CRF	Moderate CRF	Severe CRF	ESRD	Total	% of Total eyes
Good vision	>6/18	52	59	43	39	193	64.33
Impaired vision	6/24 to 6/60	18	14	08	16	56	18.6
Legally blind	<6/60	10	11	24	06	51	17.0
		80	84	75	61	300	

Table 2: Causes of visual impairment (% of the cases out of 300 cases)

Cataract	15
Maculopathy	08
PDR(Proliferative Diabetic Retinopathy)	04
Optic neuropathy	07
Corneal opacity	0.6
Others	12
Total	46.6

Table 3: Comparison of anterior segment findings related to CRF in different grades of the disease

Gradings ocular findings of CRF	Mild (80cases)	Moderate (84 cases)	Severe (75 cases)	ESRD (61 cases)	Total (300 cases)
Lid odema	37	41	50	54	182(60.67%)
Conjunctival congestion	31	43	44	32	150(50%)
Pinguecula	21	17	32	22	92(30.67%)
Red eyes	08	07	10	04	29(9.67%)
Dry eyes	15	05	14	07	41(13.67%)
Cataract	10	13	05	11	39(13%)

Table 4: Comparison of posterior segment findings in different grades of CRF

Gradings ocular findings of CRF	Mild (80cases)	Moderate (84 cases)	Severe (75 cases)	ESRD (61 cases)	Total (300 cases)
Vitreous hemorrhage	2	12	6	14	34(11.3%)
Diabetic proliferative vitreoretinopathies changes	1	8	4	7	20(6.6%)
Hypertensive retinopathy	14	23	35	42	114(38%)
Diabetic retinopathy	28	23	18	20	89(29.6%)
Maculopathy (diabetic or HTN)	15	17	21	11	64(21.33%)
Bullous retinal detachment	-	-	2	5	7(2.33%)
BRVO	-	-	4	3	7(2.33%)
Optic atrophy	5	3	3	10	21(7%)
Papilloedema	-	5	7	13	25(8.33%)
Glaucoma suspect	2	4	3	1	11(3.67%)

Table 5: Comparison of grades of hypertensive retinopathy (HR) with CRF

Gradings ocular findings of CRF	Mild (80cases)	Moderate (84 cases)	Severe (75 cases)	ESRD (61 cases)	Total (300 cases)
I	7	14	6	12	39
II	3	4	10	11	28
III	1	4	17	15	37
IV	3	1	2	4	10
Total cases with HR	14	23	35	42	114

Table 6: Comparison of grades od diabetic retinopathy (DR) among subgroups of CRF

Gradings of DR	MildCRF (28)	Moderate CRF (23)	Severe CRF (18)	ESRD CRF (20)
Mild	13	5	2	3
Moderate	3	7	5	8
Severe	4	3	4	3
Very severe	5	2	1	1
PDR	3	2	4	2
HR PDR	0	4	2	3
Total cases with DR	28	23	18	20

DISCUSSION

Male to female ratio was 2.5:1 which is similar to world wide data.^{1,4} This may be because kidney function in males have faster rate of deterioration. Whereas in the study conducted by CE Mc Avoy and G Silvestri about retinal changes associated with type 2 glomerulonephritis in female have more retinal changes than in male, the reason could be the electron dense deposits, found in the spleen, choriocapillaris, and Bruchs membrane of the eye and also by the fact that the disease has a tendency to recur in allografts²⁷. 64.33% of the total cases had visual acuity of >6/18. However, visual acuity is not the only indicator of ocular status because in the severe form of diabetes and hypertension there is good central vision if the macula is healthy.²⁸ Our study shows 8 patients of grade IV HR were at risk of vision loss. Different centers show blindness in CRF to be from 5-15% in the first year of diagnosis which was similar to our study. Limitation of this study was renal transplantation which is linked with visual deterioration. There is no control group in the present study. Cataract was the main cause of visual

loss which was seen in cases (15%). Maculopathy caused visual impairment of eyes in cases (8%). Most patients had symptoms of blurring of vision (68%) but due to lack of knowledge did not go for eye checkup. 52% of ESRD cases had eye check up in the past compared to 21% of cases in mild group. Lid puffiness 182(60.6%) and conjunctival congestion 150(50%) were present in patients which were statistically significant (p value<0.05). Corneal calcification was seen in ESRD cases. Calcification in the temporal and nasal side did not affect the vision.^{19,20} The correlation of the soft tissue calcification with the duration of hemodialysis was positive.^{29,30} Most of the patients (72%) in our study had CRF diagnosed for one year or less which could explain our result. Mean intra ocular pressure in patients of CRF was 14 mmHg + 2.4 mmHg. In a study done in Italy,³¹ average IOP of CRF patients was slightly less than the control group 14.9 mmHg +2mmHg versus 15.6 mmHg+1.9mmHg with P=0.07. 38% of total patient had HR which is more prevalent with progressive renal disease. The findings correlated well with other studies.³² Grade IV HR was present most in ESRD. 90.2 % of total diabetics in

the study had DR³³. Mild DR was mostly seen in mild CRF group but moderate, severe and PDR (proliferate diabetic retinopathy) were seen in higher grades of CRF. Although not statistically significant because of randomly taken sample size, these data supports previous studies^{15,34-36} that DR is invariably present in cases of diabetic nephropathy and that more severe forms of retinopathy are detected as renal disease progresses. Overall, 64 cases had clinically significant macular edema, most of which (52cases) were related to DR and only 12 cases were associated with HR. All types of maculopathy –focal (21 cases), diffuse (16 cases) and chronic (15 cases) were detected. There was one case of bilateral bullous, exudative type of retinal detachment in a patient with severe grade of renal disease, 7 cases of grade III HR and all 10 cases of grade IV HR were detected for the first time during this study. Grade III and IV HR have bad prognosis and this may alert the physician for more aggressive management of the blood pressure. Among newly diagnosed DR, there were 5 PDR, 4 severe and 3 very severe DR cases, all never treated before. Several patients from the study received urgent laser treatment in the retina.⁴¹⁻⁴³ Nine cases underwent successful cataract surgery.

CONCLUSION

Ocular complications can be detected after detail ocular examinations of patients with CRF. Early detection and treatment prevents morbidity in them. Awareness is needed for early check up in these patients.

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Dahal P. *et al.*, *Ocular findings in the chronic*.....

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