

OCULAR MANIFESTATIONS IN PATIENTS WITH CHRONIC KIDNEY DISEASE- A HOSPITAL-BASED STUDY

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ABSTRACT

BACKGROUND

Chronic kidney disease affects every organ system including the eye.

The aim of the study is to conduct a thorough ocular examination and to study the occurrence of various ocular manifestations exhibited by patients with chronic kidney disease and to analyse the findings.

MATERIALS AND METHODS

100 patients from Department of Nephrology, Stanley Medical College diagnosed with chronic kidney disease were examined for ocular manifestations at the Department of Ophthalmology, Stanley Medical College. This is a cross-sectional, descriptive, non-interventional, hospital-based study. The period of study was from August 2010 to October 2011.

RESULTS

The commonest cause of CKD was hypertension in 47 pts. (52.2%) followed by both diabetes and hypertension in 30 patients. Patients with only diabetes were 6 patients (6.7%) and with other causes were 7 patients (7.8%). 10% of patients were legally blind with visual acuity <6/60. In this study, 65 patients belonged to less than 50 years. 49.3% of the presenile patients had cataract. A reduced Schirmer's value was noted in 54 eyes of the 200 eyes. The incidence of ocular surface disease in the study was 27%. 92 eyes out of 200 eyes studied showed hypertensive retinopathy. Higher grades of hypertensive retinopathy was more in advanced stages of CKD, i.e. 24 eyes in stage IV and 23 eyes in stage V. 51 eyes out of 40 diabetics showed diabetic retinopathy changes of which a majority of 25 eyes belonged to stage V disease. Prevalence of diabetic retinopathy in CKD patients is significantly more when compared to diabetic patients without CKD.

CONCLUSION

Study demonstrates that routine ocular evaluation is necessary in all patients with chronic kidney disease irrespective of the presence of ocular symptoms. It also highlights the occurrence of a variety of treatable ocular manifestations, which can become vision threatening if not taken care of at the earliest.

KEYWORDS

Chronic Kidney Disease, Diabetic Retinopathy, Hypertensive Retinopathy.

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BACKGROUND

Chronic Kidney Disease (CKD) is a worldwide health problem. There is a rising incidence of renal failure due to chronic kidney disease and this phenomenon is common in both the developed and underdeveloped countries. There is

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a significant mortality and morbidity associated with this condition and it drastically reduces the quality of the patient's life. Normal functions of the kidneys can be affected by a variety of diseases and medical conditions. These cause a reduction in GFR, metabolic imbalances and retention of harmful waste products.¹A majority of patients progress to end-stage kidney disease and may require dialysis or renal transplantation. Chronic kidney disease leads to a lot of systemic effects that affects a variety of systems in the body.²The eye also shows changes due to longstanding kidney disease. Some systemic diseases such as diabetes, hypertension and autoimmune disorders affect the kidneys as well as the eye.³Ocular manifestations may arise as a result of the primary diseases causing renal

failure or as a result of the secondary effects of renal failure itself. It is thus very difficult to ascertain whether the systemic effects are due to the disease, which caused the renal failure or secondary to the changes caused by the kidney disease unless the patient is monitored continuously throughout the course of the disease.

Stages of CKD- The Kidney Disease Outcomes Quality Initiative (K/DOQI) guidelines have classified chronic kidney diseases into five stages.

Stage 1- Normal or increased Glomerular Filtration Rate (GFR), but some evidence of kidney damage reflected by microalbuminuria/proteinuria, haematuria or histological changes.

Stage 2- Kidney damage with a mild decrease in GFR (60-89 mL/min./1.73m²).

Stage 3- Moderate decrease in GFR (30-59 mL/min./1.73m²).

Stage 4- Severe decrease in GFR (15-29 mL/min./1.73m²).

Stage 5- is when renal replacement therapy in the form of dialysis or transplantation has to be considered to sustain life.

MATERIALS AND METHODS

This is a cross-sectional, descriptive, non-interventional, hospital-based study. The period of study was for 15 months from August 2010 to October 2011. Patients presenting to Department of Nephrology, Stanley Medical College diagnosed with chronic kidney disease were examined for ocular manifestations at the Department of Ophthalmology, Stanley Medical College. 100 patients were enrolled in this study.

Importance of ocular evaluation were explained to the patients. Evaluation procedures were explained and an informed consent was obtained. After obtaining consent, 200 eyes of the enrolled patients were examined thoroughly. Results of blood and urine investigations performed at Nephrology Department were collected.

The following ocular evaluation was conducted.

1. Relevant ocular history.
2. Best corrected visual acuity.
3. Detailed slit-lamp examination of anterior segment.
4. Posterior segment evaluated with indirect ophthalmoscope and slit-lamp biomicroscopy using 90D.⁴ Hypertensive retinopathy if present was graded using Keith, Wagner and Barker classification and diabetic retinopathy was graded using ETDRS system.
5. Intraocular pressure was measured with Goldman applanation tonometer.
6. Visual field analysis was done when indicated using Octopus perimeter.
7. Schirmer's test using Whatman filter paper strip.

The results thus obtained were analysed and tabulated.

Inclusion Criteria

1. All stages of chronic kidney disease.
2. Renal transplant recipients.
3. Duration of renal disease for more than 3 months.
4. Age group between 20 years to 70 years.

Exclusion Criteria

1. Cases with renal disease of unknown aetiology.
2. Cases with acute fulminant disease.
3. Cases with known pre-existing ocular disease.

RESULTS

The age distribution in the study group was more or less even with the patients in the age group of 30-39 slightly more than the rest. Mean age of the patients with chronic kidney disease is 44.2. Male patients formed 72% of the total patients in the study group. The average male:female ratio was 2.6:1.

Out of 100 patients, 90 had CKD in various stages and 10 belonged to postrenal transplant group. The sample size in each grade of CKD showed more patients in stage 5 (31%) and stage 4 (21%) followed by stage 3 (19%), stage 1(10%) and stage 2 (9%).

The commonest cause of CKD was hypertension in 47 pts. (52.2%) followed by both diabetes and hypertension in 30 patients (33.3%). Patients with only diabetes were 6 patients (6.7%) and with other causes (like IgA nephropathy, analgesic nephropathy, etc.,) were 7 patients (7.8%).

Blurring of vision was the most common symptom (85.4%). Other symptoms were ocular irritation (9.8%) and 2.4% each with discharge and redness. 10% of patients were legally blind with visual acuity <6/60.

Of the 200 eyes included in the study, 160 eyes had anterior segment changes. 92 eyes (57.5%) had cataract. Of the 92 eyes, 38 eyes were in stage V group and 31 eyes belonged to stage IV group.

In this study, 44 patients (88 eyes) belonged to less than 40 years (presenile age group). 43.18% of presenile patients had cataract.

A reduced Schirmer's value was noted in 54 eyes of the 200 eyes. The incidence of ocular surface disease in the study was 27%.

84 patients in the study had hypertension (HT alone or along with DM). 92 eyes out of 200 eyes studied showed hypertensive retinopathy. Higher grades of hypertensive retinopathy was more in advanced stages of CKD, i.e. 24 eyes in stage IV and 23 eyes in stage V. Grade III hypertensive retinopathy was the most common grade of hypertensive retinopathy occurring in 43 eyes of the 92 eyes.

40 patients (80 eyes) in the study had diabetes (DM alone or with HT). 51 eyes showed diabetic retinopathy changes of which a majority of 25 eyes (belonged to stage V disease). Moderate NPDR and severe NPDR were the most common stages of diabetic retinopathy with 29 eyes having either of these. Advanced diabetic eye disease was found in 4 patients all belonging to stage V CKD.

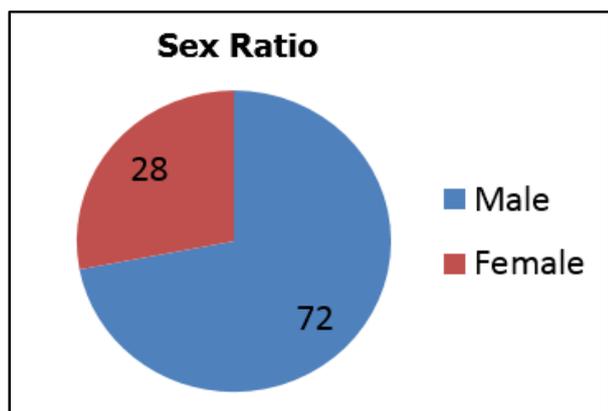
31 eyes in the study showed changes in the macula. The most common sign was macular oedema found in 13 eyes, which had a mixed population of diabetic and hypertensive patients.

Other findings in the posterior segment included 4 eyes with raised CD ratio, 2 eyes with BRVO, 2 eyes with old CRAO and 3 eyes with disc pallor.

Age Group	Number of Cases	Percentage
20-29	16	16
30-39	25	25
40-49	21	21
50-59	18	18
60-69	20	20

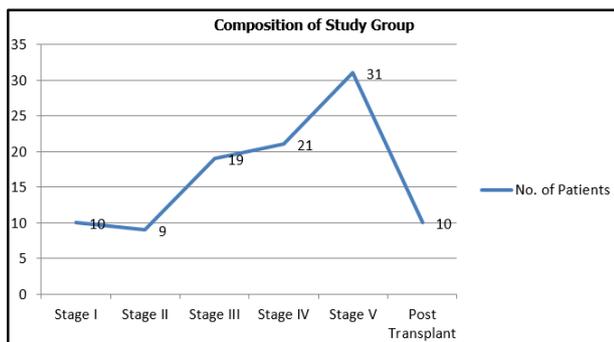
Table 1. Age Incidence

The age distribution in the study group was more or less even with the patients in the age group 30-39 slightly more than the rest of the cohort.

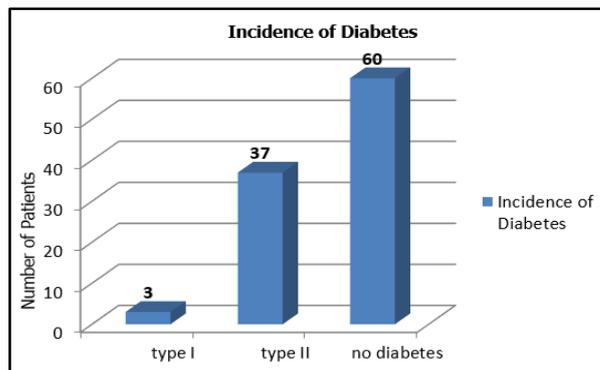


Graph 1. Sex Ratio

Stages of CKD in Study Population- The study group consisted of 31 patients with stage V disease, 21 with stage IV and 19 patients with stage III disease. 29 patients were evenly distributed in groups of stage I, II and posttransplant category.

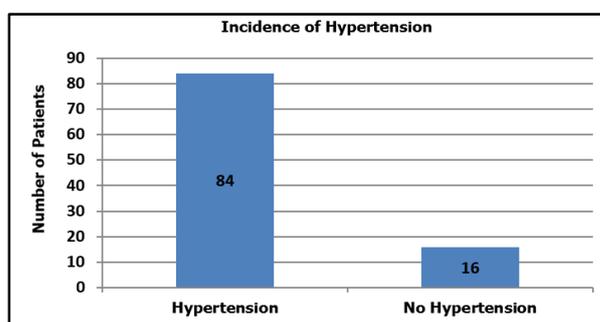


Graph 2. Composition of Study Group



Graph 3. Incidence of Diabetes

Incidence of Hypertension- They constituted 84% of the patients. Of the 100 patients who were studied, 34 were both hypertensive and diabetics.



Graph 4. Incidence of Hypertension

Cause of Chronic Kidney Disease- In this study, out of the 100 patients, 90 patients had chronic kidney disease and 10 patients were renal transplant recipients.

Disease	Number of Patients	Percentage
DM	6	6.7
HT	47	52.2
DM and HT	30	33.3
Others	7	7.8

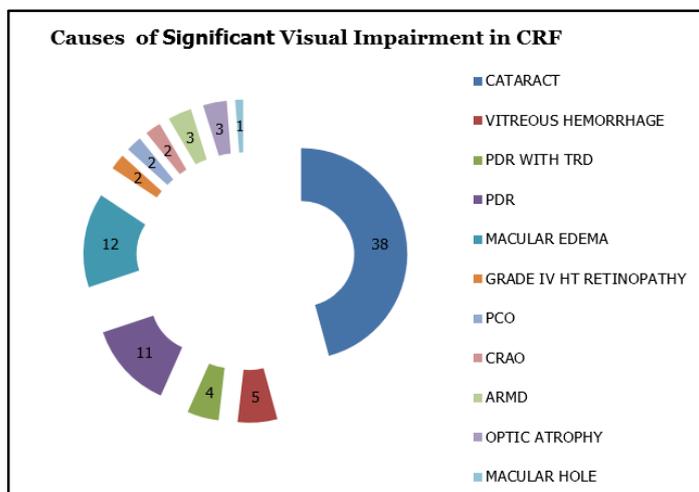
Table 2. Cause of Chronic Kidney Disease

Out of the 90 patients suffering from CKD, 6 were having only diabetes and 47 were purely hypertensives.

Ocular Symptoms- 59% of patients had no ocular complaints and only 41% complained of some form of ocular discomfort. 85.4% of patients with ocular complaints had defective vision. 2.4% of patients had redness and discharge each.

Type of Complaint	Number of Eyes	Percentage
No complaints	59	59
Def. vision	35	35
Discharge	1	1
Redness	1	1
Irritation	4	4

Table 3. Ocular Symptoms



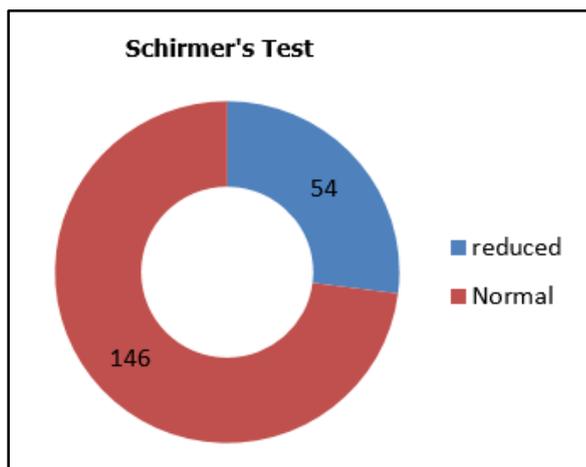
Graph 5. Causes of Significant Visual Impairment in CRF

Causes of Significant Visual Impairment- It was found that, of the 200 eyes in the study group, 83 showed significant visual impairment. 38 eyes had cataract causing significant visual impairment. This constitutes 45.8% of the total eyes with significant visual impairment. PDR and macular oedema was the cause of visual impairment in 27.8% of eyes.

	Stage I	Stage II	Stage III	Stage IV	Stage V	Posttransplant	Total
Lid oedema	1	1	2	4	5	0	13
Conj. pallor	3	1	4	2	4	0	14
Pinguecula	1	0	0	1	2	0	4
Redness	1	1	1	1	1	1	6
Cataract	5	2	10	31	38	6	92
EOM	0	0	0	0	1	0	1
Total	11	5	17	39	51	7	130

Table 4. Anterior Segment Findings in Different Stages of CKD

Incidence of Dry Eye in CKD- The incidence of dry eye in the study was 27%.



Graph 6. Schirmer's Test

Incidence of Diabetic Retinopathy in CKD- Diabetic retinopathy was more common in patients with stage V renal failure with 25 eyes out of the 51 showing changes. Moderate NPDR and severe NPDR were the most common stages of diabetic retinopathy with 29 eyes having either of these. 23 eyes were from the group of patients in stage IV and stage V renal disease.

Incidence of Hypertensive Retinopathy in CKD- 92 eyes out of the 200 under study showed hypertensive retinopathy. 43 eyes had grade III retinopathy making it the most common hypertensive retinopathy. 47 eyes of patients were in the stage IV and stage V group.

	Stage I	Stage II	Stage III	Stage IV	Stage V	Posttransplant	Total
Mild NPDR	0	0	0	0	2	0	2
Moderate	0	0	0	6	4	2	12
Severe	2	0	2	7	6	0	17
Very severe	0	0	0	0	0	0	0
PDR	0	1	2	0	9	0	12
Advanced DR	0	3	1	0	4	0	8
Total	2	4	5	13	25	2	51

Table 5. Incidence of Diabetic Retinopathy in CKD

	Stage I	Stage II	Stage III	Stage IV	Stage V	Posttransplant	Total
Grade I HR	0	2	5	2	5	3	17
Grade II HR	5	2	9	3	8	1	28
Grade III HR	5	4	5	19	8	2	43
Grade IV HR	0	2	0	0	2	0	4
Total	10	10	19	24	23	6	92

Table 6. Incidence of Hypertensive Retinopathy in CKD

Macular Findings in Study Group- 33 eyes from the study group showed changes in the macula. The most common sign was macular oedema, which was found in 13 eyes. This group had a mixed population of diabetic and hypertensive patients. Other common findings in the macula were age-related macular degeneration changes and clinically significant macular oedema in diabetic patients. PED, macular fan, subretinal precipitates and macular hole were some of the other signs found in the group.

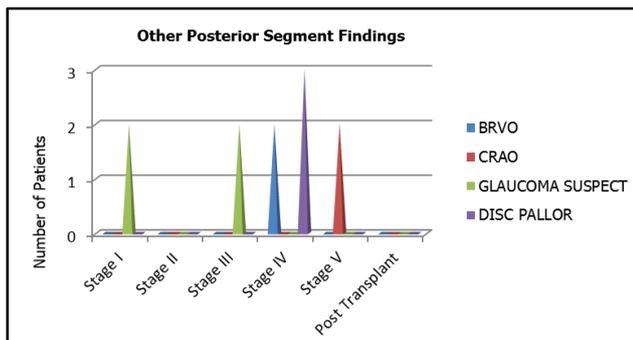
	Stage I	Stage II	Stage III	Stage IV	Stage V	Posttransplant	Total
ARMD	3	0	1	0	3	0	7
CSME	0	0	0	0	6	0	6
Macularoedema (DM and HT)	0	0	2	1	8	2	13
PED	0	2	0	0	0	0	2
Macular fan	2	0	0	0	0	0	2
Subretinal PPT	0	0	0	2	0	0	2
Macular hole	1	0	0	0	0	0	1

Table 7. Macular Findings in Study Group

Other Posterior Segment Findings- When diabetic and hypertensive retinopathies as well as macular symptoms were excluded. There were some posterior segment findings exhibited by 11 eyes from the study group. 4 eyes had a raised CD ratio. 2 eyes each showed BRVO and CRAO and 3 eyes had disc pallor.

ANALYSIS AND DISCUSSION

Chronic kidney disease is the end result of multiple systemic diseases or primary renal disease. During the natural course of the disease, it affects multiple systems of the body. The aim of the study is to conduct a thorough ocular examination of patients with chronic kidney disease and analyse the findings. Male patients formed 72% of the total patients in the study group. The vast preponderance of males in the age group of 30-49 could be explained by the social architecture of the country with middle-aged male population being more mobile and having more reach to medical facilities. The study by L. Bajracharya et al⁵ published in the Nepal Medical College Journal showed an almost equal distribution of study population in the various subsets of chronic kidney disease. Diabetic patients constituted about 40% of the study group. Hypertension was the single main cause of⁶chronic kidney disease in this study contributing to 52.2%. 33.3% of patients had both diabetes and⁷hypertension. This trend is similar to L. Bajracharya et al study. 83 out of 200 eyes showed significant visual impairment.⁸Diabetic retinopathy was more common in patients with stage V renal failure. 92 eyes out of the 200 under study showed⁹hypertensive retinopathy. 33 eyes from the study group showed changes in the¹⁰macula. A study of the incidence of cataract in the¹¹presenile age group, namely patients in the age group of 40 and less was done. This showed that of the 44 patients in the above-mentioned group, 36 had some form of cataract in varying stages of maturity.



Graph 7. Other Posterior Segment Findings

	Number of Eyes	Percentage
Cataract	36	18
PCIOL	2	1

Table 8. Cataract in Presenile Patients

A study of the incidence of cataract in the presenile age group, namely patients in the age group of 40 and less was done. This showed that of the 44 patients in the above-mentioned group 36 had some form of cataract in varying stages of maturity. 2 patients have undergone cataract extraction and had a posterior chamber intraocular lens in place.

CONCLUSION

CKD is the end result of multiple systemic diseases or primary renal disease. During the natural course of the disease, it affects multiple systems of the body including the eye. Detailed ocular examination was conducted in 100 patients in varying stages of CKD. In this study, hypertension was the single main cause of CKD followed by DM and HT together. Blurring of vision was the commonest ocular symptom. Ocular findings that were present in the stage 4 and stage 5 grades of CKD were cataract, lid oedema, conjunctival pallor, HT and diabetic retinopathy, macular oedema and CSME. Most of the patients were in advanced stages of CKD when they become symptomatic. Retinopathy is often asymptomatic in early stage. Delay in diagnosis can result in significant visual loss. Study demonstrates that routine ocular evaluation is necessary in all patients with chronic kidney disease irrespective of the presence of ocular symptoms. It also highlights the occurrence of a variety of treatable ocular manifestations, which can become vision threatening if not taken care of at the earliest.

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