A DISSERTATION IN PART FULFULMENT OF MASTERS DEGREE IN MEDICINE (OPHTHALMOLOGY) AT THE UNIVERSITY OF NAIROBI.

TITLE:

OCULAR CHANGES AS SEEN IN BLACK AFRICAN RENAL PATIENTS AT KENYATTA NATIONAL HOSPITAL.

BY

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DECLARATION

This dissertation is my original work, and has not been presented for a degree at any other University.

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APPROVAL

This thesis has been submitted for examination with our approval as University supervisors.

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DEDICATION

This work is dedicated to my dear son, Elias and all the participating kidney patients especially those who died in the course of the study.

TABLE OF CONTENTS

ABBREVIATIONS

1. ARF: Acute Renal Failure
2. CRF: Chronic Renal Failure
3. GN: Glomerulonephritis
4. NS: Nephrotic Syndrome
1. CT: Connective Tissue
2. PD/CAPD: Peritoneal Dialysis / Chronic Ambulatory Peritoneal Dialysis
3. HD: Haemodialysis
4. WG: Wegeners Granulomatosis
5. KS: Kaposis Sarcoma
6. HTN Hypertension
7. HR: Hypertensive Retinopathy
8. DM: Diabetes Mellitus
9. DR: Diabetic Retinopathy
10. DN: Diabetic Nephropathy
11. NIDM: Non Insulin Dependent Diabetes Mellitus.
12. PAN: Polyarteritis Nodosum
13. CMV: Cytomegalovirus
14 HIV: Human Immunodeficiency virus
14. BUN: Blood Urea Nitrogen
15. ERSD: End Stage Renal Disease
16. BRVO: Branch Retinal Vein Occlusion
17. NVD: Neovascularization at disc NVG: neovascular glaucoma.
18. NVE: Neovascularization Elsewhere
19. IOP: Intraocular Pressure 20. AC: Anterior Chamber

ABSTRACT

The study was on the relationship between ocular signs and symptoms and renal disease. It was a hospital-based study aimed mainly at examining the eyes of renal patients and relating the ocular signs with renal disorders in black Africans. Participants were 201 patients pooled from renal out patient clinic and renal unit of Kenyatta National Hospital, Kenya, identified as renal patients by the renal physicians of the hospital. The main outcome measures were a standardised questionnaire on ocular and renal disease aspects, slit lamp examination and fundoscopy coupled with relevant investigations. 165 patients had CRF, 28 ARF, 41 GN, 16 NS and 10 ESRD. 87.1% of the participants had ocular involvement of both anterior and posterior segments. There were only three blind patients however. Differences in the various aspects of relation between ocular findings and kidney disease were related to gender, age, pathology, treatment and control of kidney disease. 158 patients needed eye care as treatment with drugs or spectacles and others were referred for follow up and treatment in the hospital eye unit. Therefore kidney patients in KNH should have scheduled ophthalmic check up.

INTRODUCTION

Examination of the eyes in patients with kidney diseases is an indispensable part of the full clinical assessment. It permits the evaluation of the severity of complicating hypertensive disease, which involves the two organs in parallel. There are also characteristic ophthalmic findings in diabetics and some inherited metabolic diseases in which the kidney is frequently involved. In some congenital clinical syndromes, the eye lesions help characterise the renal disease. It has been shown that the dynamics of the pathological signs in the iris strongly relates to the

clinicoimmunological picture of renal and hepatobiliary disease on medication. Striking alterations occur at the iris. In these patients it was found that iridodiagnosis is a reliable test of therapeutic effect in patients with chronic renal disease. (1) The ophthalmologist who is aware of these clinical associations may often be the first to suggest important but otherwise silent renal involvement in a disease. The nephrologist who is informed of these associations will also refer these patients for periodic ocular review. It is said that the distribution of renal diseases in blacks is different from that of Caucasians with congenital diseases being rare among blacks and common among whites, glomerulonephritis hypertensive and diabetic nephropathies forming a significant proportion of renal disease among blacks. Therefore the distribution of ocular changes would be different between the two groups.

Ophthalmologists should be aware of the seriousness of hypertension because it affects many of their patients and 80% of them have their blood pressure elevated. It is also a major risk for cardiovascular disease. As medically trained specialists; Ophthalmologist should be knowledgeable about and take interest in the patients medical problems, thus playing an integral role on the health care team. As a primary health care provider Ophthalmologist should perform in office BP monitoring (2).

LITERATURE REVIEW

Renal disease is hereby defined as renal dysfunction as evidenced by elevated serum createnine (>120micromol/l) at one point of a patient's life. Both acute and chronic renal diseases are included. CRF is defined as irreversible deterioration in renal function resulting from a diminished mass of functional renal tissue with subsequent clinical syndrome of uraemia. Uraemia is a chemical, toxic and potentially fatal

condition. In a variable pattern, Uraemia ultimately kills almost every cell in the body. Uraemia is produced by hundreds of diseases, both kidney and systemic e.g. diabetes. These kinds of Uraemic conditions range from acute and catastrophic to the slowly and moderately progressive (3) The prevalence of CRF is 100 to 150 persons/million/year with 30 – 50 million needing replacement and or haemodialysis Causes in adult patients undergoing regular dialysis (4) is GN = 38.4%, Cystic kidney disease 8.3%, vascular diseases 6.8%, drugs 3.3%, hereditary nephropathies 0.4, uncertain 8.3%, other diseases 12.4%. CRF is classified as stable and unstable. ARF is defined as acute deterioration in renal function, classified according to cause, (as pre-renal, renal and post-renal) and on prognosis as reversible and irreversible.

BUN has exogenous and endogenous sources but is excreted solely by the kidney. It varies with diet, is high in fever and GIT haemorrhage,is easily affected by hydration and drugs. However, it is easy to measure and correlates to uraemia clinically. Createnine on the other hand has endogenous source only. It is difficult to measure accurately and correlates with GFR better than BUN. It is less affected by diet and other extra renal factors and therefore more stable.

Combined disorders of eyes and kidneys may result from a metabolic defect, a developmental defect, vascular disease, autoimmune disease, tumour process, infection and use of toxic products.One wonders why the two organs are concurrently susceptible to assault. In a study on bioassays in Germany it was found that the vertebrate pax genes are key regulators during organogenesis of the eyes, kidney, ear, nose and brain (5). In another study on tissue expression of a gene implicated in some diseases with retinal and renal involvement in France a monoclonal antibody that specifically reveals the ocular pigmented epithelium and the proximal convoluted tubules of the kidney was produced at all stages of development, which is human specific. It was localised at a region involved in retinitis pigmentosa and

kidney abnormality. It is proposed that this gene is involved in some of these diseases (6). Hasson et al demonstrated the gene product defective in Usher syndrome (involves the cochlear, retina and kidney) in the retina ,kidney and the testis (7). The aquaporins is a family of membrane channel proteins that serve as selective pores through which water crosses the plasma membranes of many human tissues and cell types e.g. renal water resorption, CSF secretion, aqueous humour secretion and reabsorption and lacrimation. The proteins are genetically determined and several types are implicated in diseases such as diabetes insipidus due to disorders of water distribution. They may be involved in the pathogenesis of glaucoma in kidney patients (8). All these serve to demonstrate the embryological closeness of the eye and the kidney, which may be the basis for their concurrent and parallel susceptibility to injury. Oculorenal syndromes refer to a large group of inherited and non-inherited malformations and multisystemic diseases with peculiar ocular and renal features. The clinical associations of ocular changes and renal disease can be categorised as follows:

1. Vascular diseases affecting the eye and the kidney.
2. Multisystem diseases involving the eye in which important renal disease occurs.
3. Metabolic effects of renal failure on the eye.
4. Congenital diseases affecting the eye and the kidney.
5. Ocular complications following renal replacements therapy (haemodialysis peritoneal dialysis, transplant) and other therapy for renal disease.

Vascular diseases affecting the eye and the kidney.

The glomerular and retinal circulations are the only two sites in the body with a high-pressure capillary system. The severity of vascular disease observed in the ocular fundus is an indication of the degree of renal damage as the two organs are involved

in parallel. Arterial hypertension is still a very important problem in kidney diseases and the complications of arteriosclerosis are extremely common in renal patients as a result of chronic hypertension and hyperlipidemia. Arterial hypertension is a frequent complication of congenital and acquired renal and renovascular disorders (9) The eye is a target organ in hypertension and retinopathy is a frequent complication as well as a prognostic indicator of sustained hypertension. Retinovascular abnormalities in these patients include arteriolar narrowing, tortuosity and ateriovenous nicking. Ischaemic changes in the retina choroid and optic nerve occur in malignant hypertension producing hard exudates, Elschnig's spots, exudative retinal detachment, papilloedema and optic atrophy. Sudden onset hypertension in-patients previously with high and long-standing hypertension due to dialysis or drugs may cause blindness due to infarction of optic nerve retina and anterior ischaemic optic neuropathy. Optic neuropathy may also follow uraemia (toxic) and anaemia and papilloedema of hypertensive encephalopathy. Other causes of visual loss include retinal arterial and venous obstructive diseases, which are common in chronic hypertensives.

Malignant hypertension is associated with thrombotic microangiopathy with fibrinoid necrosis of the vascular wall. Retinal changes are due to localised thrombotic microangiopathy in the choriocapillaries or from hypertension, anaemia or thrombocytopaenia associated with malignant hypertension in the haemolytic-uraemic syndrome. Occlusion of choriocapillaris and necrosis of the overlying retinal pigment epithelium causes serous retinal detachment with visual loss, which resolves on normalisation of blood pressure. Vision reduces if the macula is threatened or papilloedema persists with resultant optic atrophy (9,10,11).

Hypertensive effects on retinal blood vessels depend on the degree of underlying arteriolar sclerosis, age of the patient and the level of blood pressure, with young

individuals showing a markedly different appearance in severe hypertension from those of older ones (9). The Keith-Wagener-Barker grading of hypertension of 1939 is based on the severity of retinal features and outcome as follows:

Grade I mild narrowing or sclerosis of retinal arterioles.

good general health

no symptoms.

Grade II - moderate to marked sclerosis of retinal arterioles, arterio-venus ratio 1:2 and mild arteriovenus compression

exaggerated arterial light reflex

blood pressure higher than grade I

general good health

asymptomatic.

Grade III retinal oedema, haemorrhages and exudates

silver wiring (sclerotic arterioles) arterio-venus ratio 1:4

blood pressure higher and more sustained than grade II

symptomatic.

Grade IV - grade III changes and papilloedema.

However clinically it is difficult to differentiate grade I and II and there is little prognostic difference between grade III and IV thus a revised grading system for hypertensive retinopathy has been suggested as follows:

Grade I - non-accelerated

significance - less clinically significant retinal changes - generalised arteriolar narrowing, focal constriction (not nipping or nicking)

Hypertensive category - established hypertension.

Grade II - accelerated or malignant phase hypertension

significance - highly clinically significant

retinal changes - haemorrhages, exudates, cottonwool spots with or without optic disc swelling

hypertensive category - accelerated or malignant hypertension.

Grade II has poor prognosis due to retinovascular leakage and occlusion associated with accelerated hypertension contrasting with retinal changes of arteriolar sclerosis which may or may not be related to hypertension and are difficult physical signs in clinical practice (9). Renal hypertension is associated with non-pupillary block angle-closure glaucoma of unclear aetiology (12,13,14). The ophthalmologist thus as a primary health care provider plays a significant role in the prevention, detection, evaluation and treatment of hypertension and its associated morbidities, and must take blood pressure in the office as part of monitoring (11). The Hypertensive NIDDM compared to normotensive NIDDMS have a higher frequency of ischaemic heart disease and Diabetic nephropathy, and have a worse renal function than normotensive NIDDMS even before clinical protenuria ensues. Deterioration in GFR in hypertensive NIDDMS has important influence on the progression of diabetic nephropathy. (15)

In patients with diabetic nephropathy, retinopathy is always present and ploriferative retinopathy common. Thirty-five percent of patients with ploriferative diabetic retinopathy have no signs of diabetic nephropathy. Retinopathy tends to deteriorate as renal failure develops particularly in patients in whom no prophylactic retinal treatment has been given before the development of renal failure (16 & 17). Diabetic nephropathy has been classified into five groups as follows:

I Hyperfiltration-glomerular filtration > 20ml /min due to glomerular hyperperfusion.

II Microalbuminuria - 30 - 300 mgs/24 hrs follows in disease lasting more than five years (also known as incipient nephropathy).

III Macroalbuminuria - > 300 mgs/24 hrs albustix positive (diabetic nephropathy)

IV Nephrotic syndrome - proteinuria 5 gms/day, plasma albumin < 3gms/100 ml.

V End stage renal disease - requiring replacement therapy.

A research on microalbuminuria and retinopathy carried out at KNH showed that the prevalence of microalbuminuria in diabetics is high with a high prevalence of hypertension and retinopathy in both type I and type II diabetics (18) Diabetic retinopathy is a microvascular complication of the disease and develops in four stages.

A Early vasodilatation and hyperperfusion.

B Chronic vasodilatation.

C Retinal ischaemia.

D Aberrant repair (proliferative phase).

In the pathogenesis of diabetic microangiopathy, endothelial cell damage plays a key role and pericyte degeneration is an early histological feature. Pericytes seem to play a major role in the maintenance of normal endothelial cell structure. Capillary damage causes leakage (exudation) and microthrombi cause progressive ischaemia. Retinal Ischaemia produces stimulation of the production of angiogenic growth factors. (Appendix 1.)

Classification of Diabetic Retinopathy

I Background retinopathy comprises of microaneurysms and retinal haemorrhages and exudates

II Diabetic maculopathy are of three types

(a) Exudative maculopathy with yellow exudates forming a star or a ring (circininate pattern)

(b)Ischaemic maculopathy best demonstrated by fluorescein angiography

(c) Cystoid macula oedema

III Preploriferative retinopathy - with retinal changes that predispose to new vessel formation, characterised by

(a) cotton wool spots

(b)venous abnormalities - tortuosity, beading, reduplication

(c) intra-retinal microvascular abnormalities, consisting of dilated retinal capillaries.

(d)arteriolar abnormalities.

IV Proliferative retinopathy - with neovascularisation of the retina, optic disc and iris in response to angiogenic factors released by the ischaemic retina. This is potentially blinding because it causes vitreous haemorrhage traction retinal detachment, and neovascular glaucoma. Other features associated with diabetic retinopathy include cataract, cranial nerve palsies, ocular infections and primary open angle glaucoma. Cataract prevents adequate fundus examination and its surgery is associated with complications and Yag laser is usually required for posterior capsulotomy following posterior capsule opacification. Cataract surgery exacerbates the growth of pre-existing diabetic retinopathy (9). Hypertension accelerates the evolution of background to ploriferative retinopathy. Treatment of hypertension and end stage renal failure improves retinopathy especially macular oedema and stabilize vision. Progression of diabetic retinopathy is independent of diabetic nephropathy and not reversed by its treatment therefore retinopathy must be treated and followed up (11, 16,18,). Pregnancy is an independent risk for diabetic retinopathy and retinal

examination in pregnant diabetics must be done at the onset of pregnancy and every three months thereafter until three months postnatal. Laser therapy is safe and effective. (17).

Multisystem diseases involving the eye and the kidney

Some of the well-known causes of retinal vasculitis are polyarteritis nondusa (PAN). Wegeners granulomatosis (WG), Systemic lupus erythromatosus (SLE), and giant cell arteritis (GCA). In the collagen disorders severe vascular lesions may occur and renal failure and blindness may be the main clinical features. The ocular vascular complications may be caused by immune complex vasculitis, thrombotic microangiopathy, anaemia, occlusion of large vessels and systemic hypertension. The ocular changes parallel the systemic disease and improve with steroids. More serious ocular complications arise from systemic steroids and anti-malarials used in therapy. (10,19). PAN in addition to vasculitis causes proptosis in about fifteen percent of patients and most ocular features relate to hypertension and renal disease and central nervous system involvement (20,21). WG causes proptosis in more than fifty percent of cases due to orbital lesions. It may also present with dry eyes from lacrimal gland involvement (19,21). Wegener`s granulomatosis both classical and limited i.e. without renal involvement have sight threatening complications GCA more than the others causes visual loss in over fifty percent of the patients due to central retinal artery occlusion and ischaemic optic neuropathy. It is also associated with temporal headaches and diplopia (19). SLE gives large retinal infarcts (cystoid bodies) and optic disk infarction and papillitis in addition to dry eyes in Sjogrens syndrome. (22). In sarcoidosis ocular and renal involvement together are rare (21,22). Diagnosis of sarcoidosis can be made from its ocular features. In anterior segment it forms conjunctiva nodules and lid nodules in addition to calcification of

limbus and uveitis. The retina shows typical candle-wax exudates from periphlebitis. In renal amyloidosis there are characteristic vitreous opacities and perivascular retinal deposits in addition to lid infiltration, corneal and conjunctival deposits (9,23). Polycystic kidney disease can be congenital (autosomal dominant or recessive) or acquired. The congenital type is associated with respiratory and liver cysts. Acquired type is associated with potassium deficiency, metabolic diseases and toxic renal diseases.

Metabolic effects of renal failure on the eye

In patients with renal failure and associated hyperparathyroidism and elevated serum calcium levels, soft tissue calcification occurs often first detected in the peripheral interpalpebral cornea and adjacent conjunctiva. Band keratopathy of hypercalcaemia that threatens the visual axis occurs as a spread of the above in patients on chronic intermittent dialysis causing reduction in vision and epithelial erosions that are very painful. There is a decrease in tear secretion after each dialysis session and this is thought to cause tissue injury that favours tissue calcification (24). In a study of 38 patients on HD it was found that decreased tear production occurred after each HD session and this caused minor injury to the limbo conjunctival epithelium and subsequently calcification. (25) Calcification presents in the interpalpebral cornea and adjacent conjunctiva in patients on HD for a long time, producing band keratopathy, epithelial erosions, inflamed pingueculae and more diffuse inflammatory reaction. (11) Microcrystalline deposits can be seen on slit lamp or with +20D lens viewing the cornea and conjunctiva tangentially (10). Inflammation settles on correction of calcium levels. Pingueculae have been reported as being commoner in patients with renal failure and are often inflamed with diffuse inflammatory reactions giving tortuous telangiectatic vessels in the conjunctiva (10). The so-called renal cataract is lens stippling, a complication of end-stage renal

disease with hypocalcaemia or secondary hyperparathyroidism cataract. Steroid induced cataract may also occur. Intumiscent cataract may suddenly appear after renal dialysis due to rapidly appearing permeability cataract. Cortical cataract is associated with raised blood urea nitrogen and posterior sub-capsular cataract associated with raised blood urea nitrogen and createnine (26). Intra-ocular pressure may rise during haemodialysis and cause acute glaucoma in predisposed individuals due to sudden drop in plasma osmolality. Steroid induced glaucoma may also occur (11). Hyperuricaemia secondary to renal impairment (uric acid retention) and primary hyperuricaemia that causes urate nephropathy present with anterior uveitis ammendable by allopurinol. Serous retinal detachment due to impaired fluid and electrolyte balance and retinal pigment epithelium dysfunction influenced by immunosuppressive therapy has been documented (11). Toxic effects of uraemia on the central nervous system have been shown in the eye manifesting as uraemic amaurosis, fluctuating nystagmus, sixth cranial nerve palsy and miosis with pupillary asymmetry that all resolve on dialysis (10).

Ocular complication following renal transplantation.

Because of ocular complications in patients undergoing renal transplantation, ophthalmologists collaborating with renal units may be asked to do pre- and post operative surveillance. Serous retinal detachment following haemodialysis and transplantation is due to ischaemic and oedematous retinal damage. In a study done in Japan, the incidents of ocular complications following renal transplant was 77.8% with the following distribution: steroid-induced cataract 62.5%, increased intraocular pressure 12.5%, hypertensive retinopathy 2.8%, sub-conjunctival haemorrhage 20.8%, branch retinal vein occlusion 1.4%, and cytomegalovirus infection 2.8% (27). There are also opportunistic bacterial and fungal infections associated with immunosuppressive therapy in renal transplant patients. Neoplasia may also occur

affecting both the ocular and periocular tissues including lymphoma of the vitreous, squamous cell carcinoma of the eyelids and brown bone tumours (11).

Congenital diseases affecting the eye and the kidney

These include hereditary metabolic disorders with accumulation of substances such as Wilson's disease, Faconi syndrome and Fabrys disease and manifest with effects of deposition and metabolic effects of the substances seen in galactosaemia, Hartnup disease and homocystinuria. Dystrophic disorders such as Alports syndrome and cereberalloculorenal syndrome have characteristic ocular features that help characterise the disorder even before renal failure ensues. In the congenital X-linked disorder Alports syndrome, renal failure is a common cause of death. The typical ocular associations are dot - and - fleck retinopathy present in 85% of affected males, anterior lenticonus and polymorphous corneal dystrophy. These progress with age and retinopathy is often present at the onset of renal failure. The diagnosis of the disease is made by family history of renal disease, end stage renal disease with dot - and - fleck retinopathy. Other ocular features are other corneal dystrophies, microcornea, arcus, iris atrophy, cataract, spontaneous lens rapture, spherophakia, posterior lenticonus, a poor macular reflex and retinal pigmentation (28,29,30).

Fabrys disease (alpha - galactosidase deficiency) has characteristic eye and skin lesions and a high risk for renal and cardiovascular disease. Whirl-like corneal opacities that are slightly curved are seen in both homo and heterozygotes whose only differential diagnosis is chloroquin keratopathy. Other features are anterior and posterior lens opacities, aneurysmal dilatation of conjunctival vessels and dilatation of retinal vessels. Ischaemic optic neuropathy and retinal artery occlusion have been reported (9,11). Corneal lesions can be used to diagnose the disorder. Wilson's disease gives the characteristic Kayser-Fleischer rings of the cornea and sunflower

ract. Renal tubular dysfunction in this disorder improves with D-penicillamine . Cystine is deposited in many organs including the eye and the kidney in Faconi rome. Conjunctival and corneal cystine deposits are found in over 50% of cases. pheral retinopathy with depigmentation is claimed to be an early and reliable nostic feature. Renal damage causes amminoaciduria, glycosuria and sphaturia (10,31). Galactosemia presents in the eye with sugar cataract, which ther with renal damage are by the toxic effects of galactose-1-phosphate. nocystinuria is associated with aminoaciduria and subluxation of the lenses with odonesis, cystic degeneration of the retina and glaucoma (10). Oculocerebrorenal drome (Lowes syndrome) is diagnosed by renal disease with associated congenital oid cataracts with peculiar capsular and epithelial changes. Other abnormalities ude congenital glaucoma, adherent posterior lenticonus, miotic pupils due to esions and corneal keloids. (10,11) There is also a congenital oculorenal drome with hypomagnesaemia, hypercalciuria and nephrocalcinosis due to ormal renal handling of calcium and magnesium with associated myopia and rioretinal disease. (32,33).

SEARCH QUESTIONS

What ocular changes occur in black Africans with renal disease?

What is the frequency and distribution of ocular involvement in black African renal patients?

RATIONALE

1. Despite the awareness of the clinical association of ocular changes and renal disease, there is scanty information on the two correlated.
2. Sensitisation of the ophthalmologists and the nephrologist on the need for interaction in patient management and evaluation.
3. Ocular changes may be the initial and only manifestation of a disease involving both the eye and the kidney.

OBJECTIVES

1. To describe the eye manifestations in renal patients i.e. documents.
2. To determine the prevalence of ocular changes in renal patients.
3 To describe the correlates of ocular changes in renal patients in terms of

- age, sex,
- duration of illness,
- control of renal disease,
- type/stage of renal disease.

MATERIALS AND METHODOLOGY.

Study design: Cross- sectional, hospital based.

Population source: Renal patients in the renal out-patient clinic and renal unit, Kenyatta National Hospital

Study population: Randomly selected

Inclusion criteria Labelled renal patients

Consent

Exclusion criteria: Severe ocular trauma

Refusal to consent.

Children

Instruments: Portable slit lamp (Koiwa), direct Ophthalmoscope (Heine), indirect Ophthalmoscope with + 90 DS and +20 DS where possible, Shiotz tonometer (made in Germany), portable Snellen`s chart.

Sample size: $\frac{n=p(1-p)}{d} \quad Z\ 1\text{-}x/2 = \frac{10 \times 90 \times 3.84}{16} = 216$

The study was done between February 1999 and March 2000 both months inclusive. Patients were randomly selected In the clinic every 5th booked patient was seen and the next number seen if the 5th number was a child or previously seen patient. The HD and PD patients were seen many as could be interviewed. The selected patients had their socio-demographic data taken after the patient or the guardian gave consent. Visual acuity was taken with Snellen`s chart and ocular examination done with a portable slit lamp, IOP done by Schiotz tonometer under topical tetracaine hydrochloride, and fundoscopy done in mydriasis with phenylephrine or tropicamide both direct and indirect .All information was recorded in a questionnaire including details of medical history and a review of management and investigations and their results. All specimens were taken pre dialysis where applicable. Patients were advised, treated or referred for further management as necessary. Data analysis was done by the SSPS/ps + system.

ETHICAL CONSIDERATIONS:

1. Confidentiality - all information was held in confidence.
2. Informed consent - only patients who consented to the whole procedure were enrolled into the study.
3. Intervention - all patients were treated, referred for further management or advised as necessary.

RESULTS

POPULATION: 201

Table 1.

	MALES	FEMALES	TOTAL
Range (Years)	17 – 74	14 - 70	14 – 70
Mode (Years)	42(50)	48	42
Median (years)	41	35	39
Mean (years)	42	36	40
Total	123	78	201

DISTRIBUTION OF AGE BY SEX

Table 2

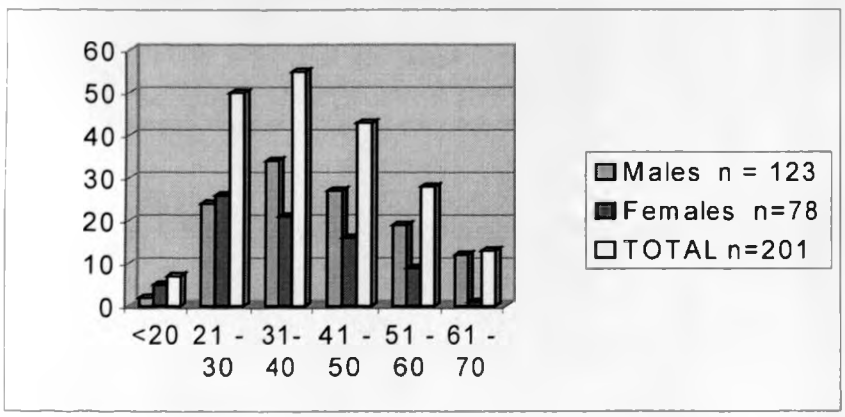
Age range Yrs.	≤20	21 - 30	31- 40	41 - 50	51 - 60	61 - 70	>70
Males n = 123	2	24	34	27	19	12	5
Females n=78	5	26	21	16	9	1	0
TOTAL n=201	7	50	55	43	28	13	5

DISTRIBUTION OF SEX RATIO

Table 3

	STUDY	TEAM	MALE	FEMALE	STUDY M:F	TEAM M:F
HD	72	52	43	29	3:2	2.7:1
PD	8	17	7	1	7:1	7.5:1
TRANS	32	72	16	16	1:1	3:2
CLINIC	89	240	57	32	1.8:1	1:1

Diag. 1.



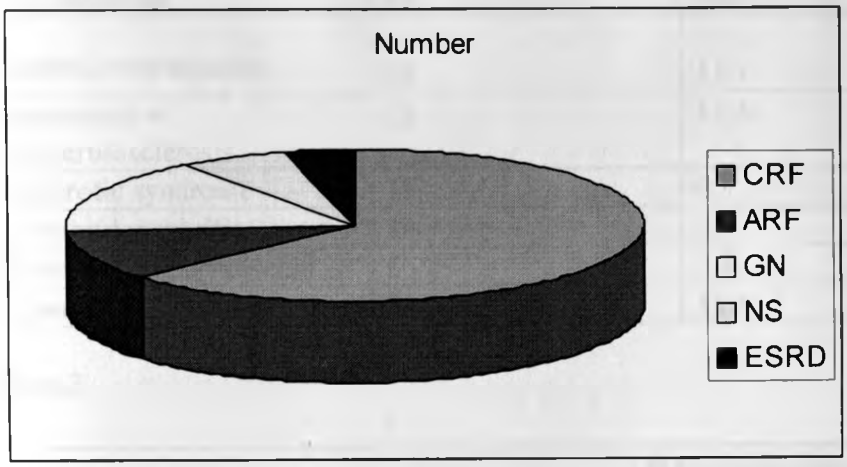
Age range in years

TYPE OF RENAL DISEASE

Table 4.

	Number	Percentage
CRF	165	63.5
ARF	28	10.8
GN	41	15.7
NS	16	6.2
ESRD	10	3.8
TOTAL	260	100.

Diag.2



DURATION OF DISEASE

Table 5

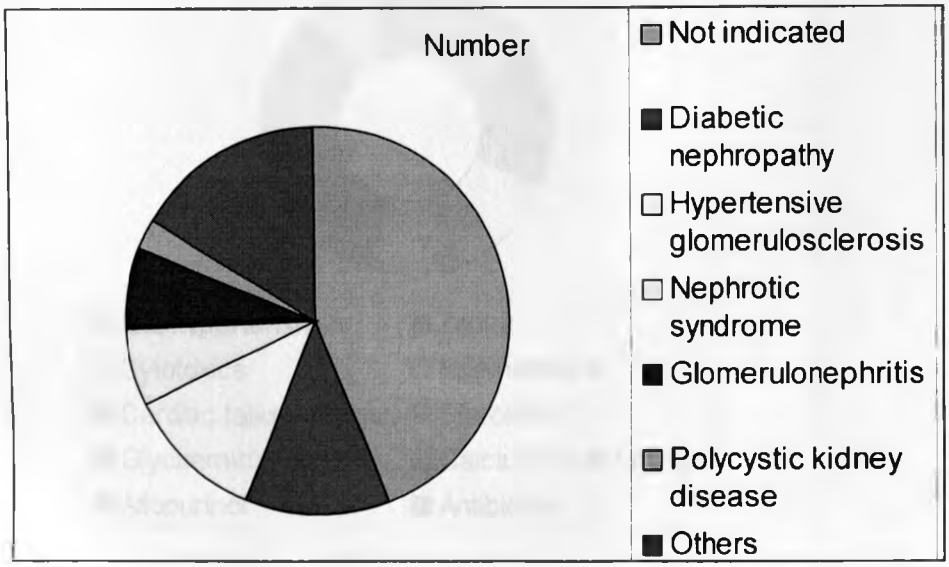
	MALES	FEMALES
Mean yrs	28	13
Mode yrs	12	5
Median yrs	24	0

UNDERLYING PATHOLOGY

Table 6.

Pathology	Number	Percentage
Not indicated	89	44.3
Diabetic nephropathy	24	11.9
Hypertensive glomerulosclerosis	23	11.4
Nephrotic syndrome	13	6.5
Glomerulonephritis	14	7.0
Polycystic kidney disease	5	2.5
Others	33	16.4

Diag.3



Others include obstructive uropathy, hypovolaemia, septicaemia, urinary tract infections and crystalline uropathy:

TREATMENT FOR KIDNEY DISORDER

Table 7

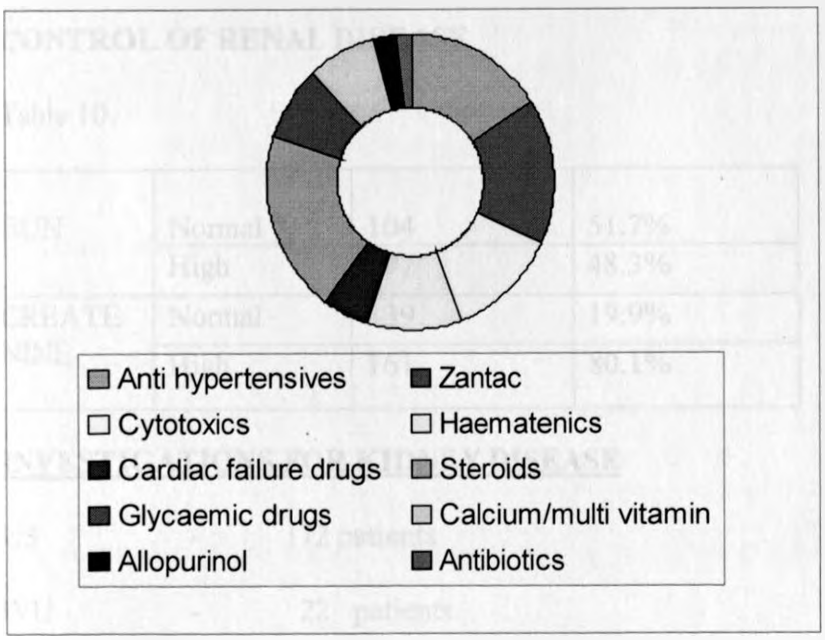
Haemodialysis	72
Peritoneal dialysis	8
Kidney transplant	32
Conservative	2

Drugs

Table 8

Anti hypertensives	46
Zantac	46
Cytotoxics	37
Haematenics	30
Cardiac failure drugs	15
Steroids	58
Glycaemic drugs	24
Calcium/multi vitamin	22
Allopurinol	7
Antibiotics	5

Diag.4



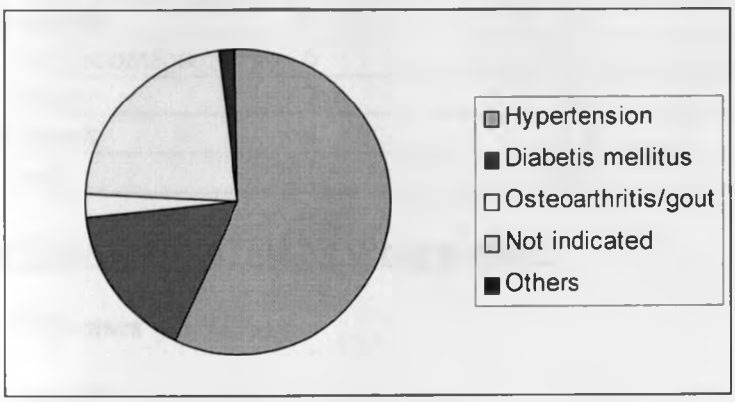
There is a lot of overlap between the above modes of treatment and classes of drugs.

ASSOCIATED SYSTEMIC DISEASES:

Table 9

Hypertension	114
Diabetes mellitus	33
Osteoarthritis/gout	5
Not indicated	45
Others	4

Diag.5



CONTROL OF RENAL DISEASE

Table 10.

BUN	Normal	104	51.7%
	High	97	48.3%
CREATE NINE	Normal	39	19.9%
	High	161	80.1%

INVESTIGATIONS FOR KIDNEY DISEASE

US - 172 patients

IVU - 22 patients

Arterogram - 28 cases

HIV - 148 - 146 (-) 2 (+)

Haemogram - 184 cases

- transfusion Hb<8 g/dl in CRF, replacement therapy 8-10g/dl

Normal up to 10g/dl

RBS = 130 cases

HBs Ag = 117 cases (3 positive cases – using separate dialysis machine).

OCULAR COMPLAINTS

Table 11

	Number	Percentage
None	85	42
Poor vision/blur	77	38.5
Discharge	14	7.0
Itchiness	8	4.0
Pain/discomfort	6	3.0
Others	7	3.5
Redness	4	2.0
Total	201	100

OCULAR TREATMENT (Prior to study)

N=32 cases (15.92%)

Table 12

Treatment	Number	Percentage
Glasses	22	10.94
Eye drops	8	3.98
Laser	6	2.99
Surgery	2	0.995

VISUAL ACUITY

Table 13

Vision grade	RE	LE
>/=6/18	150	157
<6/18 >/= 6/60	4	34
<6/60 >/= 3/60	7	3
<3/60 - NPL	12	7

The best visual acuity with the best correction in the better eye was considered.

EYE LIDS

Table 14

	Number	Percentage
Normal	130	64.7
Uraemic frost	19	9.5
Oedema	36	17.9
Cellulitis	1	0.5
Others	15	7.5
Total	201	100

CONJUNCTIVA

Table 15

	Number	Percentage
Normal	53	26.4
Pinguecula	16	8.0
Pterygium	86	42.8
Presumed calcification	5	2.5
Other	41	20.4
Total	201	100

CORNEA

Table 16

	Number	Percentage
Clear	101	50.2
Arcus	81	40.3
Ulcer	4	2.0
Other	15	7.5
Total	201	100

IOP:

Normal - 188 cases

IOP > 21mmHg :22 = 6

33 = 4

26 = 2

42 = 1

Total 13 patients

HAEMODIALYSIS AND IOP Table 17

	<10mmHg	10 - 21mmHg	>21mmHg
0(HD no)	5	117	3
1(HD yes)	1 (1.4)	61 (84.7)	10 (13.9)

A/C Table 18

	Number	Percentage
Clear	194	97
Hypopyon	2	1
Iritis (associated with gout)	5	2
Total	201	100

IRIS

Table 18

	Number	Percentage
Normal	175	87
Atrophy	12	6
Rubeosis	1	0.5
Others	13	6.5
Total	201	100

LENS

Table 19

	Number	Percentage
Clear	124	62
Opacity (fundus Visible)	69	34.5
Opacity (fundus invisible)	2	1.0
Not seen	3	1.5

Cataract surgery was done in 3 patients (aphakia=1,IOL=2)

VITREOUS

Table 20

	Number	Percentage
Clear	161	80.1
Haemorrhage	3	1.5
Degeneration	32	15.9
Fibrous Proliferation	10	5
Membranes	1	0.5

Vitreous was not seen in 4 patients

FUNDUS

Table 21

Fundus finding	Number	Percentage
Hard exudates	73	36.3
Haemorrhages	77	38.3
Soft exudates	32	15.9
Oedema/CSME	7	3.5
Roth spots/engorged vessels	7	3.5
Drusen	6	3.0
Neovascularisation	6	3.0
Pigmentary changes	3	1.5
Chorioretinal atrophy/scar	1	0.5
Normal findings	50	25

Laser marks were seen in 6 patients and fundus was inaccessible in 5 patients

OPTIC DISC

Table 22

Finding	Number	Percentage
Normal	153	76.1
Cupping	9	4.5
Atrophy	7	3.5
NVD	3	1.5
Other	29	14.5

RETINOPATHIES

Table 23

DR	Ischaemic NPDR	3	1.5
	Severe NPDR with CSME	1	0.5
	PDR - Active	8	4.0
	- Regressed	3	1.5
	Isolated Maculopathy	1	0.5
HR	KW I	26	12.9
	KW II	57	28.4
	KW III	30	14.9
	KW IV	2	1.0
OTHER RETINOPATHY	Ischaemic fundus	3	1.5
	Uraemic	6	3.0
	RD	2	1.0
	Dry ARMD	10	5.0
	CMV	2	1.0
	BRVO	1	0.5

DURATION OF DISEASE OCULAR ABNORMALITIES

Table 24

	IRIS		LENS		VITREOUS	
	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal
≤ 6/12	62	3	48	19	60	7
>6 – 12m	11	4	9	8	16	1
>12 – 24m	21	3	10	14	17	5
> 24 m	25	7	13	19	20	12
Total	119	17	80	60	113	25
	P = 0.03ss		P = 0.008ss		P = 0.005ss	

Ss=statistically significant

DISTRIBUTION OF OCULAR ABNORMALITIES BY KIDNEY DISEASE

Table 25

Abnormality	ARF N=28	CRF N=165	GN N=41	NS N=16	ERSD N=10
Conjunctiva	88.5% p=0.05*	71.3% p=0.5	70.0% p=0.8	45.5% p=0.6	70.0%
Cornea	22% p=0.004*	54.7%* p=0.00009	33.3% p=0.04*	50.0% p=1	0
AC	14.29% p= 0.002*	1.8% p=0.04*	2.5% p=1	0	0
Iris	10.7% p=1.	12.5% p=0.09	7.5% p=0.7	0	10.0%
Lens	10.7% p=0.002*	42.7% p=0.0004*	15.0 p=0.002*	33.3% p=0.2	70.0%
Vitreous	17.9% p=1	19.4% p=0.2	2.5% p=0.01*	0	20%
Hard Exudates	29.6% p=0.4	40.0% p=0.02*	20.0% p=0.02*	33.4% p=0.2	40% p=0.3
Soft exudates	35.7% p=0.004*	13.9% P=0.2	2.5% p=0.02*	0	20% p=0.02*
Haemorrhage	55.6% p=0.03*	35.8% p=0.4	15.0% p=0.02*	33.3% p=0.2	50.0% p=0.04*
Fibrous Proliferation.	3.6% p=0.4	6.2% p=0.1	0	0	30.0% p=0.03*
Neovasculari Zation	0	3.7% p=0.2	0	0	10.0% p=0.5
Maculopathy	14.8% p=0.3	23.9% p=0.2	12.8% p=0.2	0	40.0% p=0.1
Laser	0	3.1% p=0.3	0	0	10.0% p=1
Retinal detachment	0	1.2 % p=0.5	0	0	10.0% p=1
Diabetic Retinopathy	0	14.3% p=0.09	0	0	0
Hypertensive Retinopathy	I=28.6% II=14.3% P=0.1	I=47.2% II=18.2% P=0.01	I=37.5% II=10.0% P=0.2	0	0
Other Retinopathy	29.2% p=0.1	15.4% p=0.2*	5.3% p=0.03*	50.0% p=0.2	0
Optic disk	14.8% p=0.9	17.3% p=0.3	10.8% p=0.5	0	44.4% p=0.4
*=statistically significant at p<0.05					

OCULAR ABNORMALITIES IN RELATION TO TREATMENT FOR RENAL DISEASE. Table 26 *=statistically significant at p<0.05

ABNORMALITY	HD n=72	PD n=8	TRANSPLANT n=32
Conjunctiva	68.1% p=0.3	87.5% p=0.3	13.3%
Cornea	47.1% p=0.8	75.0% p=0.1	41.4%
A/C	1.4% p=0.3	0	0
Iris	11.6% p=0.4	25.0% p=0.1	6.3%
Lens	40.8% p=0.5	75.0% p=0.02*	21.9%
Vitreous	15.9% p=0.9	25% p=0.6	18.8%
Hard exudates	49.3% p=0.005*	50% p=0.4	28.1%
Soft exudates*	29.6%p=0.00002*	12.5% p=0.8	12.5%
Haemorrhage	53.6% p=0.0005*	37.5% p=0.9	25%
Fibrous proliferation	4.3% p=0.7	28.6% p=0.004*	9.4%
Neovascularisation	4.3% p=0.03*	12.5% p=0.1	0
Maculopathy	27.15 p=0.3	57.1% p=0.03*	19.4%
Laser	2.9% p=0.8	25% p=0.00004*	6.3%
RD	1.4% p=0.2	0	0
DR	13.6% p=0.6	37.5% p=0.02*	13.8%
HR	I=42.3% II=28.2% p=0.002*	I=75% II=0 P= 0.1	I=43.8% II=18.8%
Other	17.32% p=1	12.5% p=0.7	27.6%
OD	18.8% p=0.4	28.6% p=0.4	20%

OCULAR ABNORMALITIES IN RELATION TO RENAL DISEASE CONTROL

Table 27

ABNORMALITY	CREATENINE > 120 n=161	BUN > 17 n=97
Conjunctiva	75.4% p=0.2	54.7%p=0.02*
Cornea	50.4%´ p=0.03* Arcus = 44.5% p=0.003*	51.7% p=0.04* Arcus = 49.5%
A/C	3.8% p=0.5	1% p=0.08
Iris	7.7% p=0.03*	13.3% p=0.1
Lens	36.2% p=0.7	49.9% p=0.006*
Vitreous	15.4% p=0.3	21.1% p=0.1
Hard exudates	41.3% p=0.02*	52.6% p=0.00002*
Soft exudates	16.3% p=0.6	23.7% p=0.002*
Haemorrhages	41.3% p=0.04*	50.5% p=0.0004*
Fibrous proliferation	5.7% p=0.2	6.2% p=0.4
Neovascularization	2.5% p=0.8	4.2% p=0.2
Maculopathy	25.4%p=0.3	30.9% p=0.3
Laser	2.5% p=0.4	2.1%
Retinal Detachment	1.2%	1 case
DR	9.9% p=0.7	15.3% p=0.7
HR	I=47.2% II=16.8% P=0.03*	I=50% II=20.9% P=0.01*
Other retinopathy	17.5% p=0.3	16.7% p=0.4
Optic disk	15.2% p=0.4	21.3% p=0.2

*=Statistically significant at $p<0.05$

DATA ANALYSIS

The total population studied was 201 patients. The sample size expected was 216 patients. This was acceptable for computation and subsequent analysis. Data was now analysed by SPSS/pc+ method.

Characteristics of the study population

Age range was 14-74 years with a mode of 42, median of 39 and a mean of 40 years. The mode, mean and median of the males approximates that of the group while that of the ladies is lower. Majority of the population was in the age ranges 21-60 years. There were more males than females with a sex ratio of 3:2. (Refs. Tables 1 & 2 and Diag 1). The expected male to female sex ratios are as follows: Haemodialysis 3:1, Peritoneal dialysis 8:1, Transplant 3:2 and clinic outpatients 1:1.

Type of renal disease

The distribution of renal diseases is as shown in table 4 and graph 2. Majority of the patients were having CRF. Table 5 shows duration of disease in both males and females. The longest duration was 240 months i.e. 20 years and the shortest duration was one day, which was associated with acute gynae and maternity cases. Long duration of disease was associated with increased age and the male sex. It was also associated with abnormalities of iris, lens and the vitreous as shown in table 23 & 24. It was not associated with fundus abnormalities, high BUN p=0.6 or high createnine p=0.2. (Table 4&5,Diag.2)

The underlying kidney pathology was not indicated in 89 patients and diabetic and hypertensive nephropathy accounted for a significant number of patients. The expected distribution as quoted earlier by the renal team was a third hypertension, a third glomeluronephritis and another third diabetes. Here glomerulonephritis contributes only thirteen cases. Genetically determined renal diseases were rare (polycystic kidney disease equals five cases) Ref.Table 6, Diag.3.

The commonest type of treatment was haemodialysis. Haemodialysis was not significantly associated with either age or sex p=0.07 and 0.7 respectively. Two patients were on conservative treatment, however the treatment types are neither exclusive nor exhaustive.

There is a lot of interaction between the classes of treatment and drugs. 46 patients were on anti- hypertensives and 58 on steroids (2 on aldactone and 56 on prednisone). 22 patients were on calcium replacement with or without multivitamins. All transplant patients were on at least one cytotoxic either cyclosporin or azothioprin. Others on cytotoxics included uncontrolled nephrotics and glomeluronephritis. Patients on antibiotics were those with infected catheters or disseminated infection.(Table7&8, Diag.4)

The commonest associated systemic disease was hypertension noted in 114 cases, whether or not on treatment and irrespective of the blood pressure at the time of examination. It was not indicated in 45 patients and diabetes was noted in 33 cases only. There was one case of impaired GTT post transplant but no frank diabetes.

Createnine greater than 120 mmol/l is high but the cut off for haemodialysis is 200mmol/l. High createnine levels were found in 161 patients (81.1%). High createnine was associated with corneal abnormalities p=0.03, more so with arcus p=0.002. It was also associated with iris abnormalities as well as hard exudates and haemorrhages but not with soft exudates. Hypertensive retinopathy was significantly associated with high serum createnine p=0.03. High BUN was found in 97 cases (48.3%) of the patients and was significantly associated with corneal, conjunctival, lens abnormalities, hard and soft exudates, retinal haemorrhages and hypertensive retinopathy. High BUN was associated with high intraocular pressure p=0.02, male sex p=0.03 but was not significantly related to age p=0.3, duration of disease p=0.6, type of kidney disease or underlying pathology p=0.2. A normal level of BUN is 2.5 – 6.6 mmol/l (15-40 mg/dl). Createnine levels were not associated with age p=0.1, sex p=0.5 duration of disease p=0.2 underlying pathology p=0.2 or type of kidney disease. Normal values are 62 – 124 micromole/litre (0.72-1.4 mg/dl). (Table 9&10,Diag.5).

Investigations for kidney disease was done extensively for the transplant patients and less so in the rest of the patients. Universally done investigations done were blood sugar, createnine/BU N, haemoglobin level. Hepatitis B surface antigen screening was done for all haemodialysis and transplant patients. Urinalysis was not standardised i.e. different strip in use and therefore was not analysed. Calcium and phosphate levels were done in 33 and 28 cases respectively and therefore were also not analysed. Haemoglobin less than 10g/dl was considered as low and needing replacement therapy and less than 8g/dl requiring blood transfusion. 2 patients were found to be HIV positive and 3 hepatitis (HBs Ag positive). Serum lipids were done in 5 cases.

Ocular complaints were found in significant number of patients the commonest being poor vision/blur (38%). 85 cases did not complain and watery discharge was noted in 14 cases. Only 32 patients had had treatment prior to the study, which included glasses, eye drops, laser and surgery. (Tables 11&12).

Eyelids were normal in 130 cases (64.7%) while crystalline white deposits (uraemic frost) was noted in 19 cases. Lid oedema was found in 36 patients mainly in association with ARF and nephrotic syndrome. Only one patient had unilateral lid cellulitis. Lid retraction (Summers skill sign) was not found. Other lid abnormalities were stye, naevus, xanthelasma -2 and healed HZO scar -1(Table 14).

Pterygium was the commonest conjunctiva abnormality noted in 42.8% of the cases. Pinguecula was found in 16 cases and allergy in a few patients. Calcification was presumed when crystalline deposits were found in the conjunctiva with associated irritation not explained by either allergy or infection. Conjunctiva disease was associated with ARF $p=0.04$, males more than females $p=0.02$ and high BUN $p=0.02$. Sub conjunctival haemorrhage was seen in three patients (one ITP, one drug

reaction, one query cause), diffuse inflammation in 22, allergy in 9, 3 brown pigmentation and three had naevus. (Table15)

Corneal was clear in 50.2% of the patients. Arcus was found in 40.3% of the patients and was found in patients less than 40 years of age. Unilateral corneal ulcer was noted in 4 patients of whom 2 had associated hypopyon. Corneal disease was noted in more males than females and was also associated with advanced age. It was also associated with high BUN as well as high createnine. Corneal disease was associated significantly with ARF and GN P=0.004 and 0.03 respectively and very significantly with CRF p<0.001. It was however absent in ERSD. Corneal disease did not seem significantly associated with any mode of treatment. One opacity one visually significant found in one patient, scar in three, foreign body in one, Xerosis with band keratopathy in two and bilateral peripheral ulcer in one.(Table16)

Intraocular pressure was normal in most of the cases, IOP greater than 21 noted in 13 cases. High intraocular pressure was associated with haemodialysis (p=0.005) and high BUN. Only one transplant patient had IOP greater than 21. None of these patients were on steroids. All cases of high IOP had high BUN p=0.02 but only 5 had high createnine levels p=0.5. Therefore high IOP was associated with HD and high BUN. (Table17)

A/c was clear in 194 cases. There were 2 cases of Hypopyon associated with corneal ulcer and flare associated with arthritis in 5 cases. (Table 18).

Iris atrophy was found in 12 cases and rubeosis in one patient suspected to have Wegener's granulomatosis. Other abnormalities found included naevi and unexplained pupillary irregularities. Iris disease was significantly associated with increasing age p=0.01, male sex p=0.005, prolonged duration of disease and high serum createnine p=0.03. (Table 19) Iris abnormalities were not associated with any

mode of treatment or kidney disease. Uveitis with keratic precipitates was found in three cases the others were mild flare with no associated keratic precipitates.

Cataract was found in 71 patients of whom fundus was inaccessible in 2. Lens abnormalities were significantly associated with the male sex, high BUN, Peritoneal dialysis, ARF, CRF and GN. Cataracts were associated with steroid therapy (25.4%, $p=0.01$ but not with haemodialysis. In the ERSD group 70% had cataracts and cataract was significantly associated with ARF, CRF and GN and BUN but not high createnine. Only 21.9% of the transplant patients had cataract. Cataract was associated with increased age $p<0.001$. (Table 20)

Vitreous was clear in 80.1% of the patients, significant haemorrhage was found in 3 patients in whom fundus was visible. Vitreous membranes were found in one patient and fibrous proliferation in 10 patients. In 4 cases vitreous was not seen, 2 were the cases associated with corneal ulcer and 2 had dense cataracts. Fibrous proliferation was associated with increasing age $p=0.01$ and male sex $p=0.03$. Vitreous abnormalities were associated with male sex $p=0.03$, with age $p<0.0001$ and GN $p=0.01$. It was not associated with the control or the pathology of the kidney disease. (Table 21)

Fundus findings were bilateral where accessible though not symmetric. The commonest finding was haemorrhages found in 38% of the patients. The haemorrhages were not significantly associated with either age or sex. They were significantly associated with high BUN $p<0.001$, high createnine $p=0.041$, HD $p<0.001=$, ARF $p=0.003$, GN$p=0.01$ and ERSD $p=0.04$. They were present in only 35.8% of CRF and only 25% of transplant patients. 50% of patients with elevated systolic blood pressure (n=88) had haemorrhages $p=0.001$ and 65.7% of patients with haemorrhages had high systolic blood pressure. 52.3% of patients with high diastolic blood pressure (n=44) had retinal haemorrhages $p=0.01$ and 35.9% of patients with

haemorrhages had high diastolic blood pressure. Out of 41 patients with Hb less than 8g/dl. 48.8% had retinal haemorrhages p=0.1 and 28.2% of patients with retinal haemorrhages had HB less than 8g/dl. Low platelet count was found in 6 patients all of whom had retinal haemorrhages. Hard exudates were seen in 36.3%and were significantly associated with increasing age. p=0.03, male sex p=0.02, HD p=0.004, high createnine p=0.01, high BUN p<0.001, CRF p=0.02 and GN p= 0.02. Soft exudates were seen in 32 patients and were significantly associated with HD p<0.001, ARF, and high BUN p=0.001. They were not associated with age, sex, createnine, type of disease or pathology. Neovacularization was found in 9 cases NVD in 3 who were diabetics, NVE in 4 diabetics and 2 cases of ischaemic fundus.It was statistically significantly associated with age p=0.01.Laser marks were found in 6 cases of whom 4 were bilateral and 2 uniocular. Maculopathy was present in 23.6%of the cases of which 10 were ARMD. There were 4 isolated diabetic maculopathies, the rest were associated with other fundus abnormalities. There were more males than females with maculopathies p=0.0008 and they were associated with increasing age p=0.0005. Other macular lesions included bilateral bleed in one ITP patient, white lesion in another and a scar in another.Optic disc abnormalities noted include cupping 9 cases atrophy 7 cases. NVD 3 cases and disc oedema associated with BIH. Abnormalities were associated with increasing age p=0.005. AION was seen in 4 patients.(Table22&23)

Retinopathies were derived from their characteristic features .Of 33 diabetics 16 showed retinopathy (48.4%). DR was associated with age p=0.00001, male sex p=0.008 but not with duration of disease or control of renal disease p=0.9.Of the 114 hypertensives retinopathy was found in 57.2% of which 41.3% had low risk and 15.9% had high-risk hypertensive retinopathy.

It was associated significantly with age p=0.009 and male sex p=0.009. It was not associated with high blood pressure as measured at the time of examination. CMV retinitis was found in two patients, one 25-year old male with acute transplant rejection and a 32-year old lady with disseminated Kaposis sarcoma. BRVO was found in one patient. There were two patients with retinal detachment and uraemic retinopathy in 6 patients, all having ERSD. Ischaemia fundi were seen in 3 who were not HIV positive or diabetics. Table 24)

Vision was 6/18 or better in 150 right eyes and 157 left eyes and less than 6/60 in 19 right eyes and 10 left eyes. Overall there were 3 legally blind patients, one on CAPD and two diabetics on haemodialysis. (Table13)

DISCUSSION

There were more males than females in the study. It is known that kidney diseases are expensive to treat. Since women are not the financial controllers in most African families, it may be the reason why they are sidelined and therefore underrepresented in the study. The male female ratio was higher in favour of men amongst the dialysis and transplant patients as well as the out patients where it was expected that financial constraints would not limit the women. This implies that the clinic charges are still high for women to afford with their few resources.

Type of renal disease: More CRF were seen in the study probably because there were many patients on haemodialysis. Among the out patients the common kidney disease is glomerulonephritis and nephrotic syndrome and some hypertensives. Most unstable patients were too sick and irregular on treatment and therefore few examined. Most CRF cases in the study were relatively stable. There were many cases of patients with renal disease not in either CRF or ARF: (NS =16,GN =41).

There were 10 ESRD cases on several stages of work up for eventual transplantation some of which were on HD momentarily, or were unsuitable for transplantation.

CRF was associated with most ocular complications, with involvement of all ocular tissues. ARF patients are usually too sick to interrogate and this may explain the under representation. Four patients had acute on chronic renal failure.

Underlying pathology:

This was not indicated in a significant proportion of patients GN contributed 27 cases, (13.5%) or 38.4. vascular diseases 11.4% (+DM = 23.3%), polycystic 2.5% (8.3%). Other causes included obstructive uropathy, hypovolaemia, UTI; septicaemia and crystalline uropathy. This confirms that GN is the commonest cause of renal disease in our set up.Associated systemic disease: Hypertension both 1° and 2° was in 114 cases but this does not correspond to the number on anti-hypertensives.(N=46) or the number with hypertensive glomerulosclerosis (n=23).This is because pathology was not indicated in many cases, prescription not indicated in the file and patients memory not solely reliable. In a study on patients with malignant hypertension caused by renal disease, eleven were transplanted, two had HD and one on drugs only. Two cases had KW IV and the others I and II with Elschnigs spots, which persisted in later examinations at 6/12 and 21 years. This showed that hypertensive ocular changes are not necessarily reversible on control of kidney disease (.34). In the study HR = 115 cases. There were 33 diabetics of whom ten were on insulin, the rest on OHAS. There were 23 patients with diabetic nephropathy that was not staged (classified). Control as indicated by HbA1c was not done. Of the 33 diabetics, 23 had diabetic nephropathies, and 16 DR (48% in 35). There is a bias because the diabetics involved have significant nephropathy that has an independent aetiological role in DR: In diabetics, the nephropathy is not solely associated with advanced glycation and products due to hyperglycaemia. This may explain the higher rates of DR and DN in this study. (36)

The patient in the study had classical WG and CRVO with subsequent NVG. There is a study that recommended combined medical and ophthalmologic approach with prompt therapeutic intervention as ocular morbidity is well recognised. (37) Gout was found in 5 cases and osteoarthrosis in 2 cases: All had associated A/C flare from uveitis probably associated with hyperuricaemia either 1° or 2° to renal disease as described by Wing. (10) The patients seen here were not found to have other cystic disorders but had significant hypertension, and haematuria (38). Genetic disorders are rare probably because the study did not include children (Rates in a well baby clinic = 244%. (39) Connective tissue disorders were rare other than the two osteoarthritides and 1 WG.

Duration of Disease: This was taken as the month as diagnosis of the kidney disorder to the date of the study. It was not associated with control or fundus changes. In a study on 234 GN, 42% had specific fundus lesions with drusen-like and RPE damage statistically significantly related to the duration of renal disease ($p<0.0001$) and not with age, sex control or type of treatment. (11) In this study duration of disease was related to male sex and abnormalities of iris, lens and vitreous but not to type of kidney disease or control.

Treatment for kidney disease

HD: The ideal schedule is 1-2 sessions per week but titrated to patients need. Average duration is 4-6 hours. Access is by A-V fistula or subclavian catheter. Dialysate contains sodium, K+, Ca, Mg, acetate or lactate as alkali equivalent, chloride and glucose. It is expensive and therefore done irregularly and few females have it done. Most cases had dialysis equivalent to 6/12 – 1 year. The turnover is high with high mortality rates. Long term consequence of HD includes vascular calcification (also associated with DM; uraemia and systolic hypertension). In the elderly and also bone disease due to decreased Vitamin D3 production. A study on

patients on HD followed up for 10 – 25 years with an average of 16 years, and a mean of 9.7 years since onset of HD found that HD was associated with IOP, cataracts and fundus changes. HD is associated with occlusive angiopathy of unclear aetiology culminating in skin necrosis. This was not noted in the study cases. These changes resolve with transplantation.(40,41) Duration of dialysis time before transplantation had no effect on rate of post transplant complications at three years postoperative such as cataract, DM and raised IOP This aspect was not looked into in the study.

Transplant: 32 cases were seen out of 78 patients in the country (National registry for the association of transplant patients). They were on follow up for 2/12 – 5 years. Transplant patients are well motivated and are self-monitoring, majority being followed up in private clinics. Those followed up in our renal unit show up for investigations and renewal of prescriptions because K.N.H. is cheaper than other institutions. They were on Azothioprin and or cyclosporin with or without steroids. Cyclosporin is secreted in potent doses in conjunctiva and aqueous humour after systemic administration (query effects on eye) and is also nephrotoxic (42). Transplant is not recommended after 50 years because occult but progressive renovascular disease occurs that can cause progressive renal insufficiency and even ERSD (43). It has been found to be cheaper than HD in the long-term (44). It is thought to normalise kidney functions in ESRD and has been found to do so in familial hypomagnesemia with hypocalciuria not ameliorated by drugs alone (i.e. oral Mg and thiazide diuretics)(45). There was no subconjunctival haemorrhage associated with transplant, and generally there were few ocular findings in them, with hard exudates in 28.1%, lens abnormalities in 21.9%, cornea abnormalities in 41.4% and HR (62.6%) possibly due to steroid induced hypertension and lens changes. There was only one case of IGTT. Hypertension was seen in 12 cases compared to

63/548 patients. (46). Infection was seen in one CMV post transplant with acute rejection (CMV antibodies positive). Other studies have reported endogenous endophthalmitis of mixed fungal plus bacterial origin. (47). Conservative treatment was given to only two both young ladies transferred from the wards with ARF. Both opened up.

PD: This is done in HIV positive patients with CRF/ESRD or those who cannot afford HD or are not willing to have alternative treatment. Number on regular PD =17, but 8 were seen in the study. Being an out patient procedure, patients were seen when hospitalised due to peritonitis or blocked catheters. PD had the highest number of ocular complications compared to other modes of treatment with 75% having lens abnormalities statistically significant (p=0.02) and maculopathies 57% and HR 75%. Surprisingly severe HR was absent.

Control of Renal Disease: There was coincidental statistically significant association of both BUN and Createnine and ocular disease and either of them could be used to deduce association. Although their levels are related to serious ocular complications, the point in time of measure does not represent what had been happening in the patient i.e control.

Ocular findings

Lids: Oedema is due to passive fluid accumulation in extracellular spaces. Other findings were incidental as in the general population.

Conjunctiva: Limbo conjunctival calcification is said to be rare in blacks though no studies have been done. It is associated with elevated calcium and phosphates. Unfortunately, due to financial constraints, calcium levels were not done routinely in all cases. Sub-conjunctival haemorrhage was seen in 3 cases none of whom were on HD (Reported as 20.8% in Japan). (27) Pterygium was seen in 48% (23%in 49).

Cornea: Arcus was the commonest corneal pathology seen in 40.3%. It was more in males than females as in other studies (others studies showed blacks more than whites). There are several types of arcus: Arcus senelis, Arcus lipidalis, Gerontoxic, and Arcus lipoides cornea. Arcus senelis occurs after age of 40 years but in the study arcus was found in a number of younger patients associated with high BUN and createnine. This may be due to dyslipoproteinemia, hyperlipidaemia or diabetes associated with kidney disease.

IOP: High IOP was found to be associated with high BUN and HD: It was not associated with steroids possibly because, the doses used are low and steroid responders are few in the general population. Among transplants, only one patient had IOP >21 mmHg. but 12.5% in the Japanese study (27).

IRIS: Rubeiosis was found in one case of WG. More could have been seen on gonioscopy. Atrophy was probably age related or due to diabetic and hypertensive changes. Iritis associated with tubulointestitial nephritis, a hypersensitivity reaction to antibiotics or NSAIDS was not seen nor was IgA glomerulonephritis related iritis.(48)

LENS: Most cataracts seen were bilateral though not symmetric. Commonly seen in RF is anterior and posterior subcapsular opacities due to acute change in osmotic gradients. No cases of sudden onset permeability cataract was seen in HD cases. (Subtle changes could have been missed and also no quantitative data was taken on lens size pre and post dialysis). Significant causes were age p=0.001 steroids, ESRD, ARF,CRF and GN. Among transplant patients only 21.9% had cataract (62.5% in Japan study). Pseudoexfoliation was not seen and it has been shown to have an independent association with hypertension and angina in age more than 49 years and is used to identify patients at risk. It is common in females. (49)

In a population-based study on renal function and incidence of cataract, cortical cataract was associated significantly with increased BUN. (50)

Vitreous: Visually significant changes were vitreous haemorrhage and fibrous proliferation found in the diabetic s and others with other retinopathies.

Fundus: No specific fundus findings have been described in renal disease other than GN where 42% of 234 patients were found to have specific fundal lesions (drusen-like) and RPE damage statistically correlated with duration of disease but not with age, sex, treatment or control (11). DR was seen in 48.4% (48%in ref. 51). Most fundal changes were associated with control of renal disease. Elderly females and Africans are protected from the acute damaging effect of high BP on the fundus because of fibrous replacement of smooth muscles in the vessel i.e defence by sclerosis. Normal fundus appearance does not, however, rule out serious hypertensive renal damage and papilloedema is no invariably present in accelerated hypertension. (10) The single most important prognostic factor in patients with severe hypertension is BUN at the time treatment commences. Normal funds were found in 50 cases 4 transplants, 2 ESRD, 4 GN, 1NS and 31 CRF.

Optic disc. Optic atrophy was 1° or associated with retinal atrophy, or 2° to optic neuritis. Old papilloedema was found in one transplant case with VA =6/12 both eyes. Oedema was seen in ARF as well as suspected BIH 2° steroids therapy. Glaucoma was found in 4 patients and AION in 3.

Vision: Visual symptoms related to macular atrophy, cataract and retinopathies. Other significant causes of poor vision were: Corneal ulcer, Uveitis, High IOP/glaucoma and Optic neuropathies. However there were only three blind patients. Eye care was needed in 158 cases amongst whom 65 were treated with drugs or issued with spectacle prescriptions. Some patients were referred to eye filter clinic for follow up and further evaluation, 9 referred to Kikuyu Eye Unit for laser and one

to Nakuru for follow up. One patient was referred to a private practitioner for fitting of prosthesis in one phthisical globe.

CONCLUSION

There is a significant ocular pathology seen in black African renal patient with the prevalence of 87.1%. Ocular changes involve anterior and posterior segment, visually significant changes in both. CRF was a commonest kidney disease among the in patient (ward and renal unit), and GN was a commonest among the outpatient. The commonest underlying pathology was GN. Hypertension was a commonest associated systemic disease. Genetically determined and connective tissues diseases were rare. Control of renal disease was significantly associated with ocular complication and it was poor in many cases. BUN was as good indicator of control as createnine. Duration of disease was related to iris, lens and vitreous abnormalities. NS was associated with least ocular complication. HD was associated with most abnormalities and transplant the least. High IOP was associated with HD and poor control. Lens abnormalities were associated with most types of renal disease significantly but not with steroid, HD or transplant. Males were associated with more cornea disease than females. Significant fundus findings were HR, DR, Ischaemic retinopathy BRVO and isolated maculopathy. Optic disc abnormalities included AION, atrophy, NVD, cupping and oedema. Poor vision was due to both anterior and posterior segment pathology with only 3 blind patients. Majority of the patients needed eye care as treatment or further evaluation and follow up.

RECOMMENDATIONS

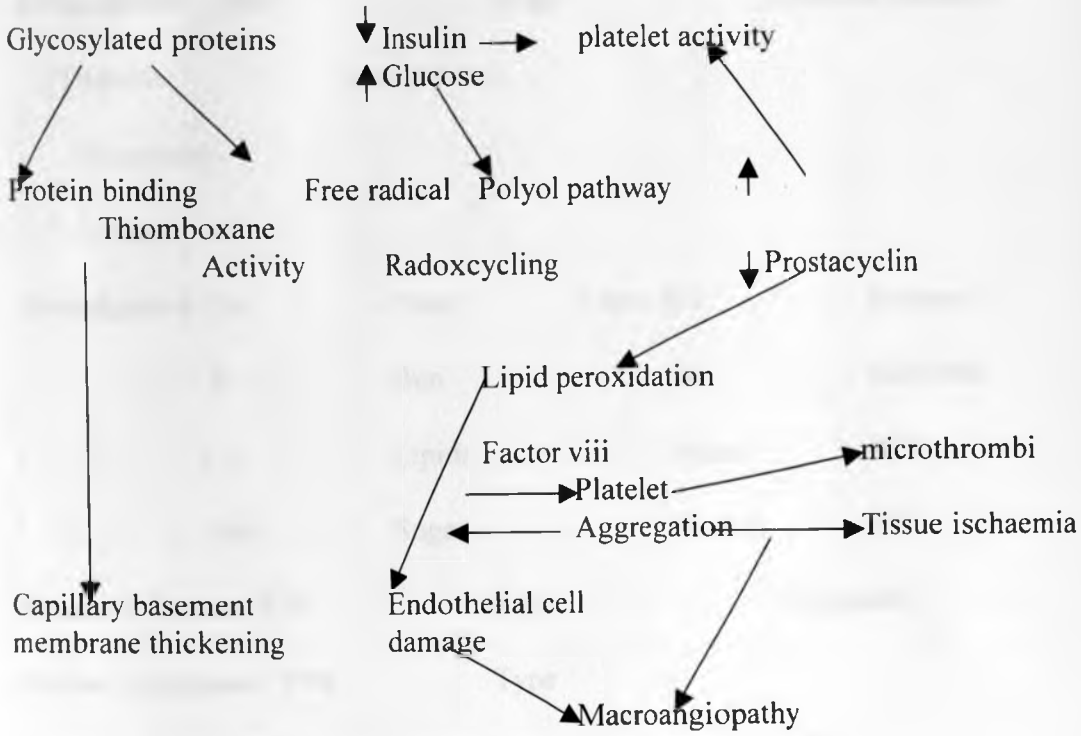
1. Renal patients should have scheduled ophthalmic review.
2. Transplant patients should have pre-and-post-operative ophthalmic review.
3. The cost of dialysis should be such that it is affordable to the majority of these handicapped patients.
4. There should be vigilance in looking for amendable ocular complications by both the renal physician and the ophthalmologists.

STUDY LIMITATIONS

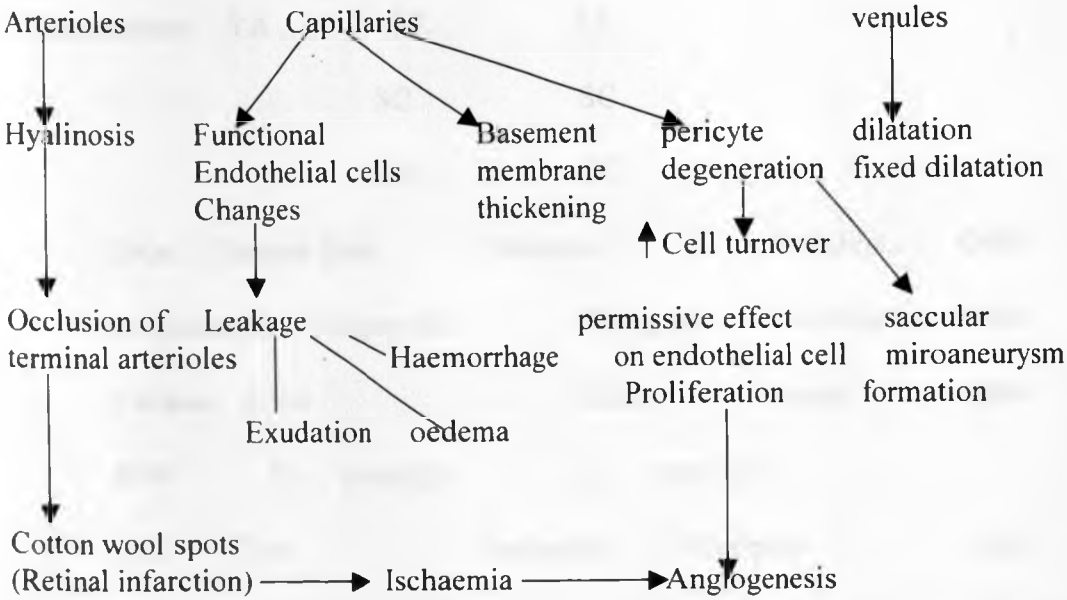
1. High morbidity among patients limited the degree of examination and subsequent investigation for ocular disease i.e. fundoscopy, SLE and FLA.
2. Cost limited degree of investigation in these already financially drained patients.
3. Medical records were incomplete in a significant number patients hence the missing data.
4. There were a lot of confounding factors in terms of pathology, type of disease and treatment and therefore difficulties in deriving associations and conclusions.

APPENDIX 1

I. Pathogenesis of Diabetic Microangiopathy (kidney and eye)



II Pathogenesis of Diabetic Retinopathy



APPENDIX 2

QUESTIONAIRE

Study Number..... Hospital Number.....

Name..... Age (years)..... Sex.M/F

Renal disease Type Stage Duration (months)

Dialysis Last session

Transplant

Drugs

Investigation Na Creat Urine PH Ketones

K Bun SG Bilirubin

Ca Lipids Sugar Wbc

Po4 Sugar Protein Rbc

Systemic disease Y/N Type Treatment

Ocular treatment Y/N Type

Investigations IVU Arteriogram RBS

U/s Haemogram HB WBC PLT

ESR

Examination **VA** RE LE

SC SC

CC CC

Lids: Uraemic frost Oedema Cellulitis Other

Conjunctiva: Pinguecula Pterygium Calcification Other

Cornea: Clear Ulcer Arcus Other

IOP R) (mmHg) L (mmHg)

A/C Clear Hyphaema Hypopyon Other

Iris Normal Nodule Atrophy Rubeosis Other

Lens Clear opacity (fundus visible) opacity (fundus invisible)

aphakia Not seen IOL

Vitreous Clear Haemorhage (fundus visible) Haemorhage (fundus

Invisible) Fibrovascular membrane Not seen

Retina R L

Hard exudates

Soft exudates

Haemorrhages

Microaneurysms

Venous loops

Fibrous ploriferation

Neovascularization

Maculopathy

Laser marks

Retinal detachment

Optic disc Normal Cupping Atrophy NVD Others

Diabetic retinopathy class

Hypertensive retinopathy class

Eye care Y/N Treat/Refer.

APPENDIX 3

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