KNOWLEDGE, ATTITUDES AND PRACTICES OF GLAUCOMA PATIENTS ATTENDING CLINIC AT KENYATTA NATIONAL HOSPITAL.

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DECLARATION:

THIS DISSERTATION IS MY ORIGINAL WORK AND HAS NOT BEEN PRESENTED FOR A DEGREE IN ANY OTHER UNIVERSITY.

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DEDICATION

This work is dedicated to my patients, the very reason I set out to do this dissertation.

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TABLE OF CONTENTS

LIST OF FIGURES.

LIST OF TABLES.

LIST OF ABBREVIATIONS.

ACG	Angle closure glaucoma
ALTP	Argon laser trabeculoplasty
ARMD	Age-related macular degeneration
CDR	Cup-disk ratio
HVF	Humphrey's visual field analyser
IOP	Intraocular pressure
KAP	Knowledge, attitudes and practices
KNH	Kenyatta National Hospital
LE	Left eye
MD	Mean deviation
POAG	Primary open angle glaucoma
PSD	Pattern standard deviation
RE	Right eye
SPSS	Statistical package for social scientists
TET	Trabeculectomy
VA	Visual acuity

ABSTRACT

Background: Glaucoma is a characteristic optic neuropathy which typically results in specific patterns of progressive visual field loss and who's most important risk factor is raised intraocular pressure (IOP). It is second to cataract as a leading cause of global blindness and is the leading cause of irreversible visual loss. In Kenya it is ranked third after cataract and trachoma. Glaucoma is often diagnosed late and accompanied by poor patient compliance and follow-up as it is very slowly progressive and commonly asymptomatic until a very advanced stage of the disease is reached.

Results: We interviewed 78 patients, 47 were male and 31 were female. Age ranged from 19-89 years with a mean age of 61.1 (SD ±11.5) years. Seventy nine percent of patients presented with normal visual acuity but 5 (6.4%) presented with bilateral blindness. Mean IOP at presentation was 23.85mmHg with a wide range of 9-60mmHg. Fifty three (67.9%) patients were classified as having some knowledge using a predefined classification system, having poor knowledge of risk factors and treatment options. On compliance to medication, 62 (78.7%) patients reported compliance while 54 (69.2%) reported compliance to all clinic visits. The most common challenges reported with drug use were drops falling on cheeks (41%), cost of drugs (23.1%), and side effects of drugs used (19.2%).The most common impediments to clinic attendance were forgetting (16.7%) and other incidental events (62.5%). Patients had wrong expectation of both treatment and surgery with 29.5% and 32.5% expecting cure from medical and surgical treatment respectively. Compliance to glaucoma medication was perceived to be very important in 88.5% of patients, while 89.7% of patients perceived compliance to follow-up clinics as being very important.

Conclusion: Forty four (56.4%) patients presented late with advanced disc damage and 40 (51.3%) had undergone surgery, the most common being trabeculectomy. There is still a wide gap in knowledge that exists and that needs to be addressed through counselling and further patient education. Self-reported compliance was high and patients had good attitudes towards treatment and follow-up of glaucoma.

1. INTRODUCTION TO GLAUCOMA.

1.1. Definition

Glaucoma is a term used to encompass a group of potentially blinding conditions. Because the pathophysiology, presentation and treatment of the different types of glaucoma are so varied, there is no single definition that adequately encompasses all forms. However, current thinking is that the glaucomas have in common a characteristic optic neuropathy which typically results in progressive visual field loss. The most important risk factor is raised intraocular pressure (IOP) secondary to reduced aqueous outflow through the filtration angle.

1.2. Epidemiology

Glaucoma is second to cataract as a leading cause of global blindness and is the leading cause of irreversible visual loss[1]. It is estimated that about 65 million people throughout the world are affected by glaucoma[2]. In 2002, 37 million individuals were blind worldwide, with glaucoma accounting for 12.3% (4.5million) of these individuals[1].

By the year 2020 it is estimated that there will be almost 80 million people in the world with open-angle glaucoma and angle-closure glaucoma (ACG). The majority of these individuals will have open-angle glaucoma. Of those with ACG, it is predicted that 70% will be women and 87% will be Asian.

Bilateral blindness from glaucoma is projected to affect 8.4 million individuals worldwide by 2010 and greater than 11 million by 2020. Globally, glaucoma is a significant cause of vision loss that disproportionately affects women and Asians.

Risk factors for open-angle glaucoma include increased age, African ethnicity, family history, increased intraocular pressure, myopia, and decreased corneal thickness.

Various systemic diseases also predispose to glaucoma. These include hypertension which in a study done by Langman et al (2005) was shown to be significantly more common in patients with glaucoma than in controls[3]. A Study done by Akhefide et al showed that other than raised

systolic and diastolic pressure, the mean arterial and pulse pressures were also significantly higher in glaucoma patients[4].

Diabetes has been shown to be a risk factor in some studies while others show that it is not a risk factor. The Beaver Dam Eye Study[5] showed a link between Diabetes and primary open angle as did a study by Dielmans et al (1996)[6]. However, the largest survey done on primary open angle glaucoma, The Baltimore Eye Survey failed to confirm any association apart from that explained by referral bias[7].

Risk factors for angle closure glaucoma include Inuit and Asian ethnicity, hyperopia, female sex, shallow anterior chamber, short axial length, small corneal diameter, steep corneal curvature, shallow limbal chamber depth, and a thick, relatively anteriorly positioned lens.

In Kenya, glaucoma was found to be the third leading cause of blindness after cataract and trachoma, as established in the Ocular Status Survey results from the Kenya Rural Blindness Prevention Project. It was found to occur at a frequency of 0.6/1000[8]. In the Rapid Assessment of Avoidable Blindness in Nakuru District, Kenya, posterior segment disease including glaucoma, diabetic retinopathy (DR) and age-related macular degeneration (ARMD) accounted for 30.4% of bilateral blindness and 24.1% of bilateral visual impairment. 19% of posterior segment disease was due to glaucoma[9]. A study done by Karimurio et al[10] in Kibera found that only 0.17% of the population had glaucoma and that it was the cause of 0.7% of the visual impairment in the community. Only one person was found to be blind from glaucoma.

A study done by Buhrmann R.R. et al on the prevalence of glaucoma in a rural East African population in Central Tanzania found a prevalence of 4.16%. Primary open angle glaucoma (POAG) was diagnosed in 3.1%, ACG in 0.59% and other forms of glaucoma accounted for 0.49%[11]. A study done in Ghana showed a standardized age-specific prevalence of 7.7% (30 years and above) and 8.5% (40 years and above)[12].

2. INTRODUCTION TO THE GLAUCOMA PATIENT.

Previous studies have shown than POAG is by far the most common type of glaucoma. It has various characteristics that predispose the patients to late presentation and these include the slow disease progression. It is only years after the initial onset of the disease that the patient starts to

experience symptoms associated with the disease. By the time the patient begins to experience significant visual loss involving central vision it is often very late and up to 40% of the fibres from the optic nerve have already been lost. This was established in a study that showed that only 60% of the nerve fibres remained in patients with glaucoma with no detectable visual field abnormality[13].

In addition to the slow progression of the condition, when the symptoms eventually manifest they appear to be very benign with patients experiencing haloes and this only when staring at bright lights. No pain is usually experienced in POAG and peripheral visual loss is seldom recognized until it is very late and central vision is affected.

This typically slow progression of symptoms that are not initially disabling has led to POAG being referred to as, "The silent thief of sight."

Patients with primary angle closure have varying presentations depending on their stage of disease. Angle closure suspects are asymptomatic and will therefore rarely present to the doctor's office until one eye has an episode of acute angle closure. Patients with intermittent angle closure may present with a history of transient blurring of vision with haloes, ocular discomfort and headache. With this kind of disturbing symptoms they are more likely to present at an earlier stage of the disease. In the case of acute congestive angle closure, the symptoms are more dramatic with unilateral painful loss of vision, periocular pain and congestion. Nausea and vomiting may also occur in severe cases. These patients will therefore usually present to hospital emergency departments for medical attention.

Due to the asymptomatic nature of chronic glaucoma, up to 50% of those with glaucoma in the industrialized world are unaware of it and are not receiving medical care.[8,11]

Several studies have been done into the characteristics of glaucoma patients due to this unique presentation of the condition. Many have looked at the visual acuity, intraocular pressures and visual field status at the time of presentation. Some have looked at patient compliance to prescribed medications, attendance to follow-up clinics after diagnosis and patient knowledge and awareness into glaucoma. Others on the other hand have looked at the socio-economic status and educational level of glaucoma patients.

Studies done in Southern India in a rural population showed that 92.6% of those with definite POAG had not been diagnosed or treated earlier and 48% of these had severe glaucomatous damage including 16% who were blind in one or both eyes [14]. In the same study it was found that only 0.33% of subjects were aware of glaucoma and that the level of education and socioeconomic status played a significant role in the level of awareness of glaucoma in this rural population[14]. In another study done in Urban Chennai, 13.5% of subjects were found to be aware of glaucoma and 8.7% had knowledge of glaucoma (of these only 0.5% had good knowledge of glaucoma)[15]. A study done in Egypt showed that 40% of patients did not know that glaucoma causes blindness[16].

On issues of compliance studies have offered varying results. Vincent in 1972 showed that 58% of glaucoma patients were noncompliant to their medications. This was using the rather strict cut off of missing 2 or more doses in a month [17]. In more recent studies such as those done by Bloch et al, 28% of the patients were found to be noncompliant and there was a tendency for non-compliers not to appreciate that blindness was inevitable in the natural history of glaucoma[18]. There is no clear evidence linking reduced adherence with more rapid visual field deterioration, however, educating patients about their disease and treatment should ultimately improve patient adherence, and reduce the risk of significant progression.

When reviewing barriers to poor follow-up a study done in South India established 5 major classes of barriers: knowledge and perception barriers (37.3%), incidental obligations (17.7%), time and inconvenience (17.4%), physical challenges (17.7%), and financial difficulty with follow-up visit-related costs (10.0%). The most prevalent barriers reported were thinking "my eyes were okay" (44.4%), lacking an escort to the clinic (19.7%), being unable to leave work responsibilities (16.1%), being unaware of the importance of regular follow-up visits (13.0%) and being out of town (10.8%)[19]. Several studies have looked into whether there exists a relationship between the socioeconomic and educational level of the patient and their compliance to medications and follow-up visits. In terms on expenditure a study done in Egypt showed that on the average patients spent 30.1% of their income on glaucoma medications per month[16].

Studies have also been done into health literacy which is described as the degree to which the individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions. In the setting of glaucoma, these studies

showed that poor health literacy was associated with poorer compliance, worse disease understanding and greater disease progression and actually showed greater visual field loss on initial presentation[20].

A study done in The Netherlands showed that patients from low socioeconomic groups less often knew that the likelihood of getting glaucoma is higher if intraocular pressure is increased, that it is possible to have glaucoma without knowing it and that early detection and treatment will slow down the course of glaucoma. These patients were also less aware that a family predisposition is a risk factor and often expected that treatment could repair their glaucoma damage[21].

A KAP study measures the knowledge, attitude and practices of a given population or sample. It serves as an educational diagnosis of the population. The Knowledge possessed by a community refers to their understanding of any given topic, glaucoma in this case. Attitude refers to their feelings towards this subject, as well as any preconceived ideas that they may have towards it. Practice refers to the ways in which they demonstrate their knowledge and attitude through their actions. Understanding the levels of Knowledge, Attitude and Practice will enable a more efficient process of awareness creation as it will allow the program to be tailored more appropriately to the needs of the community.

3. STUDY OBJECTIVES

3.1 Broad objectives.

1. To establish the level of knowledge on glaucoma among glaucoma patients.
2. To establish the attitudes and practices of glaucoma patients as regards their condition and its management.

3.2 Specific objectives.

1. To profile patients' characteristics in terms of patient demographics and presentation.
2. Establish the level of knowledge and the practices of glaucoma patients.
3. Establish levels of compliance to treatment and follow-up.
4. Establish challenges to compliance and follow-up.
5. Establish patients' expectations of medical and surgical treatment.
6. Establish patient attitudes to compliance to medication and follow-up clinics.

4. JUSTIFICATION

- No studies have been done on the knowledge, attitude and practices of glaucoma patients in Kenya.
- The data so acquired will provide baseline information on the level of knowledge on glaucoma in patients with the condition, their mode of presentation, compliance to treatment, and the factors affecting compliance.
- The information so gathered will be useful to policy makers in planning for glaucoma awareness strategies.
- The information will help practitioners to better understand the knowledge gap that exists among the glaucoma patients.
- The information may also be useful to practitioners to better understand the reasons for poor compliance and know how to enhance compliance.

5. METHODOLOGY

5.1. Study design

Cross-sectional hospital-based study.

5.2. Study area

Kenyatta National Hospital (KNH), Nairobi, Kenya.

5.3. Study population

All patients diagnosed with glaucoma and on follow-up at the KNH out-patient clinic.

5.4. Study setting

KNH is one of two national tertiary referral hospitals in Kenya and it is located in Nairobi, the capital city.

About half a million patients are seen at its outpatient clinics every year. The eye clinic at the KNH runs daily from Monday to Friday. One day a week is set aside for glaucoma patients with a consultant ophthalmologist in attendance and the bulk of glaucoma patients are seen on this day. On average 15 patients are seen per week during the glaucoma clinics.

5.5. Study period

1st December 2010 – 30th April 2011.

5.6. Sample size

The sample size was calculated using the following formula:

$N=z^2_{crit}*P(1-p)/D^2$ Where

N = required sample size

p=prevalence of knowledge on glaucoma among patients on follow-up taken as 60% (0.6) (estimated from study in Egypt that reported 60% of glaucoma patients knew that glaucoma could cause blindness).

D=precision of the study set at 0.05.

Z_{crit} is the cut off points along the x of the standard normal probability distribution that represents probabilities matching 95% confidence interval (1.96)

Substituting the above in the formula we get N=369

$N = 1.96^2 * 0.6 (1 - 0.6)/0.05^2$

$= 3.84 * 0.4 (0.4/0.0025) = 369$

Correction for a finite population

Estimating that there are about 100 patients attending clinic at Kenyatta National Hospital;

$$n = \frac{n_0}{1+n_0/N}$$

$n_0 = 369$

N = 100

$n = 369/ [1 + (369/100)]$

$= 369/4.69$

$= 78$

Therefore, **n = 78**

5.7. Sampling method

All patients with glaucoma attending the eye clinic during the study period were included. Re-visits were excluded.

5.8. Inclusion criteria

- All patients over the age of 16 diagnosed with glaucoma and attending clinic at KNH.
- Patients who gave consent to participate in the study.

5.9. Exclusion criteria

- Patients who refused to give consent.
- Patients who were not co-operative or who had mental health difficulty such that they could not participate in the interview.

5.10. Definitions.

- A drug dose is the specific amount of medication to be taken at a given time.
- Poor compliance to medication was defined as missing more than 2 doses of any medication that a patient may be on in a week[18].
- Poor compliance to clinic attendance was defined as having missed one or more clinics[19].

6. MATERIALS

- Questionnaire (Appendix II).
- Patient records.

7. PROCEDURE

All patients aged 16 and above diagnosed with glaucoma at the KNH eye clinic were recruited and informed consent (Appendix III) was obtained prior to commencing the interview.

The patients name, age, sex, marital status, occupation, residence, education level and monthly income were enquired about and noted on the questionnaire.

Data on visual acuity, intraocular pressure and cup-disk ratio (CDR) on first presentation to the clinic was obtained from the patients' records. Information on gonioscopy and visual field testing were also retrieved from the patients' records.

The questionnaire shown in Appendix II was filled by the investigator as the patient gave his/her responses.

8. DATA COLLECTION AND ANALYSIS

Data was validated prior to entry.

It was then stored in a computer for analysis.

The data analysis and processing was carried out using the Statistical Package for Social Scientists (SPSS version 17.0)

9. ETHICAL CONSIDERATIONS

The proposal was submitted to the KNH/UON ethics and research committee for approval.

A formal written consent was obtained from all the study participants.

Confidentiality was maintained throughout the study.

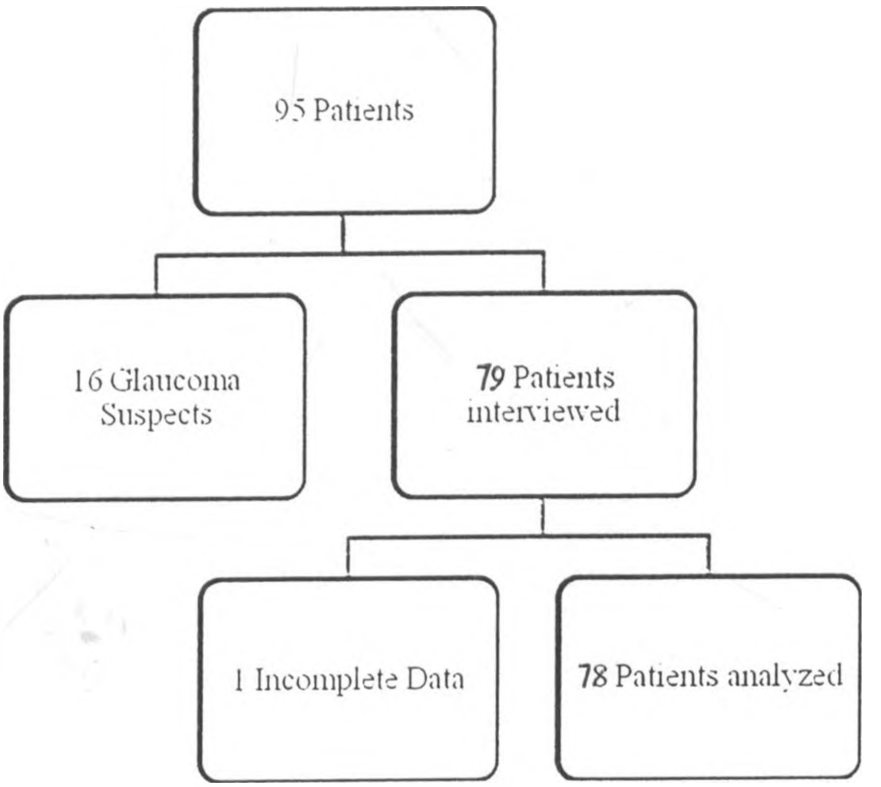
Patients with treatable eye conditions were treated or referred as appropriate.

The results of this study will be shared with the relevant stake-holders including the University of Nairobi, KNH and the Division of Ophthalmic Services in the Ministry of Public Health and Sanitation so as to improve service delivery.

RESULTS.

DEMOGRAPHICS.

Figure 1: Flow chart for patient selection.



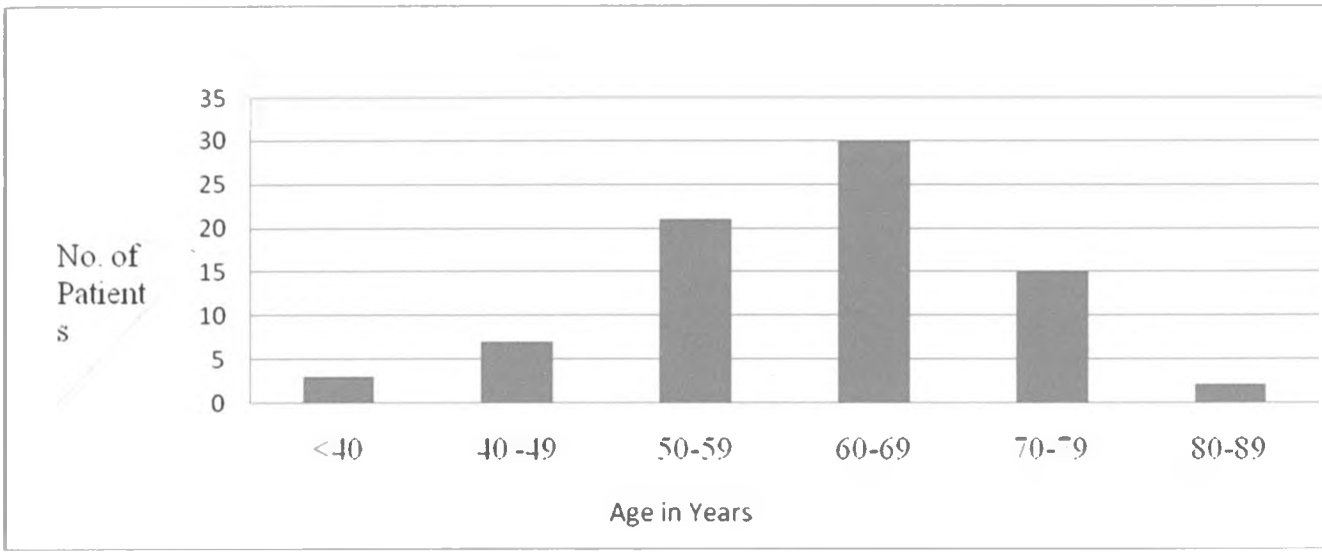
In total, 78 patients who were currently attending the KNH glaucoma eye clinic were interviewed.

Table 1: Sex distribution

Sex	Frequency n=78	%	95% CI
Female	31	39.7%	28.8 – 51.5%
Male	47	60.3%	48.5 – 71.2%

There were more male than female patients but the difference was not statistically significant.

Figure 2: Age Distribution. n=78



The age ranged from 19 to 89 with a mean age of 61.1(SD ±11.5). A similar study found a mean age of 64 years[19].

Table 2: Marital Status and Education.

Variable	Frequency n=78 (%)
Marital status	
Single	4 (5.1%)
Married	59 (75.6%)
Widowed	13 (16.7%)
Separated/Divorced	2 (2.6%)
Education level	
No schooling	9 (11.5%)
Primary	22 (28.2%)
Secondary	25 (32.1%)
Tertiary	22 (28.2%)

Most patients (75.6%) were married and had some level of education with only 9% of the patients having had no formal schooling.

Table 3: Estimated monthly income (Kshs)

Variable	Frequency n=78 (%)
Estimate monthly income (Kshs)	
<=5000	28 (35.9%)
5001-10000	16 (22.5%)
10001-25000	15 (19.2%)
25001-50000	5 (6.4%)
Over 50000	7 (9.0%)
Unwilling to disclose	7 (9.0%)

Monthly income for most of the patients ranged between Kshs. 0 to 25,000. Majority (35.9%) of the patients earned less than Kshs. 5000. (Kshs. 80 = 1 USD)

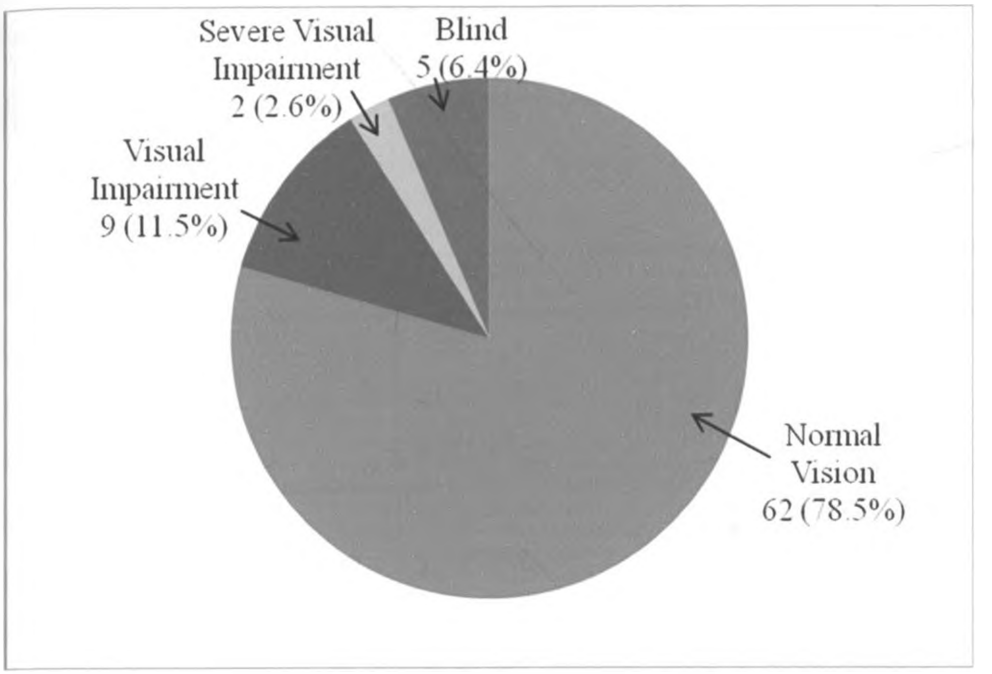
PATIENT CHARACTERISTICS AT PRESENTATION

Table 4: Visual acuity at initial presentation.

Variable	Right Eye Frequency n=78 (%)	Left Eye Frequency n=78 (%)
VA		
>=6/18	57 (73.1)	46 (59.0)
<6/18-6/60	8 (10.3)	11 (14.1)
<6/60-3/60	2 (2.6)	1(1.3)
<3/60	11 (14.1)	20 (25.6)

A total of 31 eyes were blind (<3/60 visual acuity) at presentation and 3 had severe visual impairment (<6/60 – 3/60) at presentation.

Figure 3: Vision acuity using WHO classification. n=78



Assessing vision by World Health Organization (WHO) classification, 5 (6.4%) of our patients were blind at presentation.

Table 5: Assessment of significance for visual acuity.

Variable	Normal vision >=6/18 n=62	Visual acuity worse that 6/18 in better eye n=16	P value
Mean age in years	61.9 (SD ±9.3)	61.1 (SD ±12.1)	0.811
Sex			
Male	8 (17.0%)	39 (83.0%)	0.347
Female	8 (25.8%)	23 (74.2%)	
Educational level			
No schooling	3 (33.3%)	6 (66.7%)	0.707
Primary	5 (22.7%)	17 (77.3%)	
Secondary	4 (16.7%)	20 (83.3%)	
Tertiary	4 (17.4%)	19 (82.6%)	
Monthly income			
<=5000	7 (25.0%)	21 (75.0%)	0.159
5001-10000	2 (12.5%)	14 (87.5%)	
10001-25000	6 (40.0%)	9 (60.0%)	
25001-50000	0 (0.0%)	5 (100.0%)	
Over 50000	0 (0.0%)	7 (100.0%)	

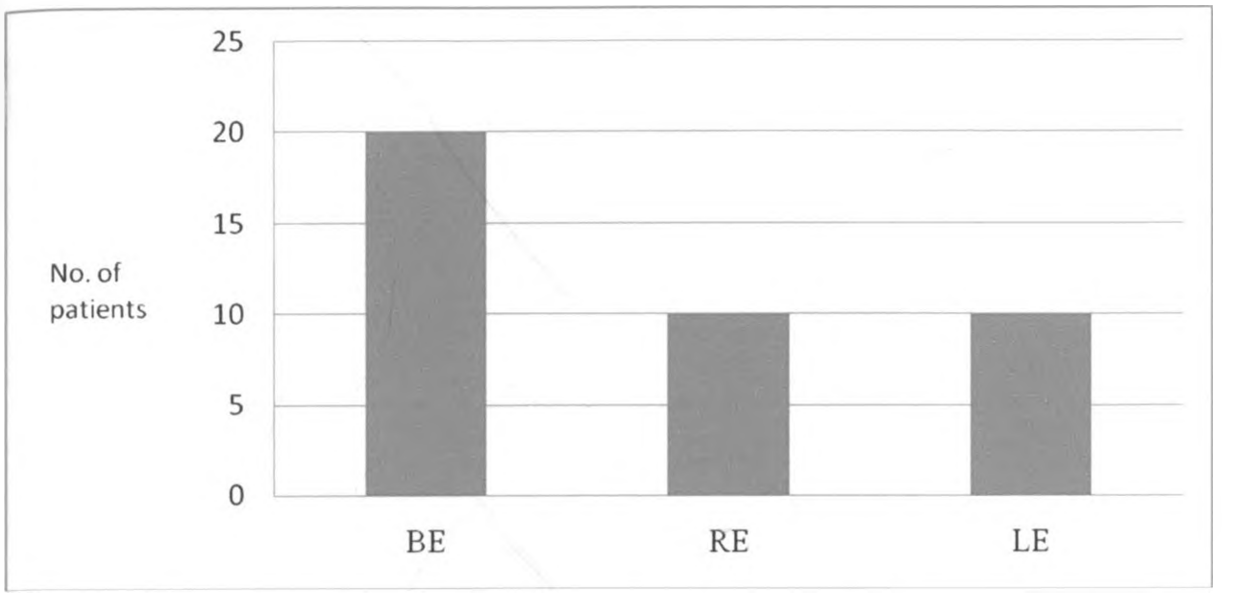
There were no statistically significant relationships between those who presented with normal vision, and those who presented with varying grades of visual impairment, when compared in terms of age, sex, education level and monthly income.

Table 6: Mean intraocular pressure (IOP), state of angle and vertical CDR at presentation.

Variable	RE Frequency n=78 (%)	LE Frequency n=78 (%)	
Intraocular pressure			
(mmHg)	24.4 (SD ±11.0)	23.3 (±11.0)	p=0.62
State of angle			
Open	72(92.3%)	69 (88.5%)	
Closed	6 (7.7%)	8 (10.3%)	
Vertical CDR			
Mean (SD)	0.7 (SD ±0.2)	0.7 (SD ±0.2)	

At presentation, the mean IOP was 23.85mmHg with a range of 9 to 60mmHg. Most eyes had open angle glaucoma. The average CDR at presentation was 0.7 in both eyes with a range of 0.2 to 1.0. A CDR of 0.8 or more was found in 44 (56.4%) patients.

Figure 4: Eye operated. n= 40



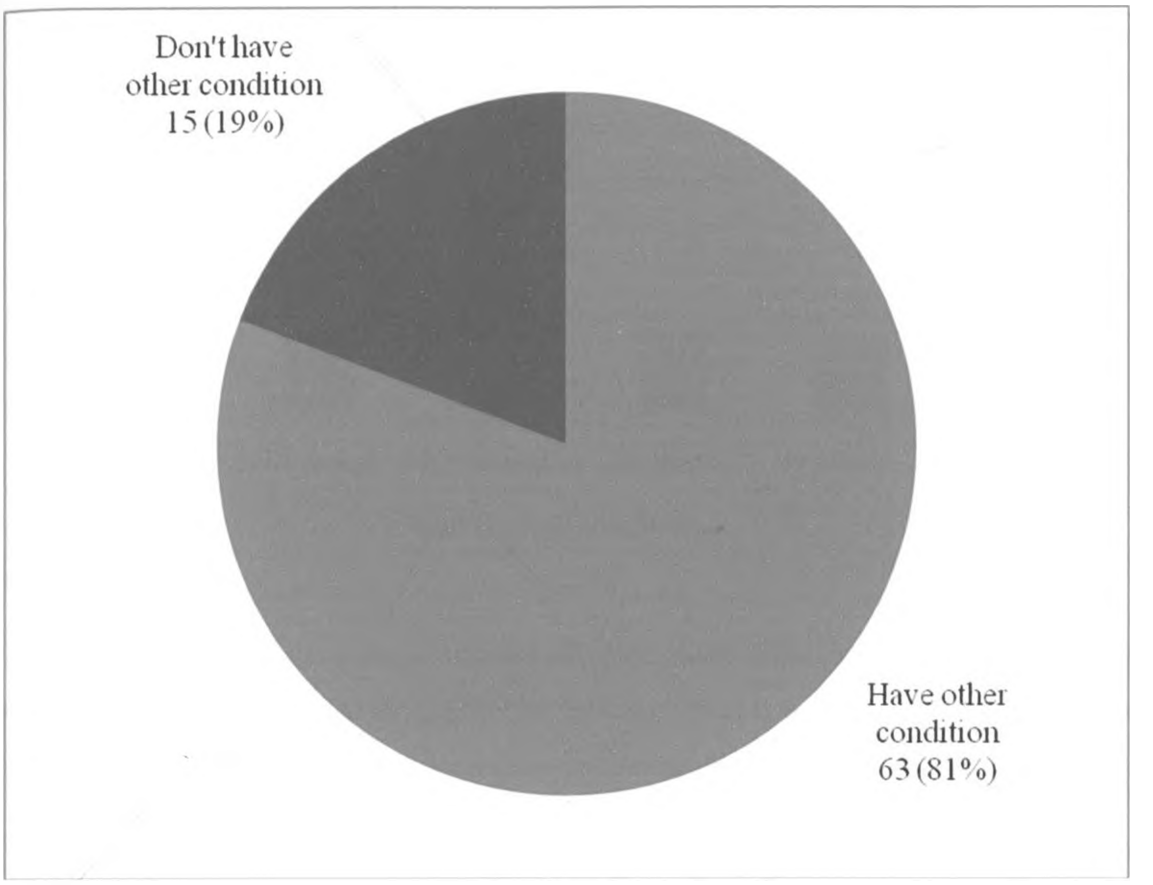
There were a total of 60 operated eyes. Both eyes were operated in 20 patients. Right eyes were operated in 10 patients and left eyes in 10 patients

Table 7: Type of surgery done.

	Frequency n=63 (%)
Type of surgery	
Argon laser trabeculoplasty (ALTP)	10 (15.9%)
Peripheral iridectomy	4 (6.3%)
Trabeculectomy (TET)	29 (46%)
TET + Antimetabolite	14 (22.2%)
Aqueous drainage tube insertion	1 (1.6%)
CPC	4 (6.3%)
Retrobulbar alcohol	1 (1.6%)

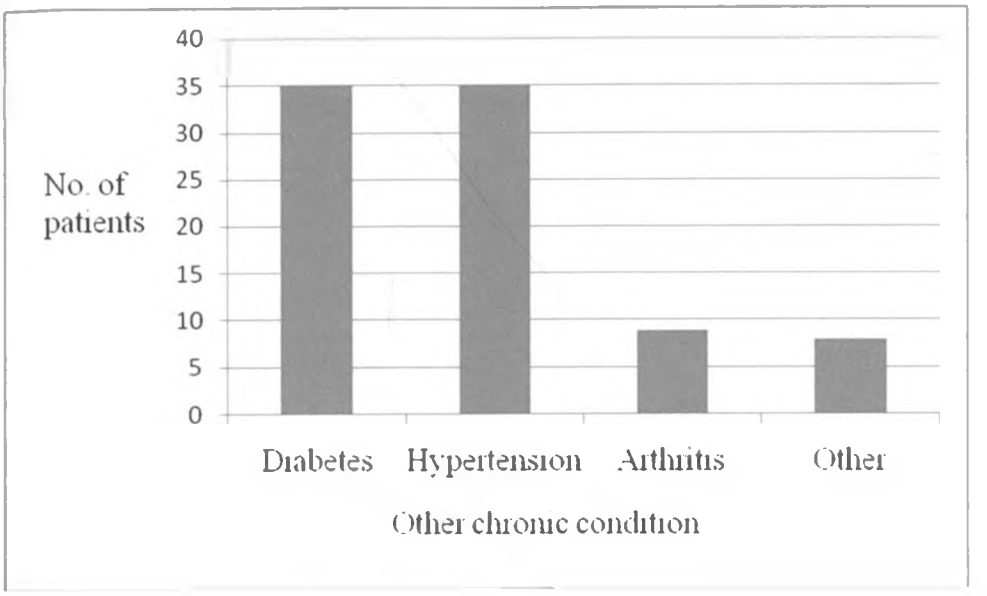
The most frequently done operation was trabeculectomy on 29 (46%) eyes

Figure 5: Presence of other chronic systemic condition. n=78



There were 63 (80.8%) patients who suffered from another chronic systemic illness.

Figure 6: Distribution of chronic systemic illnesses.



The most common of the chronic systemic illnesses were diabetes and hypertension. Diabetes and hypertension co-existed in 22 (28.2%) patients. Other conditions included peptic ulcer disease, prostate cancer, asthma, laryngeal carcinoma, and congenital facial nerve palsy.

Table 8: Tests of significance between compliance and presence or absence of other chronic condition.

Variable	**Compliant to Medication n=75**		**Compliance to follow-up n=78**		**P value**
	Yes	**No**	Yes	No	
Chronic Illness?					
Yes	49 (79.0%)	13 (21%)	43 (68.3%)	20 (31.7%)	1.000
No	10 (77%)	3 (23%)	11 (73.3%)	4 (26.7%)	

Presence of a chronic illness was not statistically significantly related to compliance to medication or follow-up.

KNOWLEDGE.

Table 9: What is the name of your eye condition?

Variable	Frequency (%) n=78
What is the name of your condition?	
Glaucoma	48 (61.5%)
Don't know	22 (28.2%)
Trachoma	4 (5.1%)
Alacoma	1 (1.3%)
Trichoma	1 (1.3%)
Coma	1 (1.3%)
Raised pressure	1 (1.3%)

Forty eight (61.5%) patients knew they were being managed for a condition called glaucoma. 8 patients had another name for the condition they were being treated for.

Table 10: How would you describe your eye condition?

Variable	Frequency n=78 (%)
How would you describe your eye condition?	
High pressure in the eye	30 (38.5%)
Disease where nerves of the eye becomes weak	3 (3.8%)
Damage to the nerve of the eye due to high pressure	15 (19.2%)
Age related process leading to a decrease in peripheral vision	8 (10.3%)
Retinal damage from pressure	1 (1.3%)
High pressure in the veins	1 (1.3%)
Disease where eye power diminishes	1 (1.3%)
Loss of eyesight	1 (1.3%)
To lose sight	1 (1.3%)
To be blind	1 (1.3%)
Don't know	31(39.7)

Thirty one (39.7%) patients did not know that glaucoma was associated with eye pressure, nerve damage or peripheral visual field loss.

Table 11: How did you come to know about your eye condition?

Source of information	Frequency n=78 (%)
Eye-care worker	68 (87.2%)
TV, magazine, other media	4 (5.1%)
Family member, relative, friend	3 (3.8%)
School	2 (2.6%)
General medical practitioner	1 (1.3%)

Sixty eight (87.2%) of our patients came to know about glaucoma for the first time from an eye care worker- either an ophthalmologist, ophthalmology resident, ophthalmic clinical officer or optometrist/optician.

Table 12: What are the risk factors for developing glaucoma? n=78.

Variable	Frequency n=78 (%)
Risk factors	
Family history of glaucoma	14 (17.9%)
Diabetes	13 (16.7%)
Hypertension	13 (16.7%)
Increased IOP	5 (6.4%)
Age	4 (5.1%)
Trauma	3 (3.8%)
Alcohol consumption	2 (2.6%)
Obesity	1 (1.3%)
Steroids	1 (1.35)
Myopia (short-sightedness)	1 (1.3%)
Hypermetropia (long-sightedness)	1 (1.3%)
Don't know	54 (69.2%)
Others	9(11.5%)
• Stress	2 (2.6%)
• Sedentary lifestyle.	1 (1.3%)
• Dust	1 (1.3%)
• Flies	1 (1.3%)
• Smoke	1 (1.3%)
• Mental disease	1 (1.3%)
• Cushitic	1 (1.3%)
• Vascular disease	1 (1.3%)

Most patients did not know of any risk factors for glaucoma (69.2%). The risk factors reported most frequently were family history in 14 (17.9%) patients, diabetes in 13 (16.7%) patients, and hypertension in 13 (16.7%) patients.

Table 13: Knowledge on visual loss from glaucoma.

	Frequency (%)
Can glaucoma cause blindness? n=78	
Yes	60 (77%)
Don't know	18 (23%)
Is vision loss permanent or reversible? n=60	
Permanent	39 (65%)
Reversible	6 (10%)
Don't know	15 (25%)

There were 60 (77%) patients who knew their eye condition could lead to blindness and of those who knew that their condition could lead to blindness, 39 (65%) knew that such blindness was permanent.

Table 14: Knowledge on treatment options.

Variable	Frequency n=78 (%)
Is your eye condition treatable?	
Glaucoma treatable	70 (89.7%)
Not treatable	2 (2.6%)
Don't know	6 (7.7%)
What treatment options do you know of?	
Medical / eye drops	70 (89.7%)
Surgery	35 (44.9%)
Laser	15 (19.2%)
Spectacles	1 (1.3%)
Diet	1 (1.3%)
Don't know	6 (7.7%)

Seventy (89.7%) patients knew that their eye condition was treatable and a similar percentage knew that medical treatment (eye drops or oral medication) could be used to treat it.

Table 15: Knowledge status of the patients interviewed (Appendix V) [15]

Knowledge	Frequency n=78 (%)
Unaware	8 (10.3%)
Aware	4 (5.1%)
Some knowledge	53 (67.9%)
Fair knowledge	2 (2.6%)
Good knowledge	11 (14.1%)

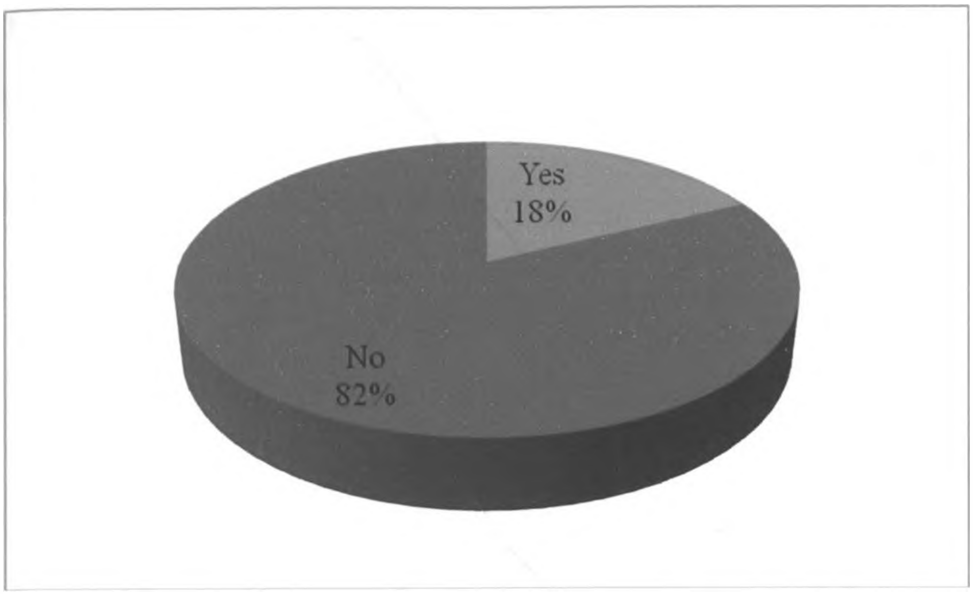
We classified knowledge based on the criteria shown in Appendix V and found that only 13 (16.7%) patients had fair to good knowledge of glaucoma.

Table 16: Tests of significance for level of knowledge. n=78

Variable	Knowledge level		P value
	Fair to good knowledge	**Unaware/Aware/Some knowledge**	
Age in years	56.6 (SD ±9.8)	62.2 (SD ±11.7)	0.114
Sex			
Male	11 (23.4%)	36 (76.6%)	0.049
Female	2 (6.5%)	29 (93.5%)	
Educational level			
No schooling	0 (0.0%)	9 (100.0%)	<0.001
Primary	0 (0.0%)	22 (100.0%)	
Secondary	3 (12.5%)	21 (87.5%)	
Tertiary	10 (43.5%)	13 (56.5%)	
Monthly income			
<=5000	0 (0.0%)	28 (100.0%)	<0.001
5001-10000	0 (0.0%)	16 (100.0%)	
10001-25000	5 (33.3%)	10 (66.7%)	
25001-50000	1 (20.0%)	4 (80.0%)	
Over 50000	4 (57.1%)	3 (42.9%)	
Compliance			
Compliant	48 (81.4%)	11 (18.6%)	0.442
Non-compliant	15 (93.8%)	1 (6.3%)	

Sex, level of education and income were statistically significantly related to the level of knowledge.

Figure 7: Have you been counselled on your eye condition? n=78



14 (18%) patients reported having received counselling on glaucoma.

Table 17: Tests of significance between compliance and counselling.

Variable	Compliant to Meds n=75		P value	Compliant to follow up n=78		P value
	Yes	No		Yes	No	
Counselling?						
Yes	11 (91.6%)	1 (8.3%)	0.335	12 (85.7%)	2 (14.3%)	0.205
No	48 (76.2%)	15 (23.8%)		42 (65.6%)	22 (34.4%)	

No statistically significant relationship was found between counselling and compliance to medication or to follow up.

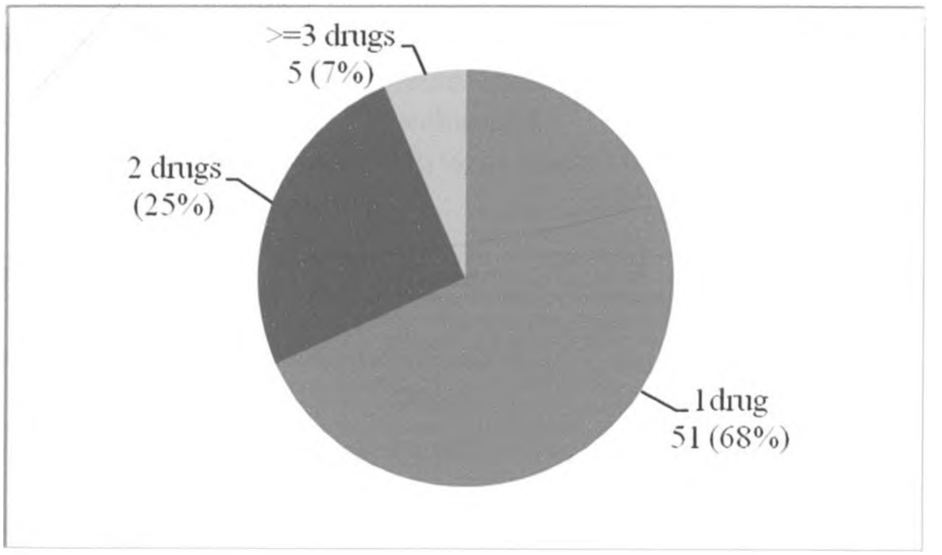
PRACTICES.

Table 18: Duration of treatment for glaucoma.

Variable	Frequency n=78 (%)
Duration of glaucoma in years	
<1	29 (37.2%)
>1-2	11 (14.1%)
>2-5	14 (17.9%)
>5-10	13 (16.7%)
>10	11 (14.1%)

Twenty nine (37.2%) patients had been on follow-up for less than a year.

Figure 8: Number of anti-glaucoma drugs currently being used per patient. n=75



75 (96.2%) were on medical treatment for glaucoma of whom 51 (65.4%) patients were on a single medication

Table 19: Drugs currently in use by the patients. n=75

Medication	Frequency	Percentage
Single medication		
Timolol	32	42.7%
Levobunolol	8	10.7%
Betaxolol	6	8.0%
Brimonidine	1	1.3%
Acetazolamide	1	1.3%
Latanoprost	3	4.0%
Two medications		
Combigan	3	4.0%
Duotrav	1	1.3%
Latanoprost + Timolol	5	6.7%
Latanoprost + levobunolol	3	4.0%
Latanoprost + betaxolol	1	1.3%
Travaprost + Brimonidine	1	1.3%
Travaprost + levobunolol	1	1.3%
Acetazolamide + Timolol	2	2.7%
Bimatoprost + Timolol	1	1.3%
Betaxolol + Timolol	1	1.3%
Three or more medications		
Timolol + Travaprost + Acetazolamide	1	1.3%
Timolol + Travaprost + Levobunolol	1	1.3%
Travaprost + Combigan + Brinzolamide	1	1.3%
Combigan + Bimatoprost	1	1.3%
Cosopt + Pilocarpine	1	1.3%
Total	**75**	**100.0%**

Note: Combigan = brimonidine + Timolol;
Duotrav = travaprost + Timolol;
Cosopt = dorzolamide + timolol.

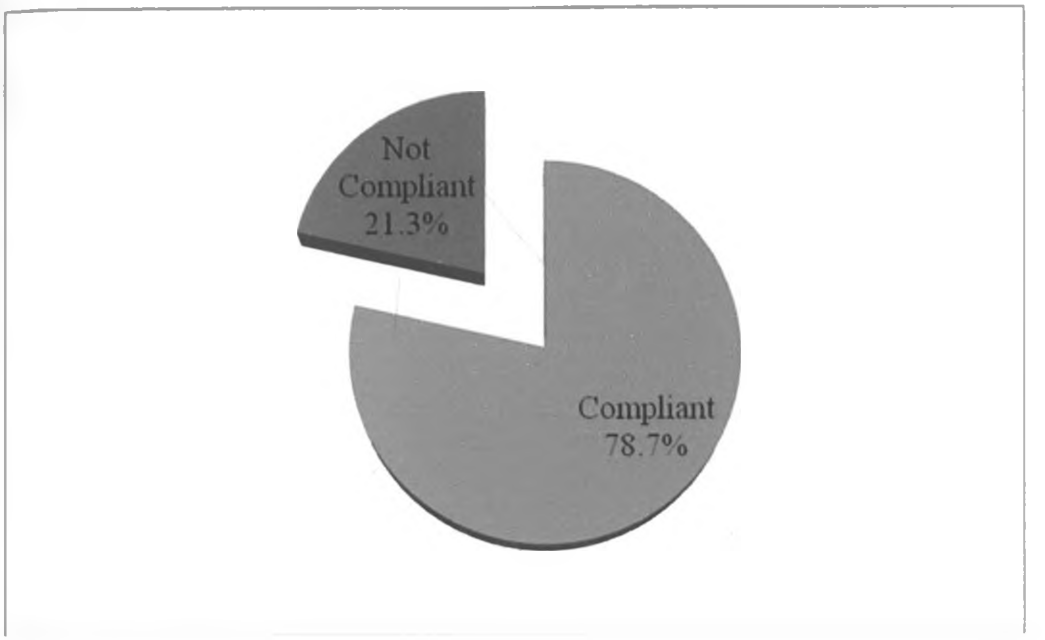
The most commonly used single medication is timolol in 32 (42.7%) patients. Timolol is also present in 13 of the 19 combinations administered to patients using 2 drugs and in all the combinations in patients using 3 or more medications.

Table 20: Doses missed per week.

Variable	Frequency n=75 (%)
Doses missed per week	
None	28 (37.3%)
1-2	31 (41.3%)
3-5	6 (8%)
>5	10 (13.3%)

Twenty eight (37.3%) patients reported 100% compliance to medication.

Figure 9: Level of compliance to medications. n=75



We established that 16 (21.3%) patients were noncompliant to medication from our definition of compliance.

Table 21: What difficulties do you have taking your medications?

Variable	Frequency n=57 (%)
Drug related	
Drops fall on cheek	32 (41%)
Too many drops come out	6 (7.7%)
Side effects	15 (19.2%)
Dosage time inconvenient	2 (2.6%)
Difficulty accessing drugs because of imprisonment	2 (2.6%)
Drugs unavailability	1 (1.3%)
Patient related	
Payment	18 (23.1%)
Difficulty remembering	6 (7.7%)
Nobody to instil drops	4 (5.1%)
Low motivation.	1 (1.3%)
Hindrance by dialysis catheter.	1 (1.3%)

Fifty seven patients faced some challenges when using their drugs. The most common challenges were drops falling on the cheeks in 32 (41%) patients and difficulty paying for the drugs in 18 (23.1%) patients.

Table 22: Have you ever had visual fields and gonioscopy done?

Variable	Frequency n=78 (%).
Ever had visual fields done	71 (91%)
Ever had gonioscopy done	63 (80.8%)

In the course of management 71 (91%) patients had been subjected to visual field testing. Gonioscopy had been done in 63 (80.8%) patients.

Table 23: Tests for significance of association between sex, education, income and monthly expenditure with compliance. n=78

Variable	Compliant	Non-Compliant	P-Value
sex			
Male	39 (83.0%)	8 (17.0%)	0.347
Female	23 (74.2%)	8 (25.8%)	
Education level			
No schooling	7 (77.8%)	2 (22.2%)	0.882
Primary	18 (81.8%)	4 (18.2%)	
Secondary	20 (83.3%)	4 (16.7%)	
Tertiary	17 (73.9%)	6 (26.1%)	
Estimate income (Kshs)			
<=5000	20 (71.4%)	8 (28.6%)	0.293
5001-10000	12 (75.0%)	4 (25.0%)	
10001-25000	14 (93.3%)	1 (6.7%)	
25001-50000	4 (80.0%)	1 (20.0%)	
Over 50000	7 (100.0%)	0 (0.0%)	
Monthly drug expenditure			
Less than 1000	28 (70.0%)	12 (30.0%)	0.077
1001-2000	12 (80.0%)	3 (20.0%)	
2001-5000	19 (95.0%)	1 (5.0%)	

No significant relationship between the level of compliance and sex, level of education, monthly income and expenditure on drugs was established.

Table 24: Tests for significance of association between counselling, number of medications used, presence of chronic illness and knowledge of whether glaucoma is blinding with compliance. n=78

Variable	Compliant to Medications		P value
	Yes	No	
Counselling?			
Yes	11 (91.6%)	1 (8.3%)	0.335
No	48 (76.2%)	15 (23.8%)	
No. of Medications	1 (1-2)	1 (1-2)	0.941
Chronic Illness?			
Yes	49 (79.0%)	13 (21%)	1.000
No	10 (77%)	3 (23%)	
Can glaucoma cause blindness?			
Yes	50 (83.3%)	10 (16.7%)	0.181
Don't know	12 (66.7%)	6 (33.3%)	

There was no statistical significance between compliance and history of counselling, number of medications, presence of a chronic illness, or knowledge that glaucoma causes blindness either.

Table 25: Frequency of missed clinics.

Missed clinics	Frequency (%) n=78
None	54 (69.2%)
1 missed	13 (16.7%)
>=2 missed	11(14.1%)

24 (30.7%) patients reported having missed at least one of their follow up clinics.

Table 26: Reasons for missed clinics.

Variable	Frequency n=24 (%)
Knowledge/perception barriers	
Forgot to come	4 (16.7%)
Confused dates	1 (4.2%)
Had enough medications	1 (4.2%)
Too many consultations	1 (4.2%)
Time/inconvenience	
Unable to leave work responsibilities	3 (12.5%)
Unable to leave from caring for relatives	2 (8.3%)
General inconvenience	1 (4.2%)
Unable to leave household responsibilities	1 (4.2%)
Lack of escort	3 (12.5%)
Incidental	
Out of town	4 (16.7)
Medical illness	5 (20.8%)
Death of relative or friend	3 (12.5%)
Other incidental obligations	2 (8.3%)
Public holiday	1 (4.2%)
Financial reasons	
Transportation costs	6 (25.0%)
Outpatient fees	5 (20.8%)
Transport related reasons	
Public transport strike.	1 (4.2%)
Post-election violence paralyzed transport	1 (4.2%)
Dropped at wrong place by public transport	1 (4.2%)

The most common reasons for missed clinics were incidental events reported on 15 occasions by the 24 patients.

Table 27: Distance, time and number of vehicles used.

Variable	Frequency (%). n=78
Distance from hospital	
<100km	51 (65.4)
=>100km	27 (34.6)
Time to travel from home to clinic	
<2hrs	38 (48.7)
=>2 hrs	40 (51.3)
Number of vehicles to get to hospital	
0	1 (1.3)
1	12 (15.4)
2	39 (50.0)
=>3	26 (33.3)

About a third of patients travelled over 100km and used 3 or more vehicles.

Table 28: Tests of significance for compliance to follow-up. n=78

Variable	Compliant to follow up		P value
	Yes	No	
Counselling?			
Yes	12 (85.7%)	2 (14.3%)	0.205
No	42 (65.6%)	22 (34.4%)	
Chronic Illness?			
Yes	43 (68.3%)	20 (31.7%)	1.000
No	11 (73.3%)	4 (26.7%)	
Distance from hospital			
<100km	33 (64.7%)	18 (35.3%)	0.234
=>100km	21 (77.8%)	6 (22.2%)	
Time to travel from home to clinic			
<2hrs	24 (63.2%)	14 (36.8%)	0.257
=>2 hrs	30 (75.0%)	10 (25.0%)	
Number of vehicles to get to hospital			
0	1 (100.0%)	0 (0.0%)	0.772
1	7 (58.3%)	5 (41.7%)	
2	27 (69.2%)	12 (30.8%)	
=>3	19 (73.1%)	7 (26.9%)	

There was no statistically significant relationship between compliance to follow-up and history of counselling, presence of a chronic illness, distance travelled to clinic, amount of time used to travel to clinic or to the number of vehicles used either.

Table 29: How much do you spend on your glaucoma medications per month?

Variable	Frequency n=78 (%)
Money spent on medication per month	
Less than 1000 Kshs	42 (53.8)
1001-2000 Kshs	16 (20.5)
2001-5000 Kshs	20 (25.6)

Most (74.2%) patients spent less 2000 Kshs on medication per month. (Kshs. 80 = 1 USD)

Table 30: Tests of significance relating monthly income to expenditure on medications. n=71 because 7 patients were unwilling to disclose their income.

	Money spend on medication per month n=71			P value
	Less than 1000	1001-2000	2001-5000	
Monthly income				
<=5000	17 (42.5%)	8 (53.3%)	3 (18.8%)	0.142
5001-10000	11 (27.5%)	3 (20.0%)	2 (12.5%)	
10001-25000	8 (20.0%)	3 (20.0%)	4 (25.0%)	
25001-50000	2 (5.0%)	0 (0.0%)	3 (18.8%)	
Over 50000	2 (5.0%)	1 (6.7%)	4 (25.0%)	

There was no statistically significant relationship between the amount of money spent on medication and the amount of money earned per month.

EXPECTATIONS

Table 31: Patient expectations of medical treatment and surgery.

Variable	Treatment n=78 Frequency (%)	Surgery n=40 Frequency (%)
Cure	23 (29.5%)	13 (32.5%)
Improvement of vision	33 (42.3%)	13 (32.5%)
Stop progression	25 (32.1%)	12 (27.5%)
Symptomatic relief	8 (10.3%)	1 (2.5%)
No expected benefit	4 (5.1%)	1 (2.5%)
Stop using eye drops	-	2 (5%)
Avoid blindness	1 (1.3%)	-
Psychological relaxation	1 (1.3%)	-

Twenty three (29.5%) patients expected cure and 33 (42.3%) expected improvement from medical treatment. Thirteen (32.5%) expected cure and a similar number expected improvement of vision from surgery. These constitute patients with wrong expectations of treatment and surgery whose main aim are to retard disease progression.

Table 32: Perceived importance to glaucoma medication and follow-up visits.

	Frequency (%) n=78
Perceived importance of glaucoma medications	
Very important	69 (88.5%)
Somewhat important	8 (10.3%)
Not too important	1 (1.3%)
Perceived importance of attending follow up visits	
Very important	70 (89.7%)
Somewhat important	8 (10.3%)

Sixty nine (88.5%) and 70 (89.7%) patients perceived importance to glaucoma medications and follow-up to clinic respectively as being very important.

DISCUSSION

A KAP study measures the knowledge, attitude and practices of a given population or sample and serves as an educational diagnosis of the population. Poor health literacy has been associated with poorer compliance, worse disease understanding and greater disease progression[30]. Understanding the levels of Knowledge, Attitude and Practice will enable a more efficient process of awareness creation as it will allow policy makers tailor their education and awareness programs more appropriately to the needs of the community. Educating patients about their disease and treatment should ultimately improve patient adherence, and reduce the risk of significant progression.

Ninety five files were selected serially as the patients presented to the glaucoma clinic (Figure 1). Of these we found that 16 were glaucoma suspects and did not therefore fulfil the inclusion criteria of being glaucoma patients. The remaining 79 patients were interviewed but on data analysis one questionnaire was found to lack significant amounts of data and was excluded for that reason.

There were more males than females with a male to female ratio of 1.5:1. The difference however was not statistically significant.

Patient age ranged from 19 to 89 years with a mean age of 61.1(SD ±11.5). A study done by Lee et al found a mean age of 64 years[19] which is comparable to our finding. Sixty six (84.6%) patients were in the range of 50-79 which is expected since advancing age, especially above the age of 40 years is an established risk factor for the development of glaucoma[12].

Fifty nine (75.6%) of the patients were married, 13 (16.7%) were widowed, 4 (5.1%) were single and 2 (2.6%) were divorced or separated. The small number of single patients could be explained by the fact that most patients with glaucoma are over 40 years old and therefore more likely to be married. In our study 76 (97.4%) patients were over the age of 40 years.

Nine (11.5%) patients had received no formal education. There was no statistical significance between a better education and an earlier presentation, a better visual acuity at presentation (Table 5), or compliance to medication (Table 23). However, those with a better education had a significantly better knowledge level than those with less education (p value < 0.001, Table 16).

We should therefore spend more time counselling those we establish to have less formal education as it appears to be an indicator for poor knowledge on glaucoma.

Fifty nine (77.6%) patients earned Kshs 25,000 or less per month. Only 12 (15.4%) earned more than Kshs 25,000 and the remaining 7 (9%) were unwilling to disclose their monthly incomes. Patients with higher incomes were not more likely to present with better visual acuity (Table 5), were not more compliant to treatment (Table 23) and did not spend significantly more on medications than patients with lower incomes. However, they are more likely to have better knowledge on glaucoma (Table 16). Visual loss from glaucoma is gradual and begins in the periphery and this may explain this universal late presentation among patients with varying incomes. The type of medication and therefore the cost is also not dictated by the patients level of income but by whether the patients IOP can be adequately be controlled by a single medication. Timolol, for example, is a relatively inexpensive medication but which has very good IOP lowering potential.

Normal visual acuity of 6/18 or better was noted in 103 (66%) patients (Table 4). Glaucoma destroys vision beginning from the periphery and it is common to find advanced field damage in patients who have normal visual acuity with preservation of central vision. However we note that 33 eyes presented blind. Looking at visual acuity per patient, 5 (6.4%) of the patients presented with bilateral blindness having visual acuity of less than 3/60 in both eyes. A total of 26 (33.3%) of patients were blind in at least one eye. In a study done by Akhtar et al 16.5% of patients were bilaterally blind at presentation. An additional 40.6% were blind in one eye[22]. A study done in East Africa showed that 29% of patients were blind at first presentation[23]. Visual acuity in our study was not significantly related to patient sex, level of education or monthly income (Table 5). The number of those presenting blind in our study is smaller than that seen in the other studies. This, however, still underscores the fact that glaucoma is a blinding condition and measures such as screening programs, continued public and patient education should be an ongoing process, as blindness from glaucoma is avoidable with early detection and treatment.

The mean intraocular pressure (IOP) at presentation was 23.85mmHg with a wide range of 9-60mmHg. A study done in Asia by Khu et al had patients with POAG presenting with a mean IOP of 23.6mmHg with most having an IOP of 16-25mmHg[24]. This is comparable to our result. Beyond that, we also realize that many of them presented with markedly damaged optic disks

with an average cup-disc-ration (CDR) of 0.7. Forty four (56.4%) of patients had a CDR of 0.8 or more at presentation. This may be explained by the fact that glaucoma, especially the primary open angle type, has very subtle symptoms and central vision is affected late in the disease when significant damage has already occurred. The study by Akhtar[22] had 33% of the patients presenting when the cup disc ratio in their better eye had worsened to 0.8 or more, and the East African study by Mwafiri et al[24] had 70% of patients present with a CDR equal to or greater than 0.8 at first presentation. Managing advanced glaucoma presents various challenges because the pressures are difficult to control with a single drug therefore often necessitating using multiple drugs either singly or as fixed dose combinations[25] which has cost and compliance implications. Advanced glaucoma also puts patients at higher risks for surgery because it tends to progress with even moderately elevated pressures and often requires the patient to undergo surgery as was seen in The Advanced Glaucoma Intervention Study (AGIS)[26]. This late presentation of our patients with advanced disc damage may necessitate the initiation of screening programs. For a disease to be eligible for screening it should be an important health problem, should have a detectable pre-clinical phase, it should be treatable and with a recognized treatment available. Glaucoma is such a disease. The problem lies in establishing an appropriate screening test that has a high positive predictive value, is simple, low cost, safe and acceptable. Visual field testing may be one such test but would need to be supplemented by disc examination and IOP measurement.

Many of the patients in our set up, 40(51.3%), had undergone surgery, the most common surgeries being trabeculectomy (TET) in 29 (46%) eyes and augmented TET with either 5-Fluorouracil (5FU) or Mitomycin-C (MMC) in 14 (22.2%) eyes. This is probably because it has been found to be very effective for the management of advanced adult glaucoma. A Cochrane review comparing the effectiveness of medical versus surgical treatment found that surgery was more effective in managing advanced glaucoma with better IOP control and less visual field loss[27]. The use of antimetabolites is also justified in our set up. Antimetabolites are often used when there are complicating factors that would potentially lead to failure of the surgery. One of the risk factors for filtration surgery failure is black race and all the patients were of black race and this could justify the use of antimetabolites in 14 (32.6%) of the trabeculectomies done in this study population.

Results from The Fluorouracil Filtering Surgery Study recommend the use of subconjunctival 5-fluorouracil after trabeculectomy in eyes after previous cataract surgery or unsuccessful filtering surgery, but cautioned against its routine use in patients with good prognoses[28]. A Cochrane review done by Wormald R, et al revealed that when delivered by postoperative injection, 5-FU appears to be effective in reducing the likelihood of surgical failure of TET both in eyes at high risk of failure and those undergoing surgery for the first time[29]. Another Cochrane review assessing the effectiveness of MMC in filtering glaucoma surgery showed that intraoperative MMC reduces the risk of surgical failure in eyes that have undergone no previous surgery and in eyes at high risk of failure[30]. Argon laser trabeculoplasty had been done in 10 eyes and its use in patients of African origin as first surgical option is supported by the Advanced Glaucoma Intervention Study (AGIS)[26].

Other chronic systemic conditions were present in 63 (80.8%) patients. The most common conditions were diabetes in 35 (44.9%) patients and hypertension, also in 35 (44.9%) patients. From previous studies it has been shown that patients with other conditions have a higher level of compliance to medications and to follow-up visits[18]. It was assumed that this was because their sick-role was more clearly defined and since they were more likely to be taking other medications regularly over an indefinite period to relieve symptoms, taking the additional treatment for glaucoma was straightforward. The same was not established in our study as the levels of compliance to medications and clinic follow-up were not statistically significant (Table 8). However, the use of several medications concurrently may be associated with poorer compliance.

When we assessed the status of knowledge of our patients with regards to glaucoma, we found that of the patients interviewed, 22 (28.2%) patients, did not know the name of their condition and a further 8 (10.3%) referred to it by another name(Table 9). A study done by MacKean and Elkington showed that patients who knew the name of their disease were more compliant[31]. We face the limitation that there is no name for glaucoma in Swahili which is the national language of Kenya. The patient was also asked to describe what damage glaucoma did to the eye. Thirty seven (47.4%) patients did not know that nerve damage was commonly associated with raised IOP or peripheral visual field loss. The various descriptions given were matched against common responses as seen in a previous study[32]. This may serve as a limitation in the assessment in the

patients' level of knowledge. However, we wrote down the patients' responses verbatim when they did not match what was on the list (Table 9).

The eye-care worker was the primary source of knowledge on glaucoma in 68 (85.9%) patients. This was similar to studies done is Egypt where 79.4% of patients had ophthalmologists as their primary source of knowledge. Only 4 (5.1%) patients came to first learn about glaucoma from the mass media including television, newspapers and radio. This is comparable to the Egyptian population where 5.8% came to know about glaucoma from the various mass media[16]. The eye-care worker as the primary source of information should therefore either spend more time passing information to the patients he/she sees or set up a system through which patients can acquire this knowledge during their clinic visits such as through a trained nurse or pamphlets. It would also appear that not enough public education campaigns for glaucoma have been established as very few (5.1%) of the patients had received information on glaucoma form TV, magazines or other mass media. Medical camps, although held regularly, do not appear to contribute much in terms of dissemination of information on glaucoma as none of our patients had heard about glaucoma from a medical camp. None of the patients had been informed about glaucoma by their general medical practitioner. These are very worrying trends as glaucoma is now the 2nd largest cause of blindness worldwide after cataract and therefore the leading cause of irreversible blindness worldwide[1]. It is the 3rd largest cause of blindness in Kenya after cataract and trachoma[8]. Emphasis must therefore be put on disseminating information on glaucoma at medical or surgical camps as well as by physicians.

We found in our study a poor knowledge of risk factors for glaucoma with 54 (69.2%) patients not knowing a single risk factor for glaucoma. Knowledge of risk factors is very important in that patients might manage these risk factors better and reduce their risks of progression. This especially applies for manageable risk factors such as raised IOP, diabetes, hypertension and steroid use.

An important point of knowledge on glaucoma is whether the patient knows if glaucoma is a blinding condition or not and whether the blindness resulting from glaucoma is reversible or not. In our study we found that 60 (77%) patients knew that glaucoma can cause blindness (Table 13). Of those who knew that glaucoma can cause blindness, 10% thought that vision loss from glaucoma was reversible and 25% did not know whether it was reversible or not. A hospital-

based study done in Egypt revealed that 60% of their patients were aware that glaucoma caused blindness[16]. Patients knowing that glaucoma leads to blindness and that such blindness is irreversible could foster compliance to treatment, compliance to follow-up clinics and possibly even prompt referral of relatives who might be at risk of developing glaucoma for screening. A study done by Bloch et al showed that a greater proportion of non-compliers did not appreciate that glaucoma can cause blindness[18]. This was not found to be the case in our study as there was no statistically significant difference in compliance to medication between those who knew that glaucoma causes blindness and those who didn't (Table 24).

Seventy (89.7%) patients knew that glaucoma was treatable. Seventy (89.7%) patients knew of medical treatment for glaucoma including either eye drops or oral medication. A total of 35 (44.9%) knew of surgical treatment while only 15 (19.2%) knew of laser treatment.

Using the grading provided in appendix V[15] where patients are classified as being not aware, aware, having some, fair or good knowledge we found that only 2 (2.6%) patients had fair knowledge and 11 (14.1%) had good knowledge. A study done in Urban Chennai using a similar grading system of knowledge found that 8.7% had knowledge about glaucoma. Among them 0.5% had good knowledge about glaucoma, and 4% had fair knowledge. This however was a population based study and may not be directly comparable with our hospital-based population[15]. We face the limitation though that this grading system has not been validated for our particular population. The overall level of knowledge was significantly related to sex, level of education and income with men, those with more education and higher income more likely to have better knowledge (Table 16). Age and the level of compliance to medication were not statistically significantly related to the level of knowledge. The higher level of knowledge on glaucoma among those with higher education may be explained by the higher level of literacy and therefore ability to acquire information. Those with higher income may have more means by which to gather information such as newspapers, TV and the internet. We would have expected that those with more knowledge on glaucoma would be more compliant but this was not shown in our study. This may, however, be explained by the small number of patients who reported poor compliance to medication as it was self-reported.

Counselling is of utmost importance in the management and follow-up of any chronic illness. It has been adopted as a standard part of care in the management diabetic and hypertensive

patients. However, from our results we find that only 14 (18%) patients reported that they had received some form of counselling concerning their diagnosis of glaucoma. This lack of counselling may have led to the very poor state of knowledge concerning glaucoma amongst our patients. It may also have contributed to patients having the wrong expectations of treatment and surgery where we found a large number of patients expected cure and improvement of vision from both medical treatment and surgery. Assessment for association between counselling and compliance to medication and to clinic attendance revealed no statistical significance in our study. This may be because of the small number of patients who reported non-compliance to medication and also a small number of patients who reported having being counselled. A study done in South India showed that the lack of recollection of being counselled on glaucoma was an independent predictor of poor follow-up[19]. Counselling can be offered either directly by the doctor upon making the initial diagnosis of glaucoma and fortified on subsequent visits by the attending doctor. The initial counselling can also be given by a trained nurse. Organized health talks can also be given prior and during the clinics by nurses or other trained health professionals during waiting times. It has been shown that patients assigned to a glaucoma educator improved over time in both motivation and adherence[33]. Novel strategies in patient education for example intensive counselling, audiovisual aids, and patient support groups[19] will need to be adopted. Several reviews have also demonstrated that most successful compliance interventions are complex and include combinations of educational, behavioural and affective components[34].

Over half our patients had been diagnosed less two years prior to the date of interview with 29 (37.2%) patients having been on follow-up for less than a year and 11 (14.1%) for between 1 to 2 years. This could indicate that the patient number has been growing.

Seventy five (96.2%) patients were on medical treatment. Fifty one (68%) were on a single medication, 19 (25%) were on 2 medications, 4 of whom were on a fixed dose combinations such as Combigan or Duotrav. 5 (7%) were on 3 or more medications. A study by Khu et al showed that for POAG 47% of patients were adequately controlled on a single medication, 17% on 2 and 36% of patients required 3 or more medications[25]. This was comparable to our study except that the study by Khu et al had a larger percentage of patients requiring 3 or more medications.

In our study we took compliance to mean patients who do not miss more that 2 doses of their medication per week. This was taken as the cut-off for compliance based on previous studies done assessing compliance to medications in glaucoma[18]. From our results we see that 62 (78.7%) patients reported being compliant to their medications and 16 (21.3%) as not being compliant. Bloch et al found a 27.5% level of noncompliance using this criterion which is comparable to our results[18]. Forty seven (62.8%) of our patients reported being less than 100% compliant missing at least one dose per week. We however face the limitation that the level of compliance to medications was self-reported. Another limitation is the difficulty in accounting for moments in the distant past when a patient may have stayed for a prolonged period of time without a drug due to unavailability but is currently on medication and compliant. Compliance was not significantly related to sex, income, expenditure on medication, number of drugs used, history of counselling, presence of another chronic illness or to the knowledge that glaucoma is a blinding condition (Table 23 and Table 24).

On assessment of consistency to clinic follow-up, we found that 54 (69.2%) patients reported that they had attended all prescribed follow-up visits where as 24 (30.7%) reported having missed at least one clinic visit. Eleven (45.8%) of those who had missed clinic had done so on 2 or more occasions. This however was also faced by the limitation that it was self-reported. A study done by Lee et al showed that 74.3% of patients in their study had failed to attend at least one follow-up visit[19]. This is different from what we found. The main reasons sighted in our set up for missed clinic attendance were incidental events such as being out of town, a temporary illness and the death of a friend of a relative (Table 26). There was no significant difference in clinic attendance between those who had another systemic chronic condition and those who didn't and between those who had been counselled and those who had not been counselled (Table 28).

When we assessed other factors that may be associated with difficulties in scheduled clinic attendance we looked at the distance patients travelled to come to the clinic, the number of hours it took them and the number of vehicles it took to get to the clinic. We found that a large number of patients (27, 34.6%), travel over 100km to attend the glaucoma clinic. This has inherent costs in terms of transport costs, fuel costs for those who drive personal vehicles and for some boarding and lodging costs as it might not be possible to return home on the same day. Forty

(51.3%) patients took 2 or more hours to get to the clinic after setting off from home while 39 (50%) patients had to use 2 vehicles to get to the clinic and 26 (33.3%) had to use 3 or more vehicles to get to the clinic. All these have the capacity to hinder compliance to clinic attendance or put undue strain on the patients both physically and financially. In a study done in South India looking at similar parameters it was interesting to find that undergoing 3 or more vehicle changes to travel to the clinic was associated with better follow-up and that time to travel to clinic and distance from clinic showed no significant relationship to follow-up[19]. In our study no significant relationship was found between compliance to clinic follow-up and distance, time of travel or number of vehicle changes (Table 28).

On following glaucoma patients up it is necessary to assess them for disease progression and this is done by clinical assessment most importantly assessing the state of the disk and the IOP. Beyond that it is necessary to do regular visual field testing and gonioscopy to assess the state of the angle. We find that 71 (91%) patients had had at least one visual field done. An additional 2 (2.6%) were not done because the patients were bilaterally blind and could not therefore do the test. Therefore only 6.4% (5 patients) had not been requested to do visual field testing. The number of visual field tests done is encouraging but efforts must still be made to bring this up to 100% for all those who can do visual field testing whether by Humphrey's visual field testing, Goldmann's visual field analysis or frequency doubling technology (FDT) all of which are available at KNH.

Sixty three (80.8%) patients had at least on gonioscopy done. It is a relatively simple assessment which effort should be put into to ensure that all patients are correctly classified as open or closed angle glaucoma and into primary or secondary glaucoma and therefore managed appropriately. The KNH clinic currently has one mirror, 2 mirror and 6 mirror gonioscopy lenses and these should be put to appropriate use.

Forty two (53.8%) of patients spent less than Kshs 1000 on treatment, and only 20 (25.6%) spent more than Kshs 2000 on treatment per month. There was no statistically significant relationship between amount spent on drugs and monthly income (Table 30) or between amount spent on medications and compliance (Table 23). The lack of a relationship between income and money spent on medication may be explained by the fact that several patients have working children who support them and purchase the more expensive drugs for them which the patient may not

afford on their income. Poorer compliance might be expected with more expensive medications but the greater investment in terms of money spent might act to foster compliance.

We found that 23 (29.5%) patients expected cure and 33 (42.3%) expected improvement of vision from their glaucoma treatment. These however are not often the goals of treatment for POAG whose treatment is aimed at slowing progression of optic nerve damage. Interestingly we found 4 patients who expect no benefits from the treatment.

We found that 13 (32.5%) of patients who had undergone surgery expected cure and a similar number expected improvement of vision. Surgery like medical treatment is done mainly to slow down progression of optic nerve damage in glaucoma by lowering IOP which is the main risk

We found that 69 (88.5%) patients perceived compliance to medications and 70 (89.7%) perceived compliance to follow-up visits 70(89.7%) as being very important which is encouraging and this could foster adherence to drug use and clinic attendance. We however face the limitation that being interviewed in a clinical set up the patients may have felt obliged to give positive responses to these questions.

It was not possible to draw meaningful statistically significant relationships between perception and age, sex, education level, income and compliance due to the very small number of patients who did not perceive compliance as being very important.

CONCLUSIONS.

- Patients are presenting late with advanced disease with 20.5% having some range of visual impairment, 6.4% blind and 54% having a CDR=>0.8.
- 81% of patients have another chronic illness.
- 51% had undergone surgery the most common operation being trabeculectomy.
- Most patients are at the level of some knowledge of glaucoma with poor knowledge on its risk factors and treatment options.
- There was a significant relationship between glaucoma knowledge and sex, income and level of education. Male sex, higher income and a higher level of education were associated with a higher level of knowledge on glaucoma.
- The eye-care worker is the most common primary source of knowledge for glaucoma.
- Very low levels of patient counselling were evident with only 18% recalling having being counselled.
- 21% reported non-compliance to medications and 31% reported non-compliance to follow-up.
- A third of our patients travel over 100km and use 3 or more vehicles to attend clinic and about a half of them spend over 2 hours travelling to clinic.
- A large number of patients have wrong expectations of treatment and surgery.
- Most patients perceive compliance to medication and follow-up to be very important.

RECOMMENDATIONS.

1. More effort should be put into counselling and a system for patient education and be set up in the clinic.
2. The setting up of screening programs to enable patients timely access to care to avoid this late presentation of so many patients.
3. Strengthening of media campaigns and education during medical camps to enhance public education.
4. Decentralization of glaucoma services and training of ophthalmologists in glaucoma and glaucoma surgery especially trabeculectomy surgery to avoid the long, strenuous trips patients have to make to access health care service.
5. A study should be done to try and establish why patients present late.

APPENDIX I: APPROVAL LETTER FROM ETHICS AND RESEARCH

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Ref: KNH-ERC/ A/658

8th December 2010

Dr. Muchai M. Gachago
Dept. of Ophthalmology
School of Medicine
University of Nairobi

Dear Dr. Gachago

Research proposal: "Knowledge, Attitudes and Practices of glaucoma patients attending clinic at Kenyatta National Hospital" (P351/10/2010)

This is to inform you that the KNH/UON-Ethics & Research Committee has reviewed and **approved** your above revised research proposal for the penod 8th December 2010 – 7th December 2011

You will be required to request for a renewal of the approval if you intend to continue with the study beyond the deadline given. Clearance for export of biological specimens must also be obtained from KNH/UON-Ethics & Research Committee for each batch.

On behalf of the Committee, I wish you a fruitful research and look forward to receiving a summary of the research findings upon completion of the study

This information will form part of the data base that will be consulted in future when processing related research study so as to minimize chances of study duplication.

Yours sincerely

PROF A N GUANTAI
SECRETARY, KNH/UON-ERC

c.c. The Deputy Director CS, KNH
The HOD, Records, KNH
The Dean, School of Medicine, UON
The Chairman, Dept. of Ophthalmology, UON
Supervisors: Dr. Kariuki M. M. Dept. of Ophthalmology, UON
Dr. Sheila Marco, Dept.of Ophthalmology, UON

APPENDIX II: QUESTIONNAIRRE.

Biodata

1. Name.....
2. Sex
   a) Male
   b) Female
3. Age.....
4. Marital status
   a) Single
   b) Married
   c) Widowed
   d) Separated/Divorced
5. Occupation.....
6. Residence.....
7. Education level
   a) No schooling
   b) Primary
   c) Secondary
   d) Tertiary (College/University)

Socio-economic status.

1. What is your estimated monthly income?

   a) <5000
   b) 5000- <=10000
   c) 10001- <=25000
   d) 25001- <=50000
   e) >50000

2. How much do you spend on medications per month?

a) <1000
b) 1000- <=2000
c) 2001 - <=5000
d) >5000

Signs at presentation

1. Visual acuity (VA) on first presentation

Option	VA	RE	LE
a)	>=6/18		
b)	<6/18-6/60		
c)	<6/60-3/60		
d)	<3/60		

2. Intraocular pressure.

a) RE:.....mmHg
b) LE:.....mmHg

3. State of angle.

Eye	Open	Closed
RE		
LE		

4. Vertical cup-disc ratio.

a) RE:.....

b) LE.....

Knowledge on glaucoma

1. What eye condition are you on follow-up for?

.....

2. How long have you had glaucoma (years)?

a) <1

b) 1 - 2

c) >2 - 5

d) >5 - 10

e) >10 years

2. What is glaucoma?

a) It is high pressure in the eye.

b) It is a disease where the nerve of the eye becomes weak.

c) It is damage to the nerve of the eye due to high pressure.

d) It is an age-related process leading to a decrease in peripheral vision.

e) Don't know

f) Other (specify).

3. How did you come to know about glaucoma?

a) General medical practitioner.
b) Ophthalmologist.
c) Optometrist/optician.
d) Eye camp.
e) Family member/relative/friend suffering from.
f) TV, magazines, other media.
g) Other(specify):

4. What are the risk factors for glaucoma?

a) Obesity
b) Increased IOP
c) Steroids
d) Chronic smoking and alcohol use
e) Family history of glaucoma
f) Diabetes.
g) Hypertension.
h) Age.
i) Myopia (short-sightedness).
j) Hypermetropia (long-sightedness).
k) Trauma.
l) Other (specify)
m) Don't know.

5. Can glaucoma cause blindness?

a) Yes.
b) No.
c) Don't know.

6. Is visual loss due to glaucoma permanent or reversible?

a) Permanent.
b) Reversible.
c) Don't know.

Treatment/compliance

1. Is glaucoma treatable?

a) Yes.
b) No.
c) Don't know.

2. What are the treatment options available for glaucoma?

a) Medical/eye drops.
b) Laser.
c) Surgery.
d) Don't know.

2. Are you on medical treatment?

a) Yes
b) No.

3. What treatment are you on? (If patient unaware information can be gathered from medical record)

.....

.....

4. On average how many doses do you miss per week?

a. None.

b. 1 - 2.

c. 3 - 5

d. More than 5.

Practices.

3. What difficulties do you have taking your medications?

Drug related.

a) Drops fall on cheek.
b) Too many drops come out.
c) Side effects.
d) Hard to open bottle.
e) Dosage times inconvenient.
f) Hard to squeeze bottle.

Other.....

Patient related

a) Problem paying.

c) Difficulty remembering.
d) Nobody to instil drops

Other

.....

.....

.....

.....

5. Have you had surgery for glaucoma?

a) Yes
b) No

6. Which eye?

a) RE
b) LE
c) BE

7. What kind of surgery? (If patient unaware information can be gathered from medical record)

a) Argon laser trabeculoplasty (ALTP)
b) Peripheral iridectomy
c) Trabeculotomy
d) Goniotomy
e) Trabeculectomy (TET)
f) Augmented Trabeculectomy (TET + Antimetabolite)
g) Aqueous drainage tube insertion.
h) Retrobulbar alcohol injection.
i) Evisceration.
j) Cyclophotocoagulation (CPC)

Attitudes.

1. Perceived importance of compliance to glaucoma medications.

    a) Very important.
    b) Somewhat important.
    c) Not too important
    d)

2. Perceived importance of attending follow up visits.

    a) Very important.
    b) Somewhat important.
    c) Not too important.

Patient Expectations.

1. Expectations of treatment.

    a) Cure
    b) Improvement of vision.
    c) Stop progression.
    d) Symptomatic relief.
    e) No expected benefit.
    f) Other.....

2. Expectations of surgery (If patient has had surgery or is due for surgery)

    a) Cure
    b) Improvement of vision.
    c) Stop progression.
    d) Symptomatic relief.
    e) No expected benefit.
    f) Other..... .....

Follow up.

1. Have you ever had visual fields done?

   a) Yes
   b) No.

2. Have you ever had gonioscopy done?

   a) Yes
   b) No.

3. Recall being counselled on glaucoma

   a) Yes
   b) No

Reasons for not attending clinic.

Knowledge/perception barriers

   a) My eyes were okay.
   b) Unaware of the importance of follow up visits.
   c) I forgot to come
   d) Fear.

Physical barriers

   a) Lack of escort.
   b) Age-related weakness.
   c) Chronic medical illness or disability.

Time/inconvenience

a) Unable to leave work responsibilities.
b) Unable to leave from caring for relative.
c) General inconvenience.
d) Unable to leave household responsibilities.
e) Long waiting times at clinic.

Incidental

a) Out of town.
b) Temporary illness.
c) Wedding or social function.
d) Death of relative or friend.
e) Family problems.
f) Other incidental obligations.

Financial.

a) Transportation costs.
b) Surgical and inpatient fees.
c) Lost wages.
d) Outpatient fees.
e) Food and lodging costs.

Other- List

.....

.....

6. Distance from hospital.

a) < 100km
b) => 100km

7. Time to travel from home to clinic.

a) < 2hrs.
b) => 2hrs

8. No. of vehicles to get to hospital.

a) 0
b) 1
c) 2
d) => 3

Co-morbidity

1. Do you suffer from any other chronic illness?

a) Yes
b) No

2. If Yes, what condition?

a) Diabetes.
b) Hypertension.
c) Arthritis.
d) Dyslipidaemia.
e) Thyroid disease.
f) Other.

APPENDIX III: CONSENT FORM.

English.

I am a student at the University of Nairobi and undertaking a study on the knowledge, attitude and practices among glaucoma patients. Participation in this study is voluntary and the information gathered will be used solely for academic and intended purposes. You do not have to write your name or identify yourself in any way in the questionnaires. Thank you for your co-operation.

Declaration.

I ..... accept that I have read and understood the above explanation and I am willing to participate in the study on a voluntary basis.

Signature.....

Swahili.

Mimi ni mwanafunzi wa Chuo Kikuu Cha Nairobi na ninafanya utafiti kuhusu ujuzi, mwelekeo na mazoea ya wagonjwa wa glaucoma. Kuhudhuria kwako kwa utafiti huu ni kwa hiari yako na mazulio ya uchunguzi huu yatatumika kwa nia ya masomo peke yake. Hutahitajiwa kuandika jina lako au kujitambua kwa njia yoyote ile kwenye fomu ya maswali.

Ahsante sana kwa ushirika wako.

Matamshi.

Mimi ..... nakubali kwamba nimeyasoma na nimeyaelewa maelezo haya na.kuhudhuria kwangu kwa utafiti huu ni kwa hiari yangu.

Sahihi.....

APPENDIX IV: W.H.O. CLASSIFICATION OF BLINDNESS

Category	Best corrected visual acuity in the better eye
Normal vision	6/6 - <6/18
Visual impairment	6/18 –< 6/60
Severe visual impairment	6/60 -<3/60 or visual field < 10°
Blind	3/60 –NPL or visual field <5°

APPENDIX V: GRADING KNOWLEDGE LEVEL ON GLAUCOMA[15].

Grade	Characteristics
Not aware	Never heard of glaucoma.
Aware	Have heard of glaucoma.
Some Knowledge	Know there is optic nerve damage, raised IOP, visual field loss/loss of side vision, or can lead to blindness
Fair knowledge	Some knowledge + 2 risk factors and a treatment option
Good knowledge	Some knowledge + >2 risk factors, >1 treatment option

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