Nigerian Journal of Ophthalmology 2011; 19(1): 19-24

Ocular Co-morbidity in Patients with Refractive Errors in Nigeria

BO Adegbehingbe FWACS, O Adeoye FWACS, BA Adewara MBBS
Ophthalmology Unit, Faculty of Clinical Sciences, Obafemi Awolowo University, Ile-Ife

ABSTRACT

Purpose: To determine the pattern and prevalence of other ocular problems seen in patients with refractive errors in a Nigerian teaching hospital.

Methods: A retrospective hospital-based review of all consecutive patients who presented with signs and symptoms of refractive errors at the Obafemi Awolowo University Teaching Hospitals Complex between 1st January 2007 and 31st August 2007. Patients who had a diagnosis of refractive error and subsequently had detailed eye examination were included in this study. Data was retrieved from the patients' clinical records and analyzed with SPSS version 15.

Results: Out of 724 new patients seen within the study period, 235 had refractive errors (93 males and 142 females). Patients' ages ranged between 7 and 74 years with a mean of 30.5+/ - 4.6 years. In more than half (54%) of the patients, associated ocular co-morbidities were documented. The vision-impairing diseases documented morbidities in 56 (44.1) patients were cataract 26 (20.5%), glaucoma 20 (15.8%), diabetic maculopathy 3 (2.7%), amblyopia, corneal opacities and CMV retinitis. Non vision-impairing disorders documented were conjunctivitis, 49 (38.6%); pterygium 6 (4.7%), chalazion 5 (3.9%), hypertensive retinopathy 4 (3.1%), dry eyes and episcleritis. Immature cataract was responsible for about 2/ 3 of cases with poor corrected visual acuity documented in a large proportion of the patients 26 (11.1%).

Conclusion: Patients with refractive errors need detailed ocular examination for early detection of other co-morbidities which may significantly affect vision and lead to avoidable blindness and visual impairment.

Key words: refractive errors, ocular co-morbidity, glaucoma, visual impairment, blindness

INTRODUCTION

Refractive errors (myopia, hypermetropia, astigmatism and presbyopia) affect a large proportion of people of all ages and gender. Patients with refractive errors (RE) account for a high proportion of patients attending ophthalmic clinics.[1-4] Refractive errors can be easily diagnosed, measured and corrected with spectacles or other refractive corrections to attain normal vision. However, non correction or inadequate correction of refractive errors becomes a major cause of low vision and even blindness. Globally, there are 8 million people who are blind and 153 million with visual impairment (presenting visual acuity <6/ 18 in the better eye) due to uncorrected refractive errors; this excludes presbyopia.[5] Poor visual outcome in patients with refractive errors could be in part due to other associated ocular morbidity, though some patients with co-existing ocular morbidity may still attain normal vision.

Studies by various researchers have shown relationships between refractive error and other ocular morbidities such as cataract,[6], glaucoma,[7] and allergic conjunctivitis.[8] Detailed assessments of individuals who have refractive errors provide an opportunity for identifying other potentially co-existing blinding conditions before they cause visual loss. The consultation of 'road-side dispensers' by most patients in developing countries and lack of detailed ocular examination by optometrists and opticians in these communities has remained one of the main challenges to the correction of refractive errors and possible identification of other co-morbidities. The majority of patients also circumvent the services of eye care professionals and consult non-qualified personnel for a number of reasons, including the belief of 'cost savings'.[9] Patients in these categories will automatically miss detailed and comprehensive review by ophthalmologists and as such, some asymptomatic ocular conditions such as glaucoma (a major cause of irreversible blindness) may not be diagnosed early enough for prompt treatment. It has been well documented that patients who require frequent change of spectacles may actually be suffering from other ocular diseases, especially glaucoma.

This study was undertaken to assess the frequency of patients that seemingly present with refractive errors but actually have other eye diseases. The aim was to determine the pattern and prevalence of other ocular co-morbidities such as glaucoma, ocular hypertension, cataract, hypertensive retinopathy, diabetic retinopathy, and other eye disorders in patients with refractive error in a tertiary eye care centre. This will assist in providing information

Correspondence: Dr Bernice O Adegbehingbe, Ophthalmology Unit, Department of Surgery, Faculty of Clinical Sciences, Obafemi Awolowo University, Ile-Ife • E-mail: berniceola2003@yahoo.co.uk

which can be useful for early detection of eye diseases and eye health planning.

METHODOLOGY

A retrospective non-comparative hospital-based review of all consecutive patients who had primary diagnosis as refractive error at the Obafemi Awolowo University Teaching Hospitals Complex between 1st January 2007 and 31st August 2007 was conducted. The protocol for this study was approved by the hospital research and ethics committee.

Inclusion criteria comprised patients of all ages who presented with vision of ≤ N8 for near or ≤ 6/ 12 for distance. Distant visual acuity in all subjects was improved with a Pin Hole and refraction by at least two lines on the Snellen's chart. Included in this study were patients in whom refractive errors were associated with other ocular or systemic disease such as cataract, glaucoma, corneal scars, diabetes, maculopathy, keratoconus, chalazion, marginal corneal degenerations, pterygium or previous ocular surgery or drugs that could cause shifts in refractive error.. Excluded from the study were those patients who had no improvement in their visual acuity with refraction.

Data collected on the patients included demographics such as patients' age, sex, occupation and level of education. Others were presenting ocular symptoms and signs, presenting visual acuity (with or without Pin Hole test), drug and past medical history. Intraocular pressure, dilated funduscopy and detailed eye examinations were carried out by a consultant ophthalmologist. Refraction measured with retinoscopy accompanied with subjective testing was done by an optometrist.

Glaucoma damage was defined as reproducible glaucomatous visual field defects with the Humphrey Full Threshold 24-2 programme with or without elevated intra-ocular pressure in association with characteristic optic nerve head damage. Gonioscopy was done on those who had glaucoma to determine the status of anterior chamber angle; those with elevated IOP in the presence of an open angle were diagnosed as having primary open angle glaucoma.

Cataract was diagnosed and classified based on slit lamp assessment. In cases where a patient had co-morbidity in both eyes, the eye with the worse vision or more advanced co-morbidity was chosen for the purpose of analysis in this study. Some patients had more than one co-morbidity in the studied eye; in such cases, all the problems identified were documented and analyzed. After refraction, the visual acuity of the studied eye was documented and analyzed.

Visual field test was done by trained optometrists while the results were interpreted by a consultant ophthalmologist who was the principal investigator. All patients had prescription glasses, including reading glasses dispensed as appropriate, and those in which other ocular morbidities were diagnosed were managed appropriately. Some of these were reviewed during their follow-up visit.

Data was imputed and analyzed using the SPSS version 15. The mean and standard deviations (SD) for patients' age were calculated. Variables were related using chi square and tests for statistical significance were done using the Welch's *t* test. A *P* value of less than 0.05 was considered significant.

RESULTS

A total of 724 new patients were seen over the study period. Of these 235 (32.5%) had a primary diagnosis of refractive errors. Patients' ages ranged between 7 - 74 yrs with a mean of 30.5 ± 4.6 yrs. A largest number of patients, 120 (51.1%), were between ages 10 and 30 years, while 57 (24.3%) were children (</ =16yrs). There were 142 patients below the age of 40 years while 93 were over 40 years. There were more females, 142 (60.4%) than males. Age range and sex distribution of patients with refractive errors were as depicted in table 1.

Table 1. Sex and age range of patients with refractive errors

Age Range	Sex		Total (%)
	Male (%)	Female (%)	
1-9	5 (2.1)	4 (1.7)	9 (3.8)
10-19	19 (8.1)	40 (17.0)	59 (25.1)
20-29	26 (11.1)	35 (14.9)	61 (26.0)
30-39	4 (1.7)	9 (3.8)	13 (5.5)
40-49	12 (5.1)	26 (11.1)	38 (16.2)
50-59	14 (6.0)	15 (6.4)	29 (12.4)
60-69	11 (4.6)	10 (4.3)	21 (8.9)
70-79	2 (0.8)	3 (1.3)	5 (2.1)
Total	93 (39.5)	142 (60.5)	235 (100)

More than half of the patients, 127 (54%) had other associated causes of ocular co-morbidity (table 2). Vision-impairing diseases documented co-morbidities in 56 (44.1) patients were cataract 26 (20.5%), glaucoma 20 (15.8%), diabetic maculopathy 3 (2.7%) and others 7 (5.5%) such as amblyopia, corneal opacities and CMV retinitis. Non vision-impairing disorders documented were conjunctivitis, 49 (38.6%); pterygium 6 (4.7%), chalazion 5 (3.9%), hypertensive retinopathy 4 (3.1%) and others 7 (5.5%) such as dry eyes and episcleritis. Immature cataract was responsible for about 2/ 3 of cases with poor corrected visual acuity documented in a significant proportion of the patients 26 (11.1%).The most common ocular co-morbidity in patients below 40 years of age was allergic conjunctivitis (12.4%), while cataract and glaucoma (16.2%) were the more prevalent in those above 40 years. This distribution of ocular co-morbidity in relation to patients' age was statistically significant, *P*= 0.0001. There were 4 individuals with double co-morbidities, two had co-existing glaucoma and cataract while 2 had pterygium and cataract. Cataract was significantly associated with age, *P*=0.0001.

Table 2. Age range and ocular co-morbidity in 127 patients with refractive errors.

Age range	Disease condition in the worse eye									
	Allergic Conjunctivitis	Cataract	Glaucoma	Diabetic Retinopathy	Age Related maculopathy	Amblyopia	Hypertension	pterygium	Others	Total
0-9	2		0	0	0		0	0	1	3
10-19	11		2	0	0	1	0	0	2	16
20-29	16	0	2	0	0	2	0	0	10	30
30-39	1	4	0	1	0	0	0	0	1	7
40-49	8	4	5	2	0	0	0	2	4	25
50-59	8	3	6	1	1	0	2	2	3	26
60-69	3	5	4	0	2	0	1	1	3	19
70-79	0	0	1	0	1	0	1	1	1	5
Total	49	16	20	4	4	3	4	6	25	131

The overall prevalence of cataract (excluding aphakia) was found to be four times more common in those above 40 years of age. Bilateral cataract was present in 80% of patients with cataract, while the rest had unilateral cataract. Among those with glaucoma, 5 had normal tension glaucoma, 2 had juvenile open angle glaucoma while the rest had primary open angle glaucoma.

The distribution of the study population according to 'presenting' and 'best corrected' visual acuity in the better eye is shown in table 3. The overall prevalence of normal vision (V≥ 6/ 12), moderate visual impairment (VA < 6/ 18-6/ 60), severe visual impairment (<6/ 60-3/ 60) and blindness (<3/ 60) based on 'presenting' visual acuity (vision with glasses if normally worn, otherwise without glasses) was 27.7%, 65.1%, 5.1%, and 2.1%, respectively. However based on 'best corrected' visual acuity, the prevalence rates became 88.9, 10.2, 0.9 and 0% respectively.

Table 3. Distribution of visual acuity before and after refraction

Visual Acuity	Frequency (%)	
	Pre-refraction	Post-refraction
≥ 6/ 12	65 (27.7%)	209 (88.9%)
6/ 18-6/ 60	153 (65.1%)	24 (10.2%)
<6/ 60-3/ 60	12 (5.1%)	2 (0.9%)
< 3/ 60	5 (2.1%)	-
Total	235 (100%)	235 (100%)

Aetiology of visual impairment among the 26 patients with best corrected visual acuity < 6/ 18 in the better eye post-refraction was as shown in figure 1. Cataract was responsible for most cases of visual impairment 17 (65.4%); this finding was statistically significant, *P*= 0.002. Eleven (64.7%) of these were posterior sub- capsular cataract while the others were mixed nuclear sclerosis and sub-capsular opacities.

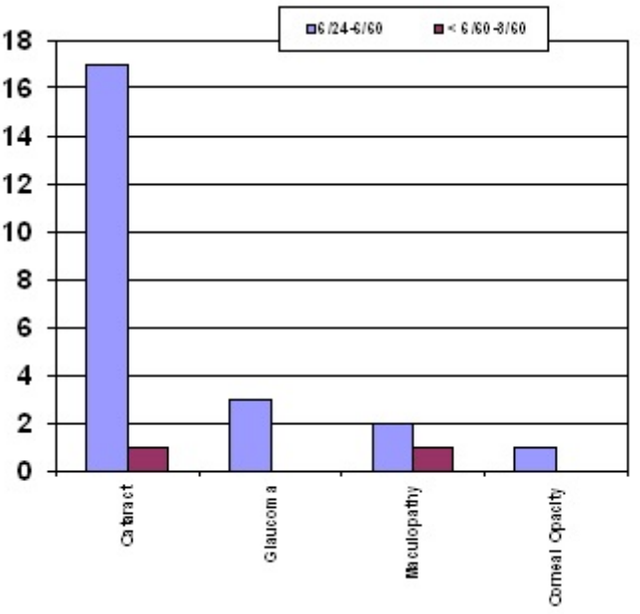

Figure 1. Ocular co-morbidity in 26 patients with visual impairment post-refraction (VA < 6/ 18)

Figure 2a and 2b depict the distribution of distance refractive errors in those below and above age 40 years respectively. The most common refractive error in patients under 40 years was myopic astigmatism 60 (42.5%). Others were hypermetropia 40 (28.5%), myopia 23 (16.2%), and hypermtropic astigmatism 19 (12.8%), only 5 patient in this age group needed distance correction. Hypermetropia was the commonest refractive error in those over 40 years. About 90%, 84 of those above 40 years had presbyopia, 34 of these had no other distance refractive error.

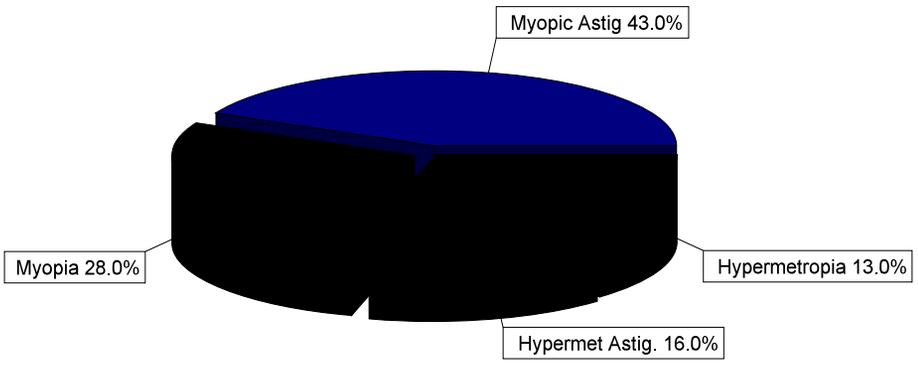

Figure 2a. Distribution of distance refractive errors in patients < 40 years

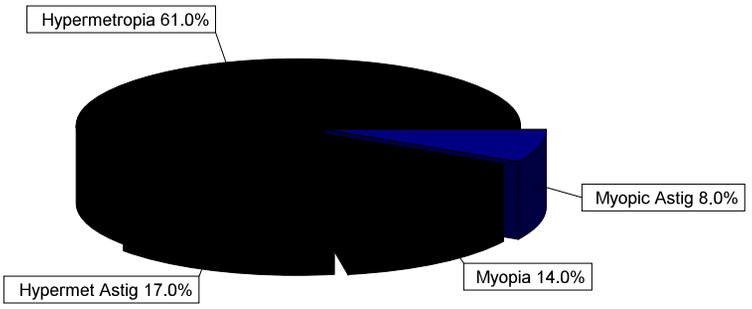

Figure 2b. Distribution of distance refractive errors in 59 patients > 40 years

There was no significant association between hypermetropia and any of the ocular co-morbidities but myopia was significantly associated with presence of cataract (P=0.01), glaucoma (P=0.02) and keratoconus (0.01).

DISCUSSION

This study analyzed the ocular co-morbidity and the relative frequency and magnitude of these in patients with refractive errors in, and the effect of refraction on eventual visual outcome of the patients. It revealed that there is a high prevalence of other blinding ocular problems such as cataract and glaucoma in the study population, all of which are treatable or preventable. Previous studies have shown that refractive error coexists with other ocular co-morbidities such as allergic conjunctivitis[8], cataract[6,10] and glaucoma.[7,11].

There is paucity of data on the prevalence of ocular morbidities found coexisting in patients presenting with refractive errors in Nigeria. This study is therefore relevant because as more people seek for glasses to address their eye problems, co-morbidities may be identified and treated to prevent visual impairment and blindness.

Reports from clinic-based study on refractive errors both in Africa and in the Western world are very few.[1-12] Though community-based studies on pattern and associated co-morbidity of refractive errors have been conducted in several studies in the past,[11-17] there have been very few reports of ocular co-morbidity in patients with refractive errors in hospital-based studies;[1-4] hence attempts were made to find out whether the pattern of ocular co-morbidity at the community were different from that of the hospital setup.

In this study more than half of patients with refractive errors had ocular co-morbid conditions, some of which are potentially blinding. The main ocular disorder responsible for visual impairment and low vision in the study population were cataract, glaucoma, maculopathy, corneal opacity and keratoconus. Allergic conjunctivitis was the most prevalent co-morbid condition in all the patients studied. This correlates to the study done by Mimura et al.[8] In developing countries such as Nigeria, allergic conjunctivitis has been found to be an important association or risk factor in patients with refractive errors.[4,9] Sometimes,

delayed or improper treatment of allergic conjunctivitis such as the use of harmful traditional medication, especially in resource-limited communities like in Nigeria, can have serious visual consequences. None of the patients studied had visual impairment from allergic conjunctivitis.

Next to allergic conjunctivitis, cataract and glaucoma were the most prevalent ocular disorders found in patients with refractive errors aged 40 years and above. This is similar to global statistics. Cataract was significantly associated with age in this study with more than 80% of the cases presenting in patient above 40 years of age. Similar cataract prevalence rates have been reported by several studies in India[12, 13] despite the fact that they are population based studies. Lower prevalence rates have, however, been reported from a few other population based studies[14, 15] including the Aravind Comprehensive Eye Survey where the prevalence of cataract in those aged 40 years and above was found to be 47.5%.[16] This difference in prevalence rate may be due to difference in sample size and study population. Also, the close association of cataract with increasing age has been documented by other studies.[17-20] Two patients with posterior sub-capsular cataract were not improved beyond 6/ 18 with refraction and this contributed to the a significant visual impairment recorded in the study population.

The prevalence of glaucoma in the present study (15.8%) was much higher than that reported by several Indian studies where prevalence rates ranging from 2.6% to 7.2% had been documented.[21-22] This was not unexpected as there were usually higher rates in population-based studies than in clinic-based studies. Eighty per cent of patients with glaucoma were aged above 40 years; however, prevalence rate increased with age from 1.7% in those below 40 years to 6.8% in those above 40 years. Glaucoma remains a challenging disease and has been described as a 'silent thief of sight' responsible for a significant proportion of irreversible blindness worldwide. The burden of blindness from this condition can be reduced by early diagnosis and prompt treatment. Majority of patients with glaucoma in the developing world present late due to the asymptomatic nature of the disease. Routine screening of all patients who present to the eye clinic with symptoms of other eye disorders such as refractive error will serve as a means of early diagnosis and prompt treatment of glaucoma.

The prevalence of corneal opacity was lower in this study population when compared to reports from other studies.[12, 23] Higher prevalence rates have been documented in population studies among rural dwellers in Nigeria[24] and in East Africa.[25] Ocular trauma and corneal ulcer were responsible for the few cases of corneal opacity documented.

Other causes of ocular morbidity in these patients were diabetic, hypertensive and CMV retinopathy. CMV retinopathy was seen in a patient with HIV/ AIDS who had not been diagnosed before presenting to the ophthalmologist.

In conclusion, patients with refractive error need detailed ocular examination for identification of other co-morbid conditions needing care or which may affect visual prognosis. Detailed assessment of individuals who have refractive error, particularly those aged 40 years and above, are highly desirable as this provides an opportunity for identifying and treating other potentially blinding ocular conditions such as glaucoma. Findings from this study will help to underscore the priorities for eye care services based on evidence-based data on associated co-morbidities. Health education programmes should target older age groups specifically and the population in general. Affordable eye care services should be provided in addition to making these services more readily available and accessible.

REFERENCES

1. Olurin O. refractive errors in Nigeria (A hospital clinic study). *Ann Ophthalmol* 1973; 5: 971-976.
2. Nworah PB, Ezepue UF. Prevalence of errors of refraction in a Nigerian eye clinic. *Orient Journal of Medicine* 1992; 4: 57-60.
3. Adefule-Ositelu AO. Refractive errors in Lagos, Nigeria. *Nig Med J* 1995; 29 (3): 101-163.
4. Adegbehingbe BO, Majekodunmi AA, Akinsola FB, Soetan EO. Pattern of refractive errors at Obafemi Awolowo University Teaching Hospital, Ile-Ife, Nigeria. *Nigerian Journal of Ophthalmology* 2003: 11(2): 76-79.
5. Resnikoff S et al. Global magnitude of visual impairment cause by uncorrected refractive error in 2004. *Bulletin of the WHO* Jan 2008; 86:63 – 70.
6. Amruta SP, Khandekar R, Dharmadhikari S, Dole K, Gogate P, Deshpande M. Prevalence of uncorrected refractive error and other eye problems among urban and rural school children. *Middle East Afr J Ophthalmol* 2009 Apr–Jun; 16(2): 69–74.
7. Krishnaiah S, Srinivas M, Khanna RC, Rao GN. Prevalence and risk factors for refractive errors in the South Indian adult population: The Andhra Pradesh Eye Disease Study. *Clin Ophthalmol* 2009; 3: 17–27
8. Mimura T, Mimura Y, Arimoto A, Amano S, et al. Relationship between refraction and allergic conjunctivitis. *Eye* (2009) 23, 63 – 66.
9. Ayanniyi AA, Adepoju FG, Ayanniyi RO, Morgan RE. Challenges, attitudes and practice of spectacle wearers in a resource-limited economy. *Middle East Journal of Ophthalmology* 17 (1):83-87.
10. Pesudovs K, Elliott DB. Refractive error changes in cortical, nuclear, and posterior subcapsular cataracts. *Br J Ophthalmol* 2003 August; 87(8):964 – 967.
11. Ramakrishnan R, Nirmalan PK, Krishnadas R, Thulasiraj RD, Tielsch JM, Katz J, et al. Glaucoma in a rural population of southern India: The Aravind Comprehensive Survey. *Ophthalmology*. 2003; 110: 1484–90.
12. Venkataswamy G, Lepkowski JM, Ravilla T, Brilliant GE, Shanmugham CA, Vaidyanathan K, et al. Rapid epidemiologic assessment of cataract blindness. The Aravind Rapid Epidemiologic Assessment Staff. *Int J Epidemiol.* 1989; 18:S60–7.

13. Raizada IN, Mathur A, Narang SK. A study of prevalence and risk factors of senile cataract in rural areas of western UP. *Indian J Ophthalmol.* 1984; 32:339–42.
14. Bachani D, Murthy GV, Gupta KS. Rapid assessment of cataract blindness in India. *Indian J Public Health* 2000; 44:82–9.
15. Chatterjee A, Milton RC, Thyle S. Prevalence and aetiology of cataract in Punjab. *Br J Ophthalmol* 1982; 66:35–42.
16. Nirmalan PK, Krishnadas R, Ramakrishnan R, Thulasiraj RD, Katz J, Tielsch JM, et al. Lens opacities in a rural population of southern India: The Aravind Comprehensive Eye Study. *Invest Ophthalmol Vis Sci.* 2003; 44:4639–43.
17. Loewenthal R, Pe'er J. A prevalence survey of ophthalmic diseases among the Turkana tribe in north-west Kenya. *Br J Ophthalmol.* 1990; 74:84–8.
18. McCarty CA, Mukesh BN, Fu CL, Taylor HR. The epidemiology of cataract in Australia. *Am J Ophthalmol.* 1999; 128:446–65.
19. Leske MC, Connell AM, Wu SY, Hyman L, Schachat A. Prevalence of lens opacities in the Barbados Eye Study. *Arch Ophthalmol* 1997; 115:105–11.
20. Singh MM, Murthy GV, Venkatraman R, Rao SP, Nayar S. A study of ocular morbidity among elderly population in a rural area of central India. *Indian J Ophthalmol* 1997; 45:61–5.
21. Jacob A, Thomas R, Koshi SP, Braganza A, Muliyil J. Prevalence of primary glaucoma in an urban south Indian population. *Indian J Ophthalmol* 1998; 46:81–6.
22. Awasthi P, Sarbhai KP, Banerjee SC, Maheshwari BB. Prevalence study of glaucoma in rural areas. *Indian J Ophthalmol* 1975; 23:1–5.
23. Singh MM, Murthy GV, Venkatraman R, Rao SP, Nayar S. A study of ocular morbidity among elderly population in a rural area of central India. *Indian J Ophthalmol* 1997; 45:61–5.
24. Adegbehingbe BO, Majemgbasan TO. Ocular health status of rural dwellers in south-western Nigeria. *Aust J Rural Health* 2007; 15:269-272.
25. Buhrmann RR, Quigley HA, Barron Y, West SK, Oliva MS, Mmbaga BB. Prevalence of glaucoma in a rural East African population. *Invest Ophthalmol and Vis Sci* 2001; 41: 40-48.