

# Journal of Ophthalmology of Eastern Central and Southern Africa

(Formerly East African Journal of Ophthalmology)

www.coecsa.org

ISSN 2308-6327



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## Editorial

### Ophthalmology as a leader in innovation

#### Introduction: Never a dull day in ophthalmology

It gives me great pleasure to write this article for I truly believe that ophthalmology is one of the most exciting branches of medicine as there is constant research that leads to numerous innovations in technology, pharmaceuticals and surgical techniques. However, for one to fully appreciate this highly dynamic breed of medicine one must have the innate desire to continuously study, research, and learn new surgical techniques. Gone are the days when we did our residency and coasted on the knowledge obtained for the rest of our lives.

In keeping with the theme of this years College of Ophthalmology of Eastern, Central and Southern Africa (COECSA) 2015 Annual Scientific Conference, "Embracing Research and Technology in Ophthalmology" we shall look at the evolution of technology in ophthalmology through the ages and realize that there is never a dull day in ophthalmology.

#### Darwin on the eye

On mentioning the word "Evolution" we must first of all turn to the grandfather of the theory, Charles Darwin and look into his fascination with the eye. In Chapter VI of his book, "The Origin of Species" Darwin discusses difficulties of the theory by covering organs of extreme perfection and complication. He mentions that, "To suppose that the eye with all its inimitable contrivances for adjusting the focus to different distances, for admitting different amounts of light, and for the correction of spherical and chromatic aberration, could have been formed by natural selection, seems, I freely confess, absurd in the highest degree".

He still goes on to make an attempt at how the theory could have led to the formation of such a complex organ when he mentions, "Reason tells me, that if numerous gradations from a simple and imperfect eye to one complex and perfect can be shown to exist, each grade being useful to its possessor, as is certainly the case; if further, the eye ever varies and the variations be inherited, as is likewise certainly the case and if such variations should be useful to any animal under changing conditions of life, then the difficulty of believing that a perfect and complex eye could be formed by natural selection, though insuperable by our imagination, should not be considered as subversive of the theory<sup>1</sup>.

#### Ophthalmology as the first specialization in medicine

From very early times, the ancient Egyptians had argued that each body part was viewed as a separate entity<sup>2</sup>.

In the 19<sup>th</sup> century a new desire to expand medical knowledge made it necessary for doctors to specialize as it was believed that only specialization permitted the rigorous observation of many cases. Ophthalmology was the very first area of medicine to set itself aside as an

area of specialization. As this happened two journals came into existence the first being, "L'Esculape: Journal Des Spécialités Médico-Chirurgicales." It was edited by a Dr. S. Furnari, a specialist in diseases of the eyes and appeared in June 1839<sup>3</sup>.

#### From couching to phacoemulsification

Cataract surgery by "couching" (lens depression) was, without doubt, one of the oldest surgical procedures. This technique involved using a sharp instrument to push the cloudy lens to the bottom of the eye. Maharshi Sushruta, an ancient Indian surgeon, first described the procedure in "Sushruta Samhita, Uttar Tantra", an Indian medical treatise (800 BC)<sup>4</sup>.



Picture courtesy of Arnold Sorsby in A Short History of Ophthalmology

This technique of managing cataracts remained largely unchanged until the 19<sup>th</sup> century when intraocular surgery saw great revolution with intraocular surgery evolving. Since then we have seen Intracapsular Cataract Extraction (ICCE), Extracapsular Cataract Extraction (ECCE), Small Incision Cataract Surgery (SICS), cataract extraction by phacoemulsification and now femtolaser-assisted phacoemulsification.

All these changes have embraced innovation, research and huge technological leaps and have made use of other fields of progress such as antibiotic and anaesthetic agents development, implant technology, laser physics, and many others. Incisions have gotten smaller from the 180 degree incision used in ECCE to 6mm used in ICCE and SICS to 1.8mm now used in phaco. This has consistently given better and better visual outcomes with fewer complications and faster visual rehabilitation for the patients<sup>5</sup>.

### Ophthalmology as leading technological change in medicine

Ophthalmology has been on the forefront of the use of technology in medicine. The first medical application of the laser—which occurred less than a year after its invention—was in retinal photocoagulation. Since then, its effect on ophthalmology cannot be overestimated, as lasers have become abundant in all ophthalmic specialties for both diagnostic and therapeutic devices. Having started off with the Xenon Arc in the 1950s to the Argon laser in the 70s<sup>6</sup>.

Lasers have come to be used on the cornea in refractive surgery and lamellar keratoplasty, on the iris and anterior chamber angle in glaucoma, on the lens during femto-second laser assisted cataract surgery, on the retina for vascular diseases such as diabetic retinopathy and maculopathy, vein occlusions and retinal tumours such as retinoblastoma. It seems there is no end to the applications for which lasers can be applied in the eye.

### Old things made new in ophthalmology

Innovation does not only mean inventing new things but also putting new use to old things and ophthalmology has done this with great success.

In the management of chronic diabetic macula oedema new use has been found for Triamcinolone as an intravitreal drug. It has previously made its rounds in medicine having been used by the rheumatologists and orthopaedic surgeons in the management of various joint maladies and calcaneal spurs.

In the treatment of Age-related Macular Degeneration (AMD) we have taken over the use of Anti-Vascular Endothelial Growth Factor (VEGF) agents with Bevacizumab (Avastin) which after being used for years in the management of metastatic colorectal carcinoma and other cancers<sup>7</sup> is now being used to manage choroidal neovascular membranes in wet AMD<sup>8</sup>.

Various machines have also been developed with ophthalmology at their heart. These include the Optical Coherence Tomogram (OCT), which has now become part of standard care in the management of retina patients despite having been adopted only 15 years ago<sup>9</sup>.

Mobile technology has also found new use in ophthalmology with several applications being developed to facilitate evaluation of patients. The most recent is the Portable Eye Examination Kit (PEEK) system which combines a mobile phone application and lens adaptor that is attached to any smart phone and allows for imaging of the posterior segment of the eye which has the potential for revolutionizing how we screen for common conditions such as diabetic retinopathy and glaucoma by making it easier and more affordable<sup>10</sup>.

### Breakthroughs in drugs

Other anti-VEGF agents have then come into common use including Ranibizumab (Lucentis) and Aflibercept (Eylea). Age-related macular degeneration was for a long time a devastating disease that affected a large portion of the elderly population rendering them blind with no hope

for effective treatment. Since the inception of the use of anti-VEGF drugs in AMD the outcome has been much more favourable with patients not only reporting no further deterioration in vision but marked improvements in their vision.

Glaucoma is an area where patients in our setting suffered grievously in the 1970s due to an overwhelming lack of medications. Now we have several classes of drugs that are highly effective including the prostaglandin analogues, carbonic anhydrase inhibitors, beta-blockers, alpha agonists and various combinations of the same. These have reduced the need for surgery, augmented the effects of surgery and reduced the rate of visual loss from glaucoma in the long term<sup>11</sup>.

### Breakthroughs in surgical techniques

It was once said that the posterior segment of the eye will forever be inaccessible to the surgeon's scalpel. It was not until 1975 when Machemer designed the single port, multifunctional 17-gauge cutter called the Vitreous Infusion Suction Cutter (VISC)<sup>12</sup>. Since then posterior segment surgery has seen the refining of surgical techniques with O'Malley and Heintz describing the use of a 20-gauge 3 port system which became and remained as the gold standard for vitrectomy for the next 3 decades<sup>13</sup>.

Over the past several years, the development of small incision transconjunctival, sutureless Pars plana Vitrectomy (PPV) has led to a major shift in how many diseases are treated in the operating room. In 2002 Fujii *et al*<sup>14</sup> introduced the modern 25-gauge PPV system, while Eckhart endorsed 23-gauge PPV in 2003<sup>15</sup>.

Corneal grafting is an area that has also seen much revolution in the techniques used from the traditional Penetrating Keratoplasty (PKP) to the lamellar keratoplasty. Now we are grafting layers using techniques such as Descemet's Stripping Automated Endothelial Keratoplasty (DSAEK), Descemet's Membrane Endothelial Keratoplasty (DMEK) and laser assisted lamellar keratoplasty.

### Treating diseases that were incurable

We have already seen the case of wet AMD that was not treatable until the age of the anti-VEGFs. We also have Keratoconus (KC) that was previously only managed with spectacles and contact lenses until it was bad enough to warrant a corneal graft. Now we have technology like collagen crosslinking with Riboflavin and UV and this has greatly reduced the progression of KC and reduced the need for grafting. Corneal regularization prior to crosslinking has enhanced the visual potential of KC patients by reducing the amount of irregular astigmatism and thus allowing better visual outcomes with spectacle correction after crosslinking<sup>16</sup>.

### Looking forward

Looking into the future we can only wait with baited breath as new technologies take root such as the Bionic Eye and the Brainport.

The Bionic Eye is mainly targeted for patients with retinitis pigmentosa which has for a long time not been amenable to treatment. The technology and the resolution of images have greatly improved over the last couple of years<sup>17</sup>. Applications for the Bionic Eye are also being developed for age-related macular degeneration.

The BrainPort V100 is an oral electronic vision aid that provides electro-tactile stimulation to aid profoundly blind patients in orientation, mobility, and object recognition as an adjunctive device to other assistive methods such as the white cane or a guide dog<sup>18</sup>.



Photo courtesy of endgadget.com

We look forward to the innovation of more drugs, finer surgical techniques and new applications of our current tools. We must however not just anticipate to be end users of these changes but be part of the change and actively take part in research, focused investigation and innovation and be the next generation of doctors driving progress in ophthalmology.

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## Aetiology of uveitis in the Gambia, West Africa

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### ABSTRACT

**Objective:** To determine the causes of uveitis in the Gambia.

**Background:** Uveitis is diverse group of disease entities leading to the inflammation of the uveal tract and are estimated to cause about 10% of blindness worldwide. The condition is often idiopathic but can be triggered by autoimmune, genetic, post traumatic or from infectious diseases. Uveitis is broadly classified into anterior, intermediate, posterior and panuveitis, based on the anatomical involvement of the eye.

**Methods:** The patients recruited for this study for a period of one year were initially diagnosed by the cataract surgeons in the regional hospitals, and the tertiary hospital. These suspected cases were referred to the Sheikh Zayed Regional Eye Care Centre, Banjul where the only ophthalmologist works and were further examined. Only those with established clinical findings were included in the study. A prepared proforma with patients' demographics such as age, name, sex and address were included. Others were presenting complaints, duration, medical and drug history, and exposure to pets. Patients had both general and ocular examinations. Patients with symptoms were sent for various investigations according to the needs, such as X-rays, blood for retroviral screening, VDRL and ESR.

**Results:** A total of 9,513 patients presented in the outpatient clinic of the hospital between January 2010 and December 2010 out of which 63 (0.66%) were diagnosed with uveitis. Thirty-two (50.8%) patients were males, with a mean age of 36.7 years at presentation. The most common type of uveitis was anterior uveitis seen in 40 (63.5%) patients, followed by posterior uveitis. Nine (14.3%), intermediate uveitis 8(12.7%) and panuveitis 6(9.5%) patients. The aetiology was unknown for 42.9% of the cases, HIV-related cases were 12 (19.0%), while toxoplasmosis and trauma accounted for 11 (17.5%) and 7 (11.1%) cases respectively.

**Conclusion:** Most of the uveitis seen in our study is of unknown cause, others were HIV-related, toxoplasmosis and trauma. More facilities are needed for better diagnosis in the eyes centres.

Key words: Uveitis, Aetiology, The Gambia

### INTRODUCTION

The uvea consists of the iris, the ciliary body and choroid. The choroid provides most of the blood supply to the retina<sup>1</sup>. Uveitis is the inflammation of this middle layer or the uvea. Uveitis is composed of a diverse group of disease entities which have been estimated to cause about 10% of blindness<sup>2,3</sup>. The condition is often idiopathic, but can be triggered by autoimmune diseases; it could be genetic, may be from trauma, infections or even drugs<sup>1</sup>. Uveitis is broadly classified into anterior, intermediate, posterior and panuveitis, based on the anatomical involvement of the eye<sup>3</sup>.

Anterior uveitis is the commonest form of the intraocular inflammation with varying incidence in the general population of various countries around the world. It is characterized by unilateral pains which may be associated with increased intraocular pressure, blurring of vision due to turbidity of the aqueous, and photophobia from ciliary spasm. Presence of flares and cells results in turbidity of the aqueous humour and circumscribed redness around the conjunctivae<sup>3</sup>.

Intermediate uveitis is the inflammation of the anterior vitreous, the ciliary body and the peripheral retina.

The prevalence is about 5.9/100,000. It affects patients of all age groups but is predominantly seen in 3<sup>rd</sup> and 4<sup>th</sup> decades of life. Bilaterality occurs in about 70-90% of cases. It may present with minimal symptoms of blurred vision due to floaters, but in severe cases there may be visual loss due to aggregation of floaters in the vitreous. Other signs may be quiet anterior chamber, or flares, cells and keratic precipitates which are usually minimal. Posterior synechiae if present usually involves the inferior iris. Vitritis is a characteristic feature of intermediate uveitis, seen as vitreous haze ranging from trace to +4. In some cases vitreous snowballs may be seen in the mid vitreous and inferior periphery. Snowbanking is also not uncommon and is seen as exudates in the pars plana. Retinal changes may be seen as tortuosity in the arterioles and venules, sheathing of the peripheral veins, neovascularisation and retinal detachments<sup>4</sup>.

Posterior uveitis is the inflammation of the adjacent structures such as the posterior vitreous, retina and optic nerve head<sup>5</sup>. Posterior uveitis may present with a quiet or inflamed eye, or patients may report floaters, reduced vision, metamorphopsia, scotoma or ocular discomfort. Ocular toxoplasmosis is the most common cause of

posterior uveitis accounting for about 90% of cases<sup>2,6</sup>. Others are herpes, toxocara, brucella and Behcet's disease<sup>2</sup>.

The international Uveitis Study Group defined panuveitis as generalized inflammation of all three parts of the uvea, i.e the iris, ciliary body and choroid. It covers a large group of diverse diseases which affect the retina and vitreous humour. It is characterized by choroidal or retinal inflammation such as choroiditis, necrotizing retinitis, vitritis and anterior uveitis<sup>7</sup>.

Medical drugs are recognized as an important cause of uveitis. A number of medical drugs encompassing various forms of administration including topical formulations, periocular and intraocular injections and recent availability of treatments for neovascular diseases of the retina and choroid, anti Vascular Endothelial Growth Factor (VEGF) and systemic medications have been implicated<sup>8,9</sup>.

Studies done in Sierra Leone shows that toxoplasmosis was the commonest cause while HIV, tuberculosis and sarcoidosis were the other causes<sup>10</sup>. While in Saudi Arabia, the commonest cause was undetermined uveitis followed by Behcet's disease<sup>11</sup>.

This prospective study, which spanned for about one year was done to determine the aetiology of uveitis in the Gambia, a West African state. The information obtained will be useful in planning eye care services with respect to training of cataract surgeons who oversee the affairs of the secondary centres.

## MATERIALS AND METHODS

The Gambia is the smallest country in West Africa with a population of about 1.6 million. It is divided into 6 regions each with a hospital which serves as secondary centres. The Eye unit in each of these centres is headed by a cataract surgeon. These are trained ophthalmic nurses with added qualifications to carry out cataract surgery and other basic eyelid surgeries. The patients recruited for this study for a period of one year were initially diagnosed by the cataract surgeons in the Regional hospitals, and the tertiary hospital. These suspected cases are referred to the Sheikh Zayyed Regional Eye Care Centre, Banjul where the only ophthalmologist works and are further examined. Only those with established clinical findings are included in the study. The Ethical Committee of the hospital approved the study. Those excluded in this study were patients who were previously diagnosed and were already on treatment.

A prepared proforma with patient's demographics such as age, name, sex and address were included. Others were presenting complaints, duration, medical and drug history, and exposure to pets. Patients had both general and ocular examinations. General examinations included inspection of the skin for rashes as seen in HIV/AIDS

patients, oral lesions (aphthous or herpetiform) and erythema nodosum as seen in patients with Behcet's disease. All patients were examined with the slit lamp after a visual acuity had been taken. The lids were examined with particular attention to the periocular skin for rashes, psoriasis, erythema nodosum, keratoderma, blennorrhagia, lupus pernio and vitiligo. The lacrimal glands were examined for any enlargements or tenderness. Other examinations included the conjunctivae and sclera for scleritis, episcleritis, circumcilliary congestion, sarcoid nodules and phlyctenulosis. The corneal endothelia for keratic precipitates and punctate keratis. The anterior chambers were examined for flares and cells while the irides for anterior and posterior synechiae, iris atrophy, heterochromia, bussaca and koeppe nodules, rubeosis and papillary signs and reactions. The lenses were checked for opacities, and pigmentary deposits, while the vitreous body was examined for cells or inflammatory cells. Fundoscopy was done to check for retinal lesions due to toxoplasmosis and toxocara gondii with a 90D lens. Gonioscopy was performed on all the patients to check the anterior chamber angles for synechiae, patency of the angles and presence of cells. Intraocular pressures were taken with the Goldman applanation tonometer. Patients with symptoms were sent for various investigations according to the needs, such as X-rays, blood for retroviral screening, VDRL and ESR.

## RESULTS

A total of 9,513 patients presented in the outpatient clinic of the hospital between January 2010 and December 2010 out of which 63 (0.66%) were diagnosed with uveitis. Thirty-two (50.79%) patients were males, while 31(49.2%) were females. The age range was from 11 to 90 years (Table 1), with a mean age of 36.7 years at presentation.

Table 2 shows that anterior uveitis was the most common cause of uveitis as seen in 40 (63.5%) patients with a high preponderance among patients between the ages of 21-30 years. Nine (14.3%) patients had posterior uveitis and this was closely followed by intermediated uveitis accounting for 8(12.7%) patients. Patients with panuveitis were 6 (9.5%).

The aetiology of most of the cases as illustrated in Figure 1 was unknown accounting for 42.9% of the cases, while HIV related conditions accounted for 12 (19.0%). Toxoplasmosis was diagnosed in 11 (17.5%) patients and trauma in 7 (11.1%) patients.

Figure 2 shows that cataract had the highest number of ocular complications accounting for 24 (38.1%) patients, while 14 (22.2%) patients had glaucoma. Hypotony occurred in 4 (6.3%) patients. Six (9.5%) patients had associated refractive error. Uveitis due to post cataract surgery occurred in 3 (4.8%) patients. Others such as, optic atrophy and heterochromia were seen in 5 (7.9%)

patients. Four (6.3%) patients had hypotony while 19(30.2%) were not found to have any associated ocular complications. Majority of the patients, 46 (73%) were not found to have any systemic diseases. Twelve patients (19%) patients had HIV/AIDS with tuberculosis; while renal disease, urethritis, and arthritis also had 1(1.6%) case each. There were 4(6.3%) patients who presented with other conditions like diarrhoea, urinary tract infection, diabetes and deafness.

Forty-three (68.3%) patients had unilateral uveitis, while 20(31.7%) cases were bilateral. A total of 23 (36.5%) patients lived with pets out of which 17 (27%) lived with cats only, 2 (3.2%) with dogs only and 4(6.4%) with both cats and dogs.

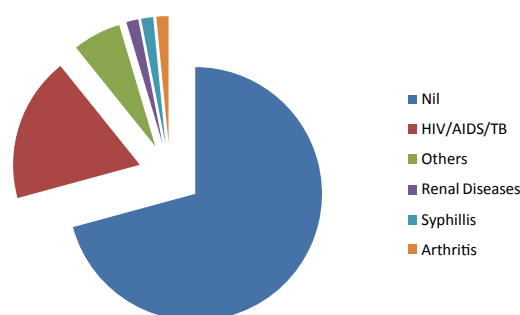
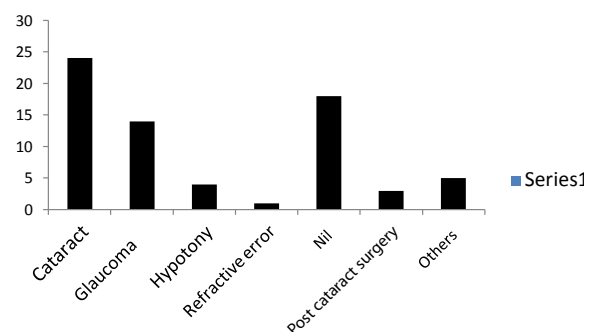
**Table 1:** Age and sex of patients at presentation

| Age (years) | Males (n %) | Females (n %) | Total (n %) |
|-------------|-------------|---------------|-------------|
| 11- 20      | 4 (6.5)     | 3 (4.8)       | 7 (11.1)    |
| 21- 30      | 11(17.5)    | 13(20.6)      | 24(38.1)    |
| 31- 40      | 6 (9.5)     | 5 (7.9)       | 11(17.5)    |
| 41- 50      | 3 (4.8)     | 4 (6.3)       | 7 (11.1)    |
| 51- 60      | 2 (3.8)     | 3 (4.8)       | 5 (7.9)     |
| 61- 70      | 4 (6.3)     | 3 (4.8)       | 7 (11.1)    |
| 71- 80      | 1 (1.6)     | 0 (0)         | 1 (1.6)     |
| 81- 90      | 1 (1.6)     | 0 (00)        | 1 (1.6)     |
| >90         | 0 (0)       | 0 (0)         | 0 (0)       |
|             | 32 (50.8)   | 31 (49.2)     | 63 (100)    |

There were no patients in the 0-10 age group with uveitis

**Table 2:** Types of uveitis in various age groups

| Age (years) | Anterior (n %) | Intermediate (n %) | Posterior (n %) | Pan uveitis (n %) | Total (n %) |
|-------------|----------------|--------------------|-----------------|-------------------|-------------|
| 11 – 20     | 5 (7.9)        | 2 (3.2)            | 6 (9.5)         | 0 (0)             | 13 (20.6)   |
| 21 – 30     | 16 (25.4)      | 3 (4.8)            | 3 (4.8)         | 1 (1.6)           | 23 (36.5)   |
| 31 – 40     | 4 (6.3)        | 1 (1.6)            | 0 (0)           | 1 (1.6)           | 6 (9.5)     |
| 41 – 50     | 5 (7.9)        | 0 (0)              | 0 (0)           | 1 (1.6)           | 6 (9.5)     |
| 51 – 60     | 3 (4.8)        | 0 (0)              | 0 (0)           | 1 (1.6)           | 4 (6.3)     |
| 61 – 70     | 6 (9.5)        | 0 (0)              | 0 (0)           | 1 (1.6)           | 7 (11.1)    |
| 71 – 80     | 0 (0)          | 0 (0)              | 0 (0)           | 1 (1.6)           | 1 (1.6)     |
| 81 - 90     | 1 (1.6)        | 0 (0)              | 0 (0)           | 0 (0)             | 1 (1.6)     |
| Total       | 40 (63.5)      | 8 (12.7)           | 9 (14.3)        | 6 (9.5)           | 63 (100)    |

**Figure 1:** Aetiology of uveitis**Figure 2:** Associated ocular complications

## DISCUSSION

Uveitis is a relatively common ocular condition with epidemiology varying with both age and geographical location; although the disease is regarded as a disease of the adults of working age (20-50 years) an American study found the incidence of uveitis in the elderly to be substantially high<sup>12</sup>. It has been estimated that over 90% of the diagnosis can be made on the basis of medical history and clinical examination alone<sup>13</sup>, this is similar to this study where most of the diagnosis were made on history and clinical examination, and except where indicated, laboratory tests, and radiological investigations were done.

Both males and females were equally affected in this study. This agrees with a study on the pattern of uveitis in a referral centre in Tunisia, having a male to female ratio of 1:1.1<sup>14</sup>. In China and Saudi Arabian hospitals, a similar study showed same ratios<sup>15,16</sup>. But a study done in Switzerland showed a male preponderance<sup>17</sup>. The mean age at presentation was 36.7 similar to other studies<sup>14,16,18</sup>. Forty-three (68.3%) of our patients had the disease in one eye only, while 20 (31.7%) had bilateral involvement. Khairallah *et al*<sup>14</sup> also recorded the disease to be unilateral in 59.7% and bilateral in 40.3%. Other studies by Kinouchi *et al*<sup>19</sup> and Nizamuddin *et al*<sup>20</sup> also had 40% bilateral involvement. This is unlike findings by BenEzra *et al*<sup>21</sup> who had 70.3% in both eyes.

The pattern of uveitis is influenced by a combination of geographical, environmental and genetic factors<sup>22</sup>. A similar study in Sierra Leone<sup>10</sup>, with same geographical location as Gambia showed that toxoplasmosis accounted for 43% of the causes of uveitis, while in the Gambia, it accounted for only 17%. This could be due to the fact that only 23(36.5%) of the patients lived with pets of which 17 (27.0%) lived with cats only, 2 (3.8%) lived with dogs only while 4 (6.3%) lived with both. Another reason for the low record could be due to the fact that there are no facilities to detect serum antibodies in the centre. All the diagnoses were purely on clinical basis. This may explain why majority of the patients, 27 (42.8%) had no known cause, as against studies done in other centres where facilities are available to make laboratory diagnosis had only 14% undetermined uveitis<sup>11</sup> and 27% idiopathic<sup>15</sup>. Other causes were HIV/HAART induced uveitis, 12(19%) and trauma 7(11.1%). No patient was diagnosed with juvenile idiopathic arthritis despite the number of children seen in this study.

There were other ocular complications associated with the uveitis such as cataract. Most uveitis enjoy good vision despite potentially sight-threatening complications including cataract<sup>23</sup>. Cataract is the most common complication affecting up to 40% of uveitic patients<sup>24</sup>. Cataract development results from chronic inflammation and also as a consequence of long term use of corticosteroids<sup>2,24</sup>. The large number of cataract patients, 38.1% could be attributed to the chronicity of the disease and also the long term use of both topical and systemic steroids.

Inflammatory glaucoma also known as uveitic glaucoma is a condition in which ocular inflammation causes persistent or recurrent intraocular pressure

elevation<sup>25</sup>. Glaucoma is one of the many potentially devastating complications of uveitis<sup>26,27</sup>. The pathogenesis of uveitic glaucoma relates to alterations in aqueous production and composition, changes to the anterior chamber angle and the effects of corticosteroid treatment<sup>27</sup>. The overall prevalence of glaucoma in eyes with uveitis varies from 10-20%<sup>25,27</sup>, but is much common in chronic uveitis and can be as high as 46%<sup>27</sup>. We had a prevalence of 22.2% which is consistent with other studies with similar figures of 22.2%<sup>28</sup> and 23%<sup>29</sup>.

Ocular hypotony is defined as intraocular pressure of 5mmHg or less. Hypotony occurs when aqueous humour production does not keep pace with outflow. Conditions such as iridocyclitis, hypoperfusion or tractional ciliary body detachment may cause inadequate aqueous humour production<sup>30</sup>. Low intraocular pressure can adversely affect the eye in many ways including corneal decompensation, accelerated cataract formation, maculopathy and choroidal detachment<sup>30</sup>. Hypotony associated with uveitis has been found to be more common in African-Americans with a prevalence of 8.3%<sup>31</sup>, while we had 6.3%, other studies by Daniel *et al*<sup>32</sup>, had an incidence of 1.83% in patients with non-infectious uveitis.

Uveitis is not always a single disease entity but includes ocular involvement related to various systemic disorders as well as primary ocular conditions. The association of uveitis and systemic disease is well known<sup>33</sup>. Several studies<sup>32,34,35</sup>, have shown that systemic diseases such as tuberculosis, sarcoidosis, juvenile arthritis, HIV/AIDs, multiple sclerosis, optic nerve inflammation, inflammatory bowel disease, isolated thyroid abnormalities and several others are associated with uveitis.

Most types of uveitis tend to become bilateral as it evolves over weeks, and months, even though the initial presentation maybe unilateral<sup>36</sup>. This may explain the large number of patients with bilateral involvement as seen in majority of patients seen with ocular uveitis as initial presentation of syphilis as reported by Tran *et al*<sup>37</sup>. Our findings showed that 68.3% of our patients had unilateral involvement at presentation.

## CONCLUSIONS

Most of the uveitis seen in our study is of unknown cause. Other causes were HIV-related, toxoplasmosis and trauma. Little attention has been given to this condition as evidenced by the paucity of literature from Africa. There is the need to put a lot of emphasis in the diagnosis and treatment of uveitis in the curriculum of the cataract surgeons in the Gambia because a lot of these patients were referred from the secondary centres managed by the cataract surgeons. More facilities should be provided in the centres for diagnosis.

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# Prevalence, risk factors and causes of visual impairment in patients with diabetes at Mbarara Regional Referral Hospital, South Western Uganda; A hospital based study

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## ABSTRACT

**Objective:** To determine the prevalence, causes and risk factors to visual impairment among patients with diabetes at Mbarara Regional Referral Hospital (MRRH) as a baseline pilot for developing diabetic retinopathy treatment services.

**Design:** This was a descriptive cross sectional hospital based study conducted for a period of six months.

**Methods:** In a cross-sectional study done at Mbarara Regional Referral Hospital, 318 patients with diabetes aged 18 years and above were enrolled. Their visual acuity was determined. Those that had visual acuity of below 6/18 underwent a detailed ocular exam including refraction and a dilated funduscopy to determine the cause of visual impairment.

**Results:** The prevalence of visual impairment was 28.6% without correction, and 17% with correction. Cataract was the commonest cause of visual impairment (34.5%) followed by refractive error (20.8%), glaucoma (16.8%) and diabetic retinopathy (12.5%). Age was the only significant risk factor to visual impairment in this population.

**Conclusion:** The proportion of visual impairment was high and cataract was the commonest cause of visual impairment in this population.

## INTRODUCTION

**Study location:** The study was conducted from the diabetic clinic of Mbarara Regional Referral Hospital. MRRH is located in Mbarara Municipality South western Uganda about 300 km from the capital Kampala. It receives patients mainly from south western Uganda, parts of western Tanzania, northern Rwanda, and eastern Democratic Republic of Congo. The diabetes clinic runs once a week under the Internal Medicine department. Routine practise in the clinic is as follows: the patients' registration for consultation starts at 8.00 am with nurses taking vital signs and testing blood sugar level, and consultations start at 9.00 am up to 4.00 pm. Patients come for blood sugar control, drug refills, consultations and also registration of new patients. Diabetes clinic is one of the busiest consultation clinics in the hospital and it attracts approximately 150 to 250 patients per consultation day.

**Study population:** The study population was comprised of all adult patients with diabetes that were 18 years and above, attending the diabetes clinic of MRRH during the specified study period. According to annual clinical records at the clinic, 1700 patients with diabetes were registered in the year 2013; they were mainly spread from areas around Mbarara Town in south western Uganda. MRRH is the regional referral and has a catchment of approximately 10 million people.

**Sample size:** A sample size of 318 patients to give a power of 80% and precision of 95% was used.

**Inclusion criteria:** All adult patients with diabetes (18 years and above) who consented to participate during the scheduled study period.

**Exclusion criteria:**

- All adult diabetic patients with mental disorders
- Restricted patients such as prisoners and refugees
- Patients who were critically ill

## MATERIALS AND METHODS

**Sampling methods:** Systematic random sampling was employed. With a modest estimation of a daily clinic attendance of 150 patients, and projected pretested data collection capacity of 30 patients per clinic day, a sampling interval not exceeding 5 was calculated. Patients register on the clinic day was used as the sampling frame. A raffle with numbers 1-30 would be drawn at the beginning of each clinic session where the principal investigator randomly chose a patient number to start with. He would then instruct the nurse to pick every 5th patient from the starting number and send him/her to the eye examination room where informed consent, questionnaire administration and eye examination were done.

**Data collection:** The principal investigator obtained consent from them to participate, using the language

that the patient was comfortable with. After that, the patient's demographic data was recorded by a research assistant. The assistant also recorded patients' height, weight and blood sugar directly from their diabetic attendance record book. Then the patient underwent ocular examination by the principal investigator. This would include visual acuity, refraction, anterior segment examination, tonometry, pupil dilatation and funduscopy with 90D/78D/indirect ophthalmoscope. Visual acuity was collected using Snellen's E chart at 6 metres and recorded in fraction notation, refraction was initially done using a manual Heine retinoscopy for distance vision and subjective for near vision and recorded in best corrected spherocylindrical notation. However, because of time constraints, this was replaced with pinhole visual acuity testing as a proxy indicator of refractive error. Anterior segment was done using an appasamy model slit lamp and data recorded on corneal opacity, anterior chamber depth, activity, pupil reactions and cataract. Tonometry was then done with Goldman applanation tonometer and recorded as mmHg. Pupil dilatation was done after using cocktail epinephrine and cyclopentolate eye drops for funduscopy using a 90D condensing lens on a slit lamp for detailed posterior segment. Data was collected on cup disc ratio, features of DR (haemorrhages, exudates, new vessels, macular oedema) and any other pathology. For complicated cases, the principal researcher would call a senior ophthalmologist from the department of ophthalmology for a second opinion. Patients who would have already participated in the study would have their files at the diabetes clinic marked to avoid risk of picking on them on the subsequent sessions. In collaboration with the staff at the diabetes clinic, we ensured that any patient who participated in the study, at the end of ocular examination, he/she was facilitated to join his position on consultation list without any unnecessary delays.

*Data management and analysis:* Data was entered into Microsoft Excel, and later exported into STATA 11.0 for analysis. A systematic analytic plan was as follows:

- (i) For the baseline characteristics; univariate analysis using one-way tables of frequencies was used to generate tabulations.
- (ii) To determine prevalence of visual impairment among patients with diabetes at MRRH, univariate analysis using one-way tables of frequencies was used to generate tabulations.
- (iii) To determine the cause of visual impairment among patients with diabetes at MRRH, univariate analysis using one-way tables of frequencies was used to generate tabulations.

*Quality assurance:* A questionnaire was pretested several times on participants who were not included in the data collected. We worked hand in hand with a senior ophthalmologist from the department of ophthalmology to validate our diagnoses. Questionnaires were administered uniformly to avoid bias of over reporting. Data was double checked before entry by the principal investigator. Patients who had already participated in the study, their files at the diabetic clinic were marked to avoid risk of picking on the same participant in the subsequent sessions. Questionnaires were verified by the principal investigator after field work.

*Ethical consideration:* Approvals were sought from the Departments of Ophthalmology and Internal Medicine, Faculty Research and Ethics Committee and Institutional Ethical Review Committee of Mbarara University of Science and Technology (IRB NO:14/11-13). Informed consent was obtained from the participants as per the Ethical Committee guidelines.

*Limitations:* The following were the limitations of our study;

- (i) Our study lacked fundus camera among the equipment to document abnormal funduscopy findings which would have made making diagnosis more interactive if shared by other specialists.
- (ii) Majority of eye diseases we encountered was cataract. In patients who had dense cataract, it was not possible to examine their fundi hence possibility of missing out posterior segment eye conditions such as diabetic retinopathy.
- (iii) The study was unable to do visual fields to confirm glaucoma; diagnosis was mainly based on optic disc cupping and IOP measurements.

Despite these limitations, we believe that the sample size of our study and the degree of confidence around our findings rendered them useful.

## RESULTS

A total of 318 study participants were enrolled for this study between September 2013 and March 2014 from MRRH.

*Demographic characteristics of the study population:* Demographic characteristics of the diabetic patients identified are shown in Table 1. A total of 318 patients were identified in this study. The mean age of study participants was 56 years (95% CI 42-70); the male to female ratio was 1:2; 229 (72%) patients came from the rural parts of Mbarara; 214 (67.3%) of the patients were married; only 30 (9.4%) of the patients had attained tertiary education; and 172 (54.1%) of the patients were casual labourers.

**Table 1:** Demographic characteristics of study participants (n=318)

| Characteristics | Frequency<br>n (%) |
|-----------------|--------------------|
| Sex             |                    |
| Male            | 107 (33.7)         |
| Female          | 211 (66.4)         |
| Residence       |                    |
| Town (5km)      | 89 (28)            |
| Rural (>5km)    | 229 (72)           |
| Age (years)     |                    |
| <35             | 25 (7.9)           |
| 35-49           | 83 (26.1)          |
| 50-59           | 74 (23.3)          |
| >60             | 136 (42.8)         |
| Marital status  |                    |
| Married         | 214 (67.3)         |
| Widowed         | 71 (22.3)          |
| Divorced        | 21 (6.6)           |
| Single          | 12 (3.8)           |
| Education level |                    |
| Primary         | 162 (50.9)         |
| Secondary       | 35 (11.0)          |
| Tertiary        | 30 (9.4)           |
| No education    | 91 (28.6)          |
| Occupation      |                    |
| Casual laborers | 172 (54.1)         |
| Business        | 56 (17.6)          |
| Professional    | 25 (7.9)           |
| House wife      | 32 (7.2)           |
| Retired         | 30 (9.4)           |
| Unemployed      | 12 (3.7)           |

*Proportion of visual impairment among patients with diabetes:* The proportion of visual impairment (VA worse than 6/18) was found to be 28.6 % without correction and 17% with correction (Table 2).

**Table 2:** Proportion of visual impairment without correction and with correction (n=318)

|                      | Without correction<br>n (%) | With correction<br>n (%) |
|----------------------|-----------------------------|--------------------------|
| Visual impairment    | 91 (28.6)                   | 54 (17)                  |
| No visual impairment | 227 (71.4)                  | 264 (83)                 |
| Total                | 318 (100)                   | 318 (100)                |

*Pattern of eye diseases among patients with diabetes at MRRH diabetes clinic:* The most common eye disease amongst study participants was found to be cataract as shown in Table 3.

**Table 3:** The pattern of eye diseases among patients with diabetes at MRRH diabetes clinic (n = 168)

| Eye disease          | n (%)     |
|----------------------|-----------|
| Cataract             | 58 (34.5) |
| Refractive error     | 35 (20.8) |
| Diabetic retinopathy | 28 (16.8) |
| Glaucoma             | 21 (12.5) |
| Others               | 26 (15.5) |
| Total                | 168 (100) |

**Table 4:** Shows risk factors for visual impairment among patients with diabetes at MRRH diabetes clinic (bivariate analysis n=318)

| Variable           | Variable category | OR (95%CI)       | p    |
|--------------------|-------------------|------------------|------|
| Gender             | Male              | 1                |      |
|                    | Female            | 0.9 (0.5-1.5)    | 0.72 |
| Age (years)        | <35               | 1                |      |
|                    | 35-49             | 5.7 (0.7-45.5)   | 0.09 |
|                    | 50-59             | 7.7 (0.9-61.1)   | 0.05 |
|                    | >59               | 16.8 (2.2-127.8) | 0.01 |
| Place of residence | Urban             | 1                |      |
|                    | Rural             | 1.1 (0.6-1.9)    | 0.68 |
| Marital status     | Married           | 1                |      |
|                    | Widowed           | 1.2 (0.7-2.2)    | 0.48 |
|                    | Divorced          | 1.3 (0.5-3.3)    | 0.61 |
|                    | Single            | 0.2 (0.1-1.9)    | 0.12 |
| Religion           | Protestant        | 1                |      |
|                    | Catholic          | 1.8 (0.9-3.5)    | 0.07 |
|                    | Muslim            | 0.9 (0.3-2.7)    | 0.87 |
|                    | Others            | 0.7 (0.4-1.4)    | 0.44 |
| Education          | No education      | 1                |      |
|                    | Primary           | 0.6 (0.2-1.5)    | 0.28 |
|                    | Secondary         | 1.2 (0.5-2.9)    | 0.64 |
|                    | Tertiary          | 1.7 (1.0- 3.0)   | 0.06 |
| Occupation         | Laborer           | 1                |      |
|                    | Business          | 0.7 (0.4-1.6)    | 1.57 |
|                    | Professional      | 0.2 (0.1-2.4)    | 2.43 |
|                    | House wife        | 1.0 (0.4-2.7)    | 2.67 |
|                    | Unemployed        | 1.8 (0.8-4.0)    | 4.00 |
|                    | Retired           | 1.6 (0.2-1.7)    | 1.67 |

**Table 4:** Continued

| History of hypertension | No hypertension |               |      |
|-------------------------|-----------------|---------------|------|
|                         | Hypertension    | 1.7(1.1-2.8)  | 0.04 |
| HIV status              | Negative        | 1             |      |
|                         | Positive        | 2.5 (0.8-7.8) | 1.61 |
|                         | Unknown         | 1.9 (1.1-3.5) | 0.03 |
| BMI                     | Underweight     | 1             |      |
|                         | Normal          | 0.9 (0.2-4.0) | 0.95 |
|                         | Overweight      | 1.0 (0.2-4.2) | 1    |
|                         | Obese           | 0.3 (0.8-1.8) | 0.23 |
| Blood sugar (n=317)     | Normal          | 1             |      |
|                         | Hyperglycemia   | 1.0 (0.6-1.8) | 0.7  |
|                         | Asymptomatic    | 1             |      |
| Visual symptoms         | Symptomatic     | 4.2(2.1-10.7) | 0.01 |
|                         | Screened        | 1             |      |
| Screening behaviour     | Never screened  | 1.8 (1.1-3.0) | 0.02 |
| History of alcohol      | No alcohol      | 1             |      |
|                         | Drinks alcohol  | 1.1 (0.5-2.6) | 0.8  |
| History of smoking      | None smoker     | 1             |      |
|                         | Smoker          | 1.5 (0.9-2.5) | 0.13 |
| Type of treatment       | Insulin         | 1             |      |
|                         | Tablets         | 0.8 (0.1-8.6) | 0.91 |
|                         | Diet            | 1.4 (0.7-3.0) | 0.35 |

From bivariate analysis, factors which showed significant association with a visual impairment were: age, history of visual complaint on presentation, history of hypertension, HIV status, and screening behaviour.

**Table 5:** Shows risk factors for visual impairment among patients with diabetes at MRRH diabetes clinic on multivariate analysis (n=318)

| Variable                         | Variable category | OR (95%CI)     | P    |
|----------------------------------|-------------------|----------------|------|
| Visual complaint on presentation | Asymptomatic      | 1              |      |
|                                  | Symptomatic       | 4.4(1.9-10.5)  | 0.01 |
| Age category                     | <35               | 1              |      |
|                                  | 35-49             | 4.3(0.5-36.1)  | 0.17 |
|                                  | 50-59             | 5.3(0.6-44.2)  | 0.12 |
|                                  | >60               | 10.4(1.3-85.4) | 0.03 |
| HIV status                       | Negative          | 1              |      |
|                                  | Positive          | 2.8 (0.7-7.3)  | 0.60 |
|                                  | Unknown           | 1.5 (0.8-3.1)  | 0.09 |
| History of Hypertension          | No hypertension   | 1              |      |
|                                  | Hypertension      | 1.2 (0.6-2.1)  | 0.61 |
| Screening behaviour              | Screening         | 1              |      |
|                                  | No screening      | 1.2 (0.7-2.1)  | 0.49 |

P<0.05 was considered statistically significant

From multivariate analysis, the only risk factors which showed strong association with visual impairment were age and presence of visual complaint at time of presentation. The odds of visual impairment for an older patient (>60 years) with diabetes were almost 10 times more than younger patients (<35 years) (p=0.04). The odds of visual impairment for patients who had visual complaints at the time of enrolment (presentation) were almost five times more than for the patients without visual symptoms on presentation (p<0.01). Screening behaviour, HIV status and history of hypertension were not significant risk factors after multivariate analysis.

## DISCUSSION

Worldwide, there are estimated 366 million people living with diabetes. By 2030 this number will have risen to 552 million. That is an increase of 54%<sup>1</sup>. It is expected that during the same period, visual impairment among patients with diabetes will also increase if necessary measures are not taken to prevent diabetes-related visual impairment<sup>2</sup>. Prevalence of diabetes type 2 in Uganda is 8.1%<sup>3</sup>, however prevalence for type 1 diabetes is not known. Before this study, the proportion of visual impairment among patients with diabetes in Uganda was not known. There are visual impairing eye diseases commonly associated with diabetes. The commonest ones are diabetic retinopathy, cataract, glaucoma, and others<sup>4-8</sup>. Their distribution patterns tend to vary from one place to another. To our knowledge, this was one of the first hospital-based studies to establish patterns of visual impairment among patients with diabetes in south western Uganda.

*Proportion of visual impairment among patients with diabetes at MRRH diabetes clinic:* The proportion of visual impairment among patients with diabetes in this population was high (29%) compared to that in Northern Africa of 22%<sup>9</sup>. However, it was almost three times more than what was found in a hospital based survey among diabetes patients at diabetes outpatient clinic at QECH, Blantyre of about 12%<sup>10</sup>. However it was almost three times less than what was reported in South Africa (64%)<sup>11</sup>. The difference in prevalence between our population and that of Malawi and that of South Africa could be in the different socio economic lifestyles. It was not possible to compare with other parts of East Africa because of paucity of information. The true significance of the proportion of the visual impairment in our population could not be properly interpreted because we did not have baseline reference for Uganda or any other close country in the region. In time when another study is done, we shall be able to comment whether the proportion of visual impairment is rising or reducing in our population. From our data, we saw that 40% of the patients showed

improvement of vision on refraction, however, it was not possible to comment on whether this was associated with control of blood sugar or an underlying refractive error.

*Distribution pattern of eye diseases among patients with diabetes at MRRH diabetes clinic:* The distribution pattern of eye diseases among patients with diabetes at MRRH diabetes clinic, agreed with other studies done elsewhere. In a study at Mulago Hospital Eye Department, Uganda, cataract was the most prevalent eye condition among patients with diabetes (37.7%), diabetic retinopathy followed with (35.2%)<sup>12</sup>. A similar study in two West African countries of Ghana and Nigeria was done and cataract was still commonest (44.9%), diabetic retinopathy (17.9%)<sup>13</sup>.

*Risk factors for visual impairment among patients with diabetes at MRRH diabetes clinic:* This study showed that visual impairment was significantly associated with older age, and having visual symptoms at time of presentation ( $p < 0.05$ ). These findings were consistent with other studies<sup>14,15</sup>. However, we did not find association of factors like duration of diabetes, type of diabetes treatment, body mass index, female gender, with visual impairment that was earlier reported in studies quoted above. We recognized the limitations of our study. It is possible that our study could have underestimated true association of other factors.

## CONCLUSIONS AND RECOMMENDATIONS

Our results could not be generalizable to Uganda since this was a study mainly in rural south western Uganda and most patients came from within this catchment area. Therefore, the true prevalence for Uganda could be different. However, based on the findings of the study, the following conclusions were drawn:

- (i) The proportion of visual impairment among patients with diabetes was high. There is urgent need to look at this as a public health concern in Mbarara area and interventions put in place.
- (ii) Cataract, refractive errors, and diabetic retinopathy were the most common eye conditions among patients with diabetes, affordable cataract services should be provided to this population. However, diabetic retinopathy causes irreversible visual loss, there is need for more efforts to sensitise improve diabetic retinopathy screening and treatment in MRRH. Older age and having visual complaints at the time of presentation were the only significant factors associated with visual impairment; however, this was not conclusive. There is need for more studies in risk factors of visual impairment in diabetic patients at MRRH.

## ACKNOWLEDGEMENTS

To all the staff of MUST Department of Ophthalmology and to all staff and attending patients of Mbarara Regional Referral Hospital diabetic clinic. The study was supported by MUST Department of Ophthalmology. Part of this work was presented at the 2nd annual COECSA scientific congress in Livingstone, Zambia November 2014.

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# Status of sub-specialization among practising ophthalmologists in Eastern Africa

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## ABSTRACT

**Objective:** To establish the status of sub-specialization among practicing ophthalmologists in the Eastern Africa region.

**Design:** This was a cross-sectional study.

**Method:** An analysis of data obtained from 65 practising ophthalmologists from six universities/teaching hospitals in three countries within Eastern Africa.

**Results:** About a third (32%) of the practising ophthalmologists had sub-specialized while the rest (68%) had not sub-specialized. Glaucoma had the highest number of sub-specialists while neuro-ophthalmology, uveitis and ophthalmic pathology/tumour had none. About two-thirds (65.9%) of ophthalmologists who had not sub-specialized indicated willingness to specialize subject to availability of opportunity and funding. Vitro-retinal surgery and anterior segment being the most preferred sub-specialties. India was cited as the main sub-specialization destination due to availability of sufficient hands-on training opportunities. The main barriers to sub-specialization cited were lack of sufficient funding and inadequate opportunities for sub-specialization. Lack of support in terms of equipment was seen as a major post-training challenge.

**Conclusion:** Majority of practising ophthalmologists had not sub-specialized mainly due to lack of sufficient opportunities and funding. Although glaucoma is the area with many sub-specialists, vitreoretinal surgery and anterior segment are emerging as the main preferred specialty area among ophthalmologists who had not sub-specialized. Consequently, sustainable and demand driven funding and training opportunities for sub-specialization needs to be provided as a mechanism of raising sub-specialization profiles within the regions.

## INTRODUCTION

The incidence of eye related diseases and complications requiring sub-specialist to handle has increased dramatically in sub-Saharan African countries and so have their serious complications<sup>1-5</sup>. Evidence indicates that most of these diseases could be managed and complications be avoided by providing better and early specialized care at the service delivery point<sup>6-8</sup>. Despite this alarming trend, eye care problems have continued to receive little attention especially in sub-Saharan Africa. Further, sub-Saharan African countries continue to experience high shortages of eye care sub-specialists as well as general eye care staff<sup>9,10</sup>.

In relation to sub-specialization, literature reviews have indicated that the status of sub-specialization remains undocumented especially within the region. Further, a study by Gilbert<sup>4</sup> and Haroon<sup>9</sup> indicated that the region continues to suffer from shortage of qualified mid level cadres for eye care. For instance, all the regional countries have less than 300 general ophthalmologists per 10,000 populations which make it difficult to adequately meet eye care services needs and demands of the population. According to previous studies and documentations, many of the eye health cases emerging now are those that increasingly require sub-specialised skills to address such as eye care cases related to diabetes, cancer and other non-communicable diseases<sup>8,12</sup>. This underpins the need to increase the profile of sub-specializations available to

handle the increasing burden of eye diseases and problem at both the national and regional level.

Currently, evidence on the status of sub-specialization, sub-specialization preferences and barriers to sub-specialization in ophthalmology is lacking at the regional level. As a result, this study aimed at obtaining reliable information on the status of sub-specialization among practising ophthalmologists in Eastern African region and understand barriers to sub-specialization in ophthalmology so as to form a base for effective and efficient program intervention and policy approach for raising the profile of sub-specialization in the region.

## MATERIALS AND METHODS

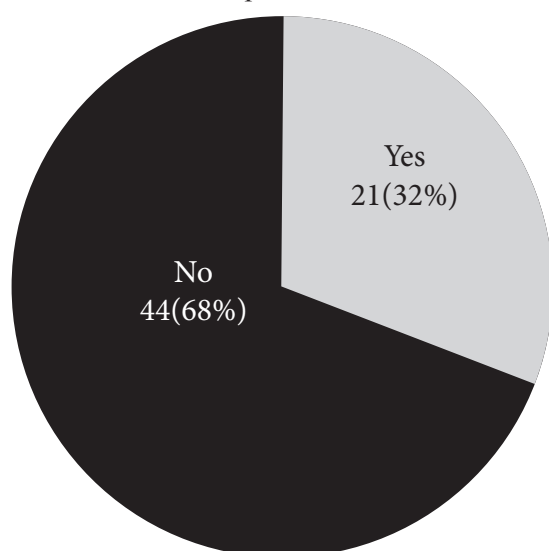
This study used a cross-sectional study design. Data was collected using a pre-tested online questionnaire to ensure that all the practising ophthalmologists across the region were capable of participating in the study so as to provide their insights, views and opinions on the preferences and barriers to sub-specialization. The main focus of the study was in three countries; Kenya, Uganda and Tanzania. Census approach was used to select study respondents using a sampling frame of all practicing ophthalmologists in the register of EACO as at the time of the study. Faculty members selected from universities and hospitals teaching ophthalmology participated in the study namely; MUST, Makerere, CCBRT, KCMC, Muhimbili and UON. A total of 65 practising respondents

participated in the study. Data from the online survey was coded, entered in a data screen, cleaned and analysed using SPSS version 20. Descriptive statistics were used to analyse the data with a special focus on the objectives of the study.

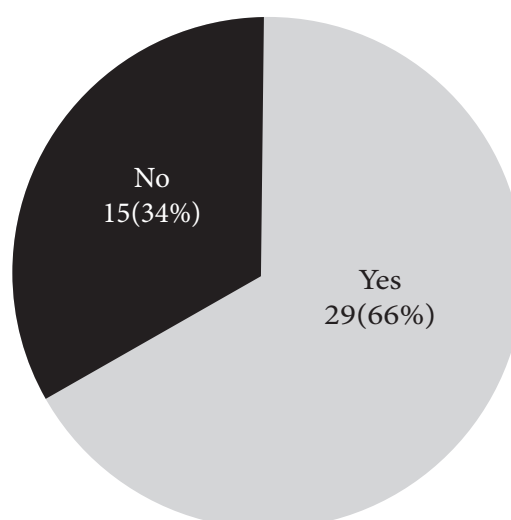
## RESULTS

A total of 65 practising ophthalmologists participated in the study. Out of the 65 practising ophthalmologists, only 21(32%) had sub-specialized while 44 (68%) had not yet sub-specialized (Figure 1). However, of the 44 who had not sub-specialized, most of them 29 (65.9%) were willing to sub-specialize (Figure 2).

**Figure 1:** Status of sub-specialization



**Figure 2:** Willingness of non sub-specialized ophthalmologists to sub-specialize



In relation to sub-specialty areas and preferences for sub-specialization, of the 21 who had sub-specialized; majority of them had sub-specialized in glaucoma (30%), followed by paediatric ophthalmology, community eye health and vitreo-retina. However, none of them had sub-specialized in neuro-ophthalmology, uveitis and ophthalmic pathology. On the other hand, of the 29 practising ophthalmologists who were willing to sub-specialize in future; majority of them preferred sub-specializing in vitreo-retina surgery (43.3%) followed by anterior segment, paediatric ophthalmology and cornea respectively (Table 1).

In terms of reasons for sub-specialization, the main reason for choice of sub-specialty among those who had sub-specialized and those who had not sub-specialized but were willing to sub-specialize was existence of need/demand for the sub-specialty services followed by personal interest in the sub-specialty (Table 2).

**Table 1:** Status of sub-specialization and sub-specialization preferences

| Sub-specialties                | Sub-specialty areas among sub-specialized ophthalmologists |     | Sub-specialization preferences among non sub-specialized ophthalmologists |      |
|--------------------------------|------------------------------------------------------------|-----|---------------------------------------------------------------------------|------|
|                                | No. of responses                                           | (%) | No. of responses                                                          | (%)  |
| Glaucoma                       | 8                                                          | 30  | 0                                                                         | 0.0  |
| Paediatric ophthalmology       | 4                                                          | 15  | 0                                                                         | 0.0  |
| Community eye health           | 4                                                          | 15  | 0                                                                         | 0.0  |
| Vitreo-retina surgery          | 4                                                          | 15  | 13                                                                        | 43.3 |
| Cornea                         | 2                                                          | 7   | 3                                                                         | 10.0 |
| Anterior segment               | 2                                                          | 7   | 9                                                                         | 30.0 |
| Epidemiology and biostatistics | 2                                                          | 7   | 0                                                                         | 0.0  |
| Oculoplastics                  | 1                                                          | 4   | 0                                                                         | 0.0  |
| Neuro-ophthalmology            | 0                                                          | 0   | 0                                                                         | 0.0  |
| Uveitis                        | 0                                                          | 0   | 0                                                                         | 0.0  |
| Ophthalmic pathology           | 0                                                          | 0   | 5                                                                         | 16.7 |
| Total                          | 27                                                         | 100 | 30                                                                        | 100  |

**Table 2:** Reasons for sub-specialization

| Reasons                                            | Sub-specialized ophthalmologists |     | Non sub-specialized ophthalmologists |     |
|----------------------------------------------------|----------------------------------|-----|--------------------------------------|-----|
|                                                    | No. of responses                 | (%) | No. of responses                     | (%) |
| Specialty within area of interest                  | 9                                | 43  | 10                                   | 29  |
| High need/demand for sub-specialty                 | 10                               | 48  | 14                                   | 41  |
| Very few specialist in this area and in the region | 0                                | 0   | 9                                    | 26  |
| We have equipment                                  | 0                                | 0   | 1                                    | 3   |
| Availability of opportunity/chance                 | 2                                | 10  |                                      |     |
| Total                                              | 21                               | 100 | 34                                   | 100 |

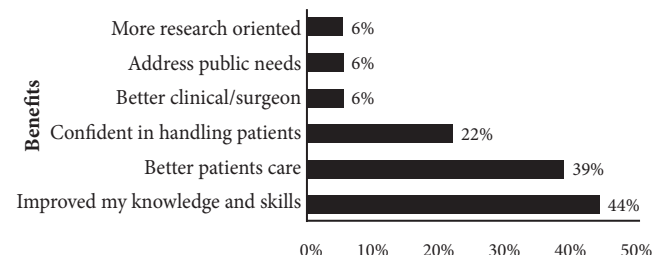
In relation to training institutions, Indian training institutions have produced most of the sub-specialists compared to institutions within the region and other overseas training institutions. Additionally, overseas

institutions are the most preferred training institutions among those who had not sub-specialized. The main reason for choice of training institution was availability of opportunities for adequate hands on training (Table 3).

**Table 3:** Reasons for choice/preference for sub-specialties

| Sub-specialized ophthalmologists           |                  |     | Non sub-specialized ophthalmologists       |                  |      |
|--------------------------------------------|------------------|-----|--------------------------------------------|------------------|------|
| Reasons for choice of training institution | No. of responses | (%) | Reasons for choice of training institution | No. of responses | (%)  |
| I got hands-on experience                  | 5                | 33  | To get hands on training                   | 14               | 58.3 |
| Had best training and experienced faculty  | 3                | 20  | Good for experience                        | 5                | 16.7 |
| Had what I wanted                          | 3                | 20  | Internationally recognized                 | 2                | 8.3  |
| Convenience                                | 2                | 13  | Low cost of living/Cheap                   | 3                | 12.5 |
| Opportunity/ chance                        | 1                | 7   | -                                          | -                | -    |
| Research oriented                          | 1                | 7   | -                                          | -                | -    |
| Total                                      | 15               | 100 | Total                                      | 24               | 100  |

The main benefit for sub-specialization was identified as acquisition of knowledge and skills (44.4%) and provision of better services to patients (38.9%) (Figure 3). In relation to sub-specialization challenges, lack of sponsorship (42.9%) was the main pre-training challenge cited followed by lack of clear training structures (28.6%). The duration of training was a major concern for those with families as one had to be away (63.6%). Lack of infrastructure and equipment (75%) for practice was most cited post-training challenge (Table 4).

**Figure 3:** Benefits of sub-specialization

**Table 4:** Challenges to sub-specialization

| Nature of challenge      | Challenge                            | No. of responses | (%)  |
|--------------------------|--------------------------------------|------------------|------|
| Pre training challenges  | Lack of facilities regionally        | 1                | 7.1  |
|                          | Lack of sponsorships                 | 6                | 42.9 |
|                          | No clear training structures         | 4                | 28.6 |
|                          | Difficult of choice of subspecialty  | 3                | 21.4 |
| In training challenges   | Away from home for a long time       | 7                | 63.6 |
|                          | Problems with subsistence            | 1                | 9.1  |
|                          | Lack of Aid                          | 1                | 9.1  |
|                          | Difficult in adjusting               | 1                | 9.1  |
|                          | Language barriers                    | 1                | 9.1  |
| Post training challenges | Lack of infrastructure and equipment | 2                | 75   |
|                          | Lack of refresher program            | 2                | 25   |

## DISCUSSION

Despite the escalating incidence and complications of eye health conditions requiring ophthalmology sub-specialists in the region<sup>3,4,13,14</sup>, this region continues to suffer serious setbacks in terms of available eye care human resources capable of appropriately responding to these needs. Although past studies have shown that many of the eye care diseases could be managed and complications be avoided by better and early clinical care at specialized level<sup>6,8,15</sup> the low rate of sub-specialization among practising ophthalmologists continues to poses a major challenge in the achievement of the Vision 2020. This is supported further by the finding that majority of the ophthalmologists have not yet sub-specialized. Additionally, majority of the practising ophthalmologists have sub-specialized in areas with high demand for sub-specialized care. The preferences for those who have not sub-specialized are also driven by demand<sup>16</sup> of the services sought. This situation has left a number of the sub-specialties such as neuro-ophthalmology, uveitis and ophthalmic pathology with few or no sub-specialists. This sub-specialization trend does not augur well for eye care conditions requiring such sub-specialists. The poor and vulnerable populations are most affected by this situation due to health access barriers and inequalities in accessig sub-specialized eye care<sup>13</sup>. This calls for concerted efforts aimed at improving quality and access to sub-specialized care. This requires increased advocacy and resource mobilization for supporting training of more sub-specialists in sub-specialties with increasing demands and as well as provision of incentives for sub-specialization in sub-specialties with low sub-specialization profiles such as providing them with basic infrastructure and equipment for practice.

Sub-specialization has been linked to acquisition of better skills and knowledge for improved patient care and improved patients outcomes<sup>17,18</sup>. However, most of the training institutions in the region cite lack of technical capacity to offer sub-specialized training. Hands-on

training and learning experiences constitutes the single most incentive for choice of a training institution. As a result, majority of sub-specialists have trained or preferred future training in institutions in India due to better opportunities for hand-on training and learning experiences.

The desire to sub-specialize has been greatly limited by lack of sufficient funding, sub-specialization opportunities and lengthy training period away from home. Additionally, the regional institutions and service delivery facilities lack adequate infrastructural capacity to support sub-specialized service delivery after training. This has created disincentive for sub-specialization among the practicing ophthalmologists. A more in-depth appraisal of regional training institutions indicated that the regional institutions lack appropriate infrastructure/facilities for offering most of the sub-specialties<sup>10,19,20</sup>. Further, the region doesn't have an effective and efficient coordinated strategy for supporting the sub-specialist after training. This has contributed greatly to low production of sub-specialists regionally. Therefore, improving the technical and infrastructural capacity of regional training institutions and service delivery facilities can play a key role in raising the profiles of ophthalmologists in the region<sup>5,10,19,20</sup>.

## CONCLUSIONS

There are very few ophthalmology sub-specialists to meet the increasing demand for sub-specialized eye care services, as most of the practising ophthalmologists have not sub-specialized. Although glaucoma is the area with most sub-specialists, vitreoretinal surgery and anterior segment are emerging as the main preferred specialization areas among practising ophthalmologists who have not specialized, due to increased demand for such sub-specialized services. Therefore, mechanisms to increase funding opportunities and support trainees to acquire equipment after training are recommended as incentives for increasing sub-specialization in the

Eastern Africa region. Further, the region should establish regional training centres of excellence with adequate infrastructural and instructional support to deliver hands-on training.

### LIMITATIONS OF THE STUDY

There was limited publication on sub-specialization and their preferences to provide a strong background of the study and base the discussions of the findings. Although this review found some articles about eye health in Africa, they were not focused on sub-specialization in ophthalmology but rather general eye health situation. However, the information provided important inputs and insight in the study.

### ACKNOWLEDGMENTS

The authors would like to thank the following for their enormous contributions towards the success of this study: President and EACO secretariat, Heads of Ophthalmology Departments, Faculty members (Mbarara, Makerere, UON, KCMC and Muhimbili), representatives of key eye health stakeholders and all practicing ophthalmologists who took part directly or indirectly in this study.

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# Radio as an effective tool for community mobilisation for eye health programs, a case study of the Mbarara University of Science and Technology, Department of Ophthalmology outreach program to Ntungamo district, rural south-western Uganda

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## ABSTRACT

**Objective:** To determine the most effective method of mobilizing the rural community to uptake cataract outreach services in Ntungamo district, south western Uganda.

**Methods:** This was a community based prospective survey conducted in Ntungamo district, rural south western Uganda. Different methods were used to inform the local communities in the six sub regions in Ntungamo district about an ongoing University outreach program. These included; local radio announcements, announcements at places of worship, posters, word of mouth and referral from a previous outreach. One hundred and twenty five respondents were randomly selected from a total of 600 people who turned up for the service and enrolled into the study. Interviewer administered questionnaires were administered. The main interview question was how respondents had received information about a cataract outreach service coming to their area. Results were compiled and frequency tabulations were drawn.

**Results:** The respondents reported that they received the information through radio announcements (85.6%), by word of mouth (10%), by posters (2%) and by referral from previous outreach (1%). The results were consistent across all the six sub regions in Ntungamo district.

**Conclusion:** Radio announcements were the most effective method for mobilizing the community for uptake of cataract outreach services.

**Recommendation:** Radio should be encouraged as a key tool for mobilizing communities to uptake health promotion services.

## INTRODUCTION

Mbarara University of Science (MUST) and Technology, Department of Ophthalmology has been in existence for the last 13 years. It is part of MUST and is located in south-western Uganda, about 4 hours' drive from the capital Kampala. It offers undergraduate and residency training. The department has been conducting outreach programs to Ntungamo district in south western Uganda for the last five years. Ntungamo district is largely a rural community of about 500, 000 people<sup>1</sup>. These programs were mainly for free screening and treatment of eye diseases, health promotion sensitisation and cataract surgery hands on experience for the residents away from the main hospital (Figure 1).

**Figure 1:** Outreach cataract surgery in Ntungamo district



This program was funded by COECSA under a 5 year EU grant. Outreaches were conducted every quarter to various counties within the district. Before each outreach, different methods would be used to mobilise the community to come for free screening, treatment and surgery. These included; radio announcements, posters, word of mouth, referral from a previous outreach and announcements at places of worship. In most of these outreaches, the response was good with an average number of 1000 people treated and about 50 operated. The outreach team would consist of an ophthalmologist (team leader), resident, ophthalmic clinical officer, ophthalmic nurse, a theatre nurse and other support staff. At the end of the project in 2013, we conducted a feedback survey among these communities which had been benefitting from the outreach service to try and find out if the program had been beneficial, how they had benefitted, areas of improvement and need for continuity. One of the questions as part of the bigger survey that we were interested in was of the different mobilisation methods we had used, which had been the most effective? We share this component of the survey in this report.

## MATERIALS AND METHODS

This study was to determine the most effective method for mobilizing communities for uptake of cataract outreach services in Ntungamo district, rural south western Uganda.

In a prospective survey design, respondents who had benefited from the outreach program were by systematic random sampling selected from the six sub regions across Ntungamo district. Ntungamo district has a total population of 489,320 people; however, particularly for this survey, 600 people turned up for the eye outreach services; and, 125 were randomly selected as respondents<sup>1</sup>. The tools used were pre tested program evaluation templates availed by COECSA and translated into the local language. These tools were used across all the implementing sites across the ECSA region. By interview guided questionnaires, respondents were asked about different aspects of their experiences before, during and after the outreach service. The key interview question pertaining this component of mobilisation was *“how did you get to know about this outreach?”* Respondents were also asked about the clarity of the information received in terms of venue and date of the outreach service on a scale of very happy, happy, unhappy or very unhappy.

This was part of the general end of program evaluation, all respondents had translated informed consent, and their names were not captured on the data collection tool. For minors, their parents or legal guardians consented on their behalf.

## RESULTS

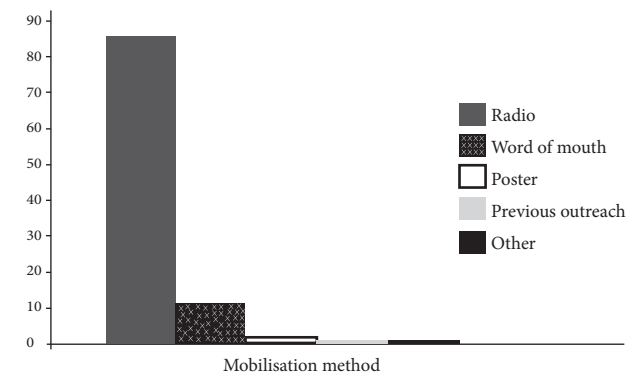
One hundred and twenty five respondents were enrolled into the survey, mean age was 51 years, range=16-100 years. They were well distributed across all the regions in the district (Table 1).

**Table 1:** Distribution of respondents per county across Ntungamo district

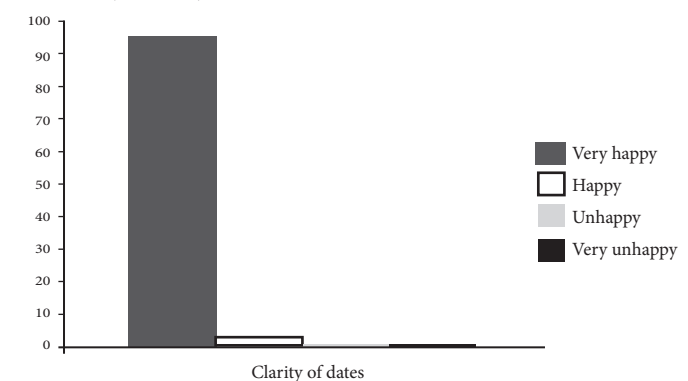
| Outreach location | No. of respondents | (%) |
|-------------------|--------------------|-----|
| Itojo             | 24                 | 19  |
| Kitwe             | 40                 | 32  |
| Ntungamo          | 18                 | 14  |
| Rubare            | 12                 | 9   |
| Ruhama            | 14                 | 12  |
| Rwashamire        | 17                 | 14  |
| Total             | 125                | 100 |

In terms of how they had known about the outreach coming to their area, 85.6% of the respondents said it was by radio announcement (Table 2 and Figure 2). In terms of the clarity of the information about venue and date the outreach service, majority of the respondents were very happy with the clarity of the information received (Tables 3 and 4, Figures 3 and 4).

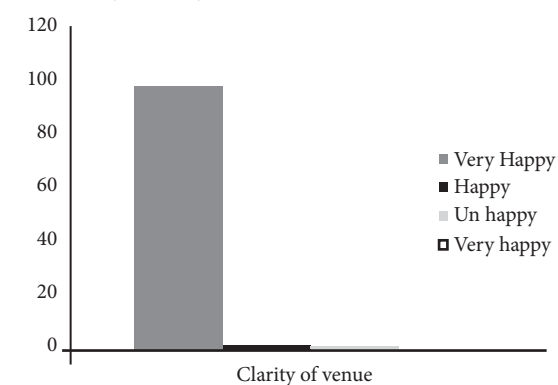
**Figure 2:** Percentage respondent responses on how they had known about the outreach service (N=125)



**Figure 3:** Percentage respondent responses on their satisfaction of communication of the dates of outreach service (N=125)



**Figure 4:** Percentage respondent responses on their satisfaction of communication of the venue of outreach service (N=125)



**Table 2:** Respondent responses on how they had known about the outreach service (N=125)

| Mobilisation method | No. | (%)  |
|---------------------|-----|------|
| Radio               | 107 | 85.6 |
| Word of mouth       | 14  | 11.2 |
| Poster              | 2   | 1.6  |
| Previous outreach   | 1   | 0.8  |
| Other               | 1   | 0.8  |
| Total               | 125 | 100  |

**Table 3:** Respondent responses on clarity of date of the outreach service (N=125)

| Clarity of date of outreach | No. | (%)  |
|-----------------------------|-----|------|
| Very happy                  | 119 | 95.2 |
| Happy                       | 4   | 3.2  |
| Unhappy                     | 1   | 0.8  |
| Very unhappy                | 1   | 0.8  |
| Total                       | 125 | 100  |

**Table 4:** Respondent responses on clarity of venue of the outreach service (N=125)

| Clarity of venue of outreach | No. | (%)  |
|------------------------------|-----|------|
| Very happy                   | 122 | 97.6 |
| Happy                        | 2   | 1.6  |
| Unhappy                      | 1   | 0.8  |
| Very unhappy                 | 0   | 0    |
| Total                        | 125 | 100  |

## DISCUSSION

For our experience in this survey, it was clear that radio was a very effective tool for mobilising the community as majority of the respondents had got to know about the outreach service by way of radio announcements. Also, the next group of respondents (11%) got to know about the service by word of mouth. From further discussions with these people, we noted that most of them heard it from people who had heard the radio announcements in the first place. Therefore, by extension, our impression is that radio could have been the primary source of information in about 97% of the respondents. In terms of clarity of information, majority of respondents were able to know with certainty the dates and venue of the outreach service. Although for this question the method of the primary source of information was not analysed, we can safely assume most had got the source from radio as indicated prior, also, the fact that numerous announcements were aired gave people an opportunity of getting clarity of the details of the outreach such as date and venue if they missed it the first time.

Radio has been used in Uganda for public health promotion campaigns particularly starting with the advent of HIV/AIDS in the 1980s where the ABC strategy was strongly aired on the only national broadcaster then<sup>2</sup>. In the mid-1990s, the Uganda communication act was amended to allow private radio stations<sup>3,4</sup> and by 2012, the number of radio stations in Uganda per capita had increased from 0.10 per capita to 0.14 per capita<sup>5</sup>. This was boosted by the changing social economic status, a growing per capita income from about USD 100 in the 1990s to USD 500 by 2010<sup>5</sup>, this meant more purchasing power with more people able to procure radios. In terms

of accessing information, radio is one of the main sources especially in the rural households in Uganda. In a number of house hold surveys by the Uganda National Bureau of Statistics (UBOS), majority of the people reported radio as their primary source of information<sup>1</sup>. Of note is that with the advent of the mobile phone, radio coverage has further increased since these mobile phones usually have an inbuilt radio and torch as accessories. By 2012, one in two Ugandans had a mobile phone and by extension a radio<sup>5</sup>.

## CONCLUSION AND RECOMMENDATION

From this simple survey, radio announcements were the most effective method for mobilizing the community for uptake of cataract outreach services. It is clear to us that radio is an effective tool for disseminating information particularly in the rural communities. The fact that these messages can be reciprocated, gives an opportunity for people who missed it the first time to be able to hear it again, therefore keeping the integrity of first-hand information and minimising second and third hand distortions.

Radio should therefore be encouraged as a key tool for mobilizing communities to uptake health promotion services.

## ACKNOWLEDGEMENTS

To all the staff of MUST Department of Ophthalmology who participated in the outreach programs and all the patients who consented for the feedback interviews.

Source of support: MUST Department of Ophthalmology, COECSA, EU grant

Part of this work was presented at the 2nd annual COECSA scientific congress in Livingstone, Zambia November 2014.

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# Knowledge, attitude and practice of eye diseases in children among paediatricians in Kenya

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## ABSTRACT

**Objective:** To assess knowledge, attitude and practice of childhood eye diseases among paediatricians working in Kenya.

**Methods:** The study was carried out among paediatricians working in the various hospitals and clinics in Kenya. A semi structured questionnaire was distributed to consenting paediatricians for completion. Dependent variables were knowledge attitude and practice. Independent variables were age, sex, duration and type of practice. The data was analyzed using STATA. Level of knowledge was grouped according to Bloom's original cut-off points into good (>80%), moderate (60-80%) and poor (< 60%).

**Results:** Out of the 125 paediatricians who responded, 69.6% had a level of knowledge classifiable as poor, 28.0% moderate and 2.4% good. The mean score of participants in this study was 58.20%. However participants showed varied levels of knowledge in different subject matters. Sixty nine point six per cent of paediatricians carry out eye examination in children, though this varied with each participant doing only the test they are familiar with. Their referral of children with eye diseases to an ophthalmologist was found to be generally appropriate. The attitudes of participants in the various subject areas raised were positive. Ninety nine point two per cent of participants agreed that eye examination by paediatricians could help with early referral of retinoblastoma.

**Conclusion:** The participants had poor level of knowledge of childhood eye diseases. However their attitude and practice was generally positive. Their knowledge could be boosted with regular continuous medical education on eye diseases.

## INTRODUCTION

Childhood blindness is the second largest cause of blind person years after cataracts, accounting for about 70 million blind person year's globally<sup>1</sup>. It poses educational, occupational and social challenges with affected children being at higher risk of behavioral, psychological and emotional difficulties, impaired self esteem and poorer social intergration<sup>2</sup>.

It is estimated that, in almost half of the 1.4 million children who are blind today<sup>3</sup>, the underlying cause could have been prevented, or the eye condition treated to preserve vision or restore sight<sup>4</sup>, thus emphasizing the critical role of early diagnosis and appropriate treatment in preventing childhood blindness, a role that should involve primary care physicians including paediatricians.

However literature review reveals only one published study<sup>5</sup> on knowledge attitude and practice among paediatricians of childhood ocular diseases. A few others have focused mainly on ROP<sup>6</sup> and preschool vision screening practices<sup>7-10</sup>.

A study of 140 paediatricians done in Brazil by Michel *et al*<sup>5</sup> on what paediatricians know about childhood ocular illnesses revealed that 28(20%) of respondents did not know the best age to start treatment of a child with visual impairment. Seventy four (53%) knew the correct time of ophthalmologic evaluation in retinopathy of prematurity. In the same study 88(63%) could not remember that retinoblastoma and retinopathy

of prematurity are causes of leucocoria while, 14 (10%) did not know that retinoblastoma is malignant. A further 73(52%) did not know that the classic symptom triad of congenital glaucoma is photophobia; lacrimation and blepharospasm while 21(15%) of respondents did not know the proper management of children with strabismus. Another study done by Sathjamohanraj *et al*<sup>6</sup> on awareness of retinopathy of prematurity among paediatricians in a tier two city of South India showed that 54(65.1%) of paediatricians were aware of ROP. Thirty-three respondents (39.8%) answered that ROP is preventable and only 43 (51.8%) paediatricians were sure that ROP is treatable. The study also revealed that paediatricians in private hospitals were more aware of ROP compared to their counterparts in government ( $P = 0.006$ ).

Elsewhere a survey carried out in the state of Illinois USA by John and Sharon on compliance with requirement of vision screening by paediatricians showed that 60% of paediatricians tested visual acuity in children aged 5 years and above, while half of this group tested children 2 to 4 years old. The most common reasons for not testing visual acuity were inadequate time (42%), children too young (18%), or that screening would be done at school (18%)<sup>7</sup>. These results suggest that many Illinois paediatricians do not perform vision screening of preschool children, though screening does occur at other sites.

Another survey on preschool vision screening in paediatric practice was conducted by Alex *et al*<sup>8</sup> where

a sample of paediatricians was surveyed to evaluate preschool vision screening practices in the U.S. The rate of acuity screening for 3-year-old children was low (35%), but increased for 4 year olds (73%) and 5 year olds (66%). Few paediatricians used photo screening or auto refraction (8%). In this study the common barriers to vision screening cited were that screening is too time-consuming and children are uncooperative (49%). In the same survey few paediatricians (3%) reported that screening is unnecessary because vision problems would be identified elsewhere (e.g., by the family)<sup>8</sup>.

In the U.K. a survey of paediatricians' practice and training in routine infant eye examination was done by Jungo *et al*<sup>9</sup>. Overall 248 (71%) of all responding paediatricians (57% of paediatric consultants, 81% of hospital paediatric registrars and CMOs considered they would benefit from further training by an ophthalmologist<sup>9</sup>.

## MATERIALS AND METHODS

In this cross sectional study, 148 paediatricians were recruited consecutively between 1<sup>st</sup> January 2013 to 30<sup>th</sup> January 2014 after approval was obtained from ethics and review committee of Kenyatta National Hospital and University of Nairobi. All paediatricians in active practice were eligible to participate while those no longer in practice were excluded. Information was gathered using a self administered semi-structured questionnaire delivered by study assistants to the participants. Participation was purely voluntary and the questionnaires were filled after signing consent to

participate. All information was treated confidentially and analysis was done using STATA (stataCorp.2013. stata statistical software: Release 13.College station, TX StataCorp LP). Descriptive statistics were used to summarize and describe the data. Stepwise logistic regression was done to assess the relationship between independent variable and knowledge and practice. An alpha level of 0.05 was used for all significant tests.

## RESULTS

In this study 165 participants were approached; thirty five declined to participate while 5 were excluded because they are no longer in active practice leaving 125 questionnaires for final analysis. The male: female ratio was 1:1 with a mean age of  $43.9 \pm 10.3$  years [95 % CI: 42.0 – 46.0]. Mean duration of practice in years  $11.0 \pm 9.7$  years. Thirty six per cent of participants were purely in private practice. Overall majority of participants (69.6%) had a poor level of knowledge as categorized according to the blooms cut of points (Table 1). Private practice was less likely to be associated with satisfactory level of knowledge compared to public practice (OR 0.35; CI 0.12-0.98;  $p=0.045$ ) (Table 2).

**Table 1:** Categorization of participants' knowledge according to bloom's cut off points (N=125)

| Variable                                 | n (%)      |
|------------------------------------------|------------|
| Poor Knowledge (<60%)                    | 87 (69.60) |
| Moderate Knowledge (60-80%)              | 35 (28.0)  |
| Good Knowledge (80-100%)                 | 3 (2.40)   |
| The average score was 54.82% (SD 10.73%) |            |

**Table 2:** Univariate logistic regression assessing the association between satisfactory\* knowledge on childhood eye diseases and socio-demographic factors

| Factor             | Knowledge (N=125) |            |                     |         |
|--------------------|-------------------|------------|---------------------|---------|
|                    | N                 | n (%)      | OR (95% CI)         | p-value |
| Gender             |                   |            |                     |         |
| Female             | 63                | 21 (33.33) | 1.00                |         |
| Male               | 62                | 17 (27.42) | 0.76 (0.35 – 1.62)  | 0.473   |
| Age groups (years) |                   |            |                     |         |
| > 60               | 10                | 1 (10.00)  | 1.00                |         |
| 30 – 39            | 50                | 18 (36.00) | 5.06 (0.59 – 43.25) | 0.138   |
| 40 – 49            | 34                | 12 (35.29) | 4.91 (0.55 – 43.53) | 0.153   |
| 50 – 59            | 31                | 7 (22.58)  | 2.63 (0.28 – 24.44) | 0.397   |
| Years of practice  |                   |            |                     |         |
| >30                | 6                 | 1 (16.67)  | 1.00                |         |
| 1 – 10             | 68                | 24 (35.29) | 2.73 (0.30 – 24.71) | 0.372   |
| 11 – 20            | 30                | 10 (33.33) | 2.50 (0.26 – 24.38) | 0.430   |
| 21 – 30            | 21                | 3 (14.29)  | 0.83 (0.07 – 9.86)  | 0.885   |
| Type of practice   |                   |            |                     |         |
| Public             | 34                | 13 (38.24) | 1.00                |         |
| FBO                | 9                 | 5 (55.56)  | 2.02 (0.46 – 8.92)  | 0.354   |
| Private            | 45                | 8 (17.78)  | 0.35 (0.12 – 0.98)  | 0.045   |
| Public/ Private    | 37                | 12 (32.43) | 0.78 (0.29 – 2.06)  | 0.609   |

\*Satisfactory = Good + Moderate knowledge

When asked about causes of leucocoria 90.6% of participants mentioned retinoblastoma. A further 74.4% mentioned cataracts while another 18.0% mentioned retinopathy of prematurity. In addition when asked about signs of retinoblastoma 86.1% mentioned white reflex; 54.1% mentioned proptosis while squint was cited by 20.5% of participants.

On congenital glaucoma, when asked about the signs and symptoms of the disease the classical symptoms of photophobia, excessive tearing and blepharospasm were mentioned by 18.9%, 18.9% and 8.2% respectively. Eighty seven point nine per cent of participants knew that congenital glaucoma is a treatable condition.

On refractive errors while 98.4% of participants state that children can get refractive errors; only 19.2% knew that the condition can be detected by refraction. 72.9% of participants knew the correct definition of a squint and 93.6% stated that the condition is treatable.

On ROP, 33.3% knew it as a condition resulting in proliferation of abnormal retinal vessels in the retina secondary to oxygen exposure while 35.8% simply refer to it as oxygen damage to the retina. The risk factors listed for the disease included prematurity (75.6%); exposure to high concentration of oxygen (75.6%) and low birth weight (22.8%). Sixty two per cent said the condition was treatable while 28.1% said it was not.

When it came to the practice section, only 87(69.6%) admitted doing eye examination in children. Of these 42.5% said they do it as a routine part of every child's examination. Tests done included visual acuity: performed by 42.5% of participants, fundoscopy by 33.3% and pupillary light reflexes by 23.0% among others (Table 3).

**Table 3:** Practices of eye examination in children

| Practice                                       | n (%)      |
|------------------------------------------------|------------|
| Do you do eye examination in children (n=125)  |            |
| Yes                                            | 87 (69.60) |
| No                                             | 38 (30.40) |
| If yes, how often (n=87)                       |            |
| When caregiver reports child has eye problem   | 38 (43.68) |
| As a routine part of every child's examination | 37 (42.53) |
| At every MCH/FP visit                          | 8 (9.20)   |
| Others <sup>1</sup>                            | 4 (4.60)   |
| Which test do you do? (n=87)                   |            |
| Visual acuity                                  | 37 (42.53) |
| Physical exam using a torchlight               | 36 (28.80) |
| Fundoscopy                                     | 29 (33.33) |
| Pupillary light reflexes                       | 20 (22.99) |
| Eye movement examination                       | 12 (13.79) |
| Color test                                     | 2 (2.30)   |
| Others <sup>2</sup>                            | 6 (6.90)   |
| Why not do examination? (n=38)                 |            |
| Don't have enough time                         | 15 (39.47) |
| Don't know how to                              | 12 (31.58) |
| Children uncooperative                         | 7 (18.42)  |
| No equipment                                   | 4 (10.53)  |

Others<sup>1</sup> include – when I notice child has a problem (2), screening for school enrollment (2)

Others<sup>2</sup> include-cover test (3), visual fields (2) and refraction (1)

Male participants were less likely to do eye examination in children than their female counter parts (OR 0.45; CI 0.21-0.99, p=0.047) (Table 4).

**Table 4:** Univariate logistic regression assessing the association between the practice of eye examination and socio-demographic factors

| Factor             | Practice (N=125) |            | OR (95% CI)         | p-value |
|--------------------|------------------|------------|---------------------|---------|
|                    | N                | n (%)      |                     |         |
| Gender             |                  |            |                     |         |
| Female             | 63               | 49 (77.78) | 1.00                |         |
| Male               | 62               | 38 (61.29) | 0.45 (0.21 – 0.99)  | 0.047   |
| Age groups (years) |                  |            |                     |         |
| > 60               | 10               | 6 (60)     | 1.00                |         |
| 30 – 39            | 50               | 38 (76)    | 2.11 (0.51 – 8.75)  | 0.224   |
| 40 – 49            | 34               | 22 (64.71) | 1.22 (0.29 – 5.20)  | 0.468   |
| 50 – 59            | 31               | 21 (67.74) | 1.40 (0.32 – 6.10)  | 0.213   |
| Years of practice  |                  |            |                     |         |
| 1 – 10             | 6                | 3 (50)     | 1.00                |         |
| 11 – 20            | 68               | 50 (73.53) | 2.78 (0.51 – 15.03) | 0.236   |
| 21 – 30            | 30               | 19 (63.33) | 1.73 (0.30 – 10.08) | 0.544   |
| >30                | 21               | 15 (71.43) | 2.5 (0.39 – 16.05)  | 0.334   |
| Type of practice   |                  |            |                     |         |
| Public             | 34               | 28 (82.35) | 1.00                |         |
| FBO                | 9                | 6 (66.67)  | 0.43 (0.08 – 2.22)  | 0.312   |
| Private            | 45               | 28 (62.22) | 0.35 (0.12 – 1.03)  | 0.056   |
| Public/ Private    | 37               | 25 (67.57) | 0.45 (0.15 – 1.37)  | 0.158   |

Of the 38 who said they did not do eye examination in children, 39.5% stated lack of time as the main impediment. Other barriers mentioned include lack of clinical skill (31.6%); uncooperative child (18.4%) and no equipment (10.5%).

Participants attitudes were varied depending on the subject at hand. Ninety eight point four per cent disagreed with the statement that eye examination in children should only be done when care giver complains hence the need to make this part of routine examination of any child. A similar percentage disagreed that eye examination in children can only be done by an eye care worker as opposed to other health care workers including paediatricians. However, only 70.4% agreed that they adequately inform care givers on the consequences of untreated squints. On spectacle use by children, 20.0% of participants disagreed that children can use spectacles effectively. Finally 60.8% of participants disagreed that their training adequately equips them to diagnose, manage and refer children with eye diseases.

## DISCUSSION

Childhood blindness leaves an individual with a lifetime of morbidity. However with timely diagnosis and treatment most of the consequences can be averted. This study sought to assess knowledge, attitude and practice on childhood eye diseases among paediatricians practicing in Kenya to enhance understanding of the role they play in averting childhood blindness.

In this study, the average score on knowledge was  $54.8 \pm 10.7$ , while a similar study in Brazil found a score of 58%<sup>5</sup>, both of which fall in the category of “poor knowledge” as per blooms cut of points. It’s possible that the training of paediatricians in both settings places little emphasis on ophthalmological conditions.

On possible causes of leucocoria, majority (90.6%) of the respondents mentioned retinoblastoma, which is a much higher proportion than the 37% reported by Michel *et al*<sup>5</sup>. This could be attributed to enhanced media campaigns on retinoblastoma in our country and implies more paediatricians were likely to refer affected children for specialist care. Its notable however that the proportion of respondents who mentioned ROP (17.95%) was comparatively lower than those in the Brazil study (37%)<sup>5</sup>. This is possibly because the study in Brazil was done exclusively in a city setting (Porto- Allegre) where the health system could be well developed to support survival of children with ROP and hence practitioners as a whole were more likely to encounter children with this disease. This study was done among paediatricians all over Kenya some of whom were in rural setting; as a result knowledge of ROP in our study was generally poor. For instance only 22.8% mentioned low birth weight as a risk factor for the disease while only 62.8% said it was treatable.

On congenital glaucoma, the classical symptoms triad of photophobia, excess tearing and blepharospasm was reported by less than a fifth of the respondents. This is

lower than the findings in the Brazil study where at least 48% of participants mentioned the triad of symptoms<sup>5</sup>. In both cases however awareness of these symptoms remains low and this could be attributed to the relative rarity of this disease (affects 1 in 10,000 children worldwide)<sup>11</sup>.

On refractive errors even though almost all the respondents (98.4%) knew that children can get refractive errors only a fifth (19.2%) knew how they can be detected. Not knowing how a disease is detected can have significant bearing on the action a doctor takes in so far as referral and subsequent management and follow up is concerned. No published study has evaluated the KAP of paediatricians on refractive errors.

Notably participants demonstrated good awareness about squints. Majority of respondents (93.6%) knew that squints are treatable. This compares with the findings in the Brazil study in which 85% knew the management of squints<sup>5</sup>.

Assessment of participants’ practices showed a satisfactory level of good practice among participants. 69.6% of participants reported doing eye examination in children. Of these however only 43.5% do it as a routine part of every child’s examination, while an equal number only do eye examinations when the care giver reports the child has an eye problem. This is a disturbing finding as most of the common eye diseases are painless and children may not show distress to alert the doctor or the untrained eyes of the guardians.

The most common test reportedly done is visual acuity testing (42.5%) followed by “physical examination using a torch” (28.8%) and fundoscopy (33.3%) among others (Table 3). However these responses could not be duly confirmed as this study did not include an observation schedule and the close ended nature of this particular question meant further clarity as to how these tests were carried out or availability of necessary equipment could not be established. The most common reasons cited by those who reported they don’t do eye examination (30.4%) were lack of enough time to do examination (39.5%) and not knowing how to do eye examination (31.6%). In a study done in the US to evaluate screening for preschool children in paediatric practice<sup>9</sup> nearly all paediatricians (97%) reported including at least one component of the eye examination as part of their preschool well-child care. These included the red reflex test (83%), cover test (75%), and corneal light reflex test (77%). The American Association of Paediatricians has issued guidelines which the paediatricians in the US are expected to adhere to. In the same study the most commonly mentioned barrier to vision screenings were that screening is too time consuming and children are not cooperative, a trend that is replicated in our study.

Logistic regression showed that male respondents were less likely to do eye exams than their female counterparts (OR 0.45; CI 0-21-0.99;  $p < 0.047$ ). Similar findings were reported by Terry *et al*<sup>10</sup>.

The attitudes of the respondents in this study were generally positive. Majority (98.4%) disagreed with the statement that eye exam should only be done when

care giver complains or that eye exam can only be done by eye care workers. In addition 99.2% agree that eye examination by paediatricians may help early detection of retinoblastoma. This shows the recognition among participants that they have a role in detection of eye problems in children and hence provides a good avenue for plugging the deficiencies in their knowledge and practice.

However even though refractive errors are relatively common, 20% disagree that children can use spectacles effectively. This shows there's still more work to be done to create awareness on refractive errors. Children, their guardians and their teachers need encouragement by health workers to enforce the use of spectacles, hence positive attitudes on the part of practitioners are critical.

Only 60.8% agreed that their training was adequate to diagnose and refer children with eye diseases while only 70.4% agreed they can advice parents on the consequences of squints. These latter statements show the need for an avenue to be created to plug this gap in knowledge. There is no published study on attitudes on childhood eye diseases among paediatricians.

The main limitations of this study included the self administered nature of the questionnaire which meant clarification on some responses could not be ascertained. In addition there are very few published studies with which to compare these findings and finally accessing all the intended respondents was made difficult due to absenteeism from their places of work.

## CONCLUSIONS AND RECOMMENDATIONS

Participants generally had poor knowledge of eye diseases in children though this varied widely with lower levels of knowledge on less common illnesses like ROP. However they demonstrated a satisfactory level of good practice and their attitudes were generally positive.

However to aid their level of knowledge an introduction of modules on ophthalmology in their postgraduate training should be considered. In addition their continuous medical education should include topics related to childhood eye diseases. Finally there's a need for similar studies to be done elsewhere both in Africa and the world over to better understand the gaps.

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# Knowledge, attitude and practices among medical officers and diabetic patients regarding diabetic retinopathy in Ogun state of Nigeria

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## ABSTRACT

**Objective:** To assess the knowledge, attitudes and practices regarding Diabetic Retinopathy (DR) among Medical Officers (MO) and diabetic patients in Ogun State of Nigeria.

**Design:** This was a cross-sectional study.

**Setting:** Diabetic clinics based in three hospitals in Ogun state.

**Methods:** Medical officers in all the general hospitals were interviewed via telephone while one teaching hospital and two state hospitals were randomly selected to conduct face-to-face interviews with diabetic patients. Data obtained from these interviews was filled into a structured questionnaire.

**Results:** All the medical officers in the general hospitals were aware that DM affects the eyes while 43% believed that diabetic patients need a monthly eye examination. About 36% examined the eyes of diabetic patients on each visit. All medical officers would refer a diabetic with poor vision to an ophthalmologist. Majority (75%) of the patients recruited were female. Fifty-one per cent of patients were not aware that diabetes affects the eyes while only 35% had ever had a funduscopy.

**Conclusions:** The medical officers in the general hospitals in the state are all aware that diabetes can cause DR but don't have eye clinics. Less than half of them (43%) screen for DR. Known diabetics are not having regular eye examination.

**Key words:** Medical Officers, Diabetic retinopathy, Ogun State, Screening

## INTRODUCTION

Diabetic Mellitus (DM) is one of the leading causes of death, disability and economic loss globally. The World Health Organisation (WHO) estimated that in the year 2000, there were about 171 million people worldwide with diabetes mellitus, and has predicted that this will rise to about 366 million people by 2030<sup>1</sup>.

Diabetes has been on the increase in Nigeria, Africa and indeed the world. This is due to massive migration to towns and cities with attendant change in lifestyle leading to poor nutrition and little physical activity<sup>2,3</sup>.

Population based surveys conducted in various parts of Nigeria estimate the prevalence of diabetes to be 2-3.3% with notable variations between urban and rural settings<sup>3,4</sup>. It is estimated that 4.8% of global blindness (1.8 million persons) is due to Diabetic Retinopathy (DR). The proportions of blindness due to DR ranges from close to 0% in most of Africa to 3-7% in much of southeast Asia and the western pacific to 15-17% in the wealthier regions of Americas, Europe and the western pacific<sup>2</sup>. According to the Nigerian national blindness survey (2007), the prevalence of DR was 0.02%, age-related cataract (1.8%) and glaucoma (0.7%)<sup>6</sup>.

The screening of diabetics for DR is important because early detection is the key to preventing blindness. With early detection, treatment is effective and vision is not usually affected in early DR<sup>7,8</sup>. Fundus examination has a key role in the screening of DR.

Lack of comprehensive DR screening programmes, poor early detection and management in Nigeria have made the vision 2020 recommendation very imperative: to incorporate eye care services for diabetic patients into

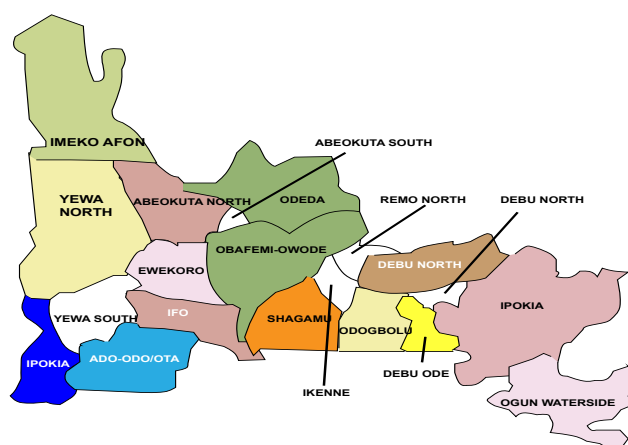
the strategic vision 2020 national plans: public health intervention for its control. In diabetic patients, regular examination of the fundus is essential, followed by appropriate treatment if required<sup>1,9,10</sup>. Nigeria is one of the countries in West Africa with an estimated population of 140 million people<sup>11,12</sup>. It is made up of 36 states plus the federal capital territory Abuja. Ogun state is one of the 36 states that make up Nigeria (Figure 1). It is located in the southwest zone of Nigeria with a population of 3.7 million. It is made up of 20 local government areas (Figure 2). About 45% of the population is urban while 55% is rural<sup>11,12</sup>.

**Figure 1:** Map of Nigeria showing states of the federation.



Source: Nigeria official website

**Figure 2:** Map of Ogun state showing 20 local governments that make up the state



Source: Ogun state official website

In the Nigeria national blindness survey, prevalence of diabetes mellitus in people aged  $\geq 40$  years is 3.3% (48% newly diagnosed)<sup>6</sup>. Prevalence of diabetic DR among DM patients is 17.3% of whom 12% had Sight-Threatening Diabetic Retinopathy (STDR)<sup>6</sup>. When these figures are extrapolated to Ogun State it suggests there are approximately 4000 people aged over 40 years with DR (Table 1).

**Table 1:** Estimation of the DM/DR for Ogun State using results from Nigeria national survey<sup>6, 13</sup>

| Population of Ogun State (n= 3,700,000)                     | Population |
|-------------------------------------------------------------|------------|
| Number >40 years                                            | 740,000    |
| Number with diabetic mellitus (DM) (3.3%)                   | 24,420     |
| Number of DM with diabetic retinopathy (DR) (17% of all DM) | 4,151      |
| Number with sight threatening DR (12% of DR)                | 498        |

There is lack of information about activities throughout Ogun state in terms of screening for DR and referral for treatment in timely fashion. There has been no assessment of the level of awareness of DR among medical officers. A DR workshop was organized by EFCPB in 2008 for healthcare workers but don't know who attended and whether it was useful.

Medical officers in Ogun state are qualified medical doctors that run various departments in the general hospitals including diabetic clinics. They are not specialists but are very important because they have acquired experience over the years and they are closer to the communities than specialists.

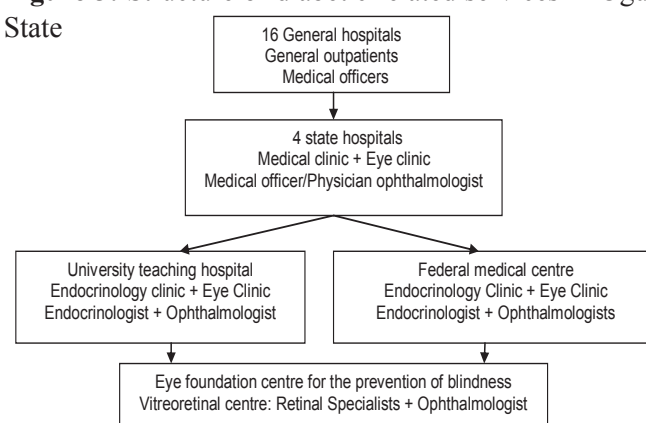
The purpose of this study was to assess the knowledge, attitudes and practices regarding Diabetic Retinopathy (DR) among medical officers in all General Hospitals and diabetic patients who attend diabetic clinics in three hospitals in Ogun State, Nigeria.

## MATERIALS AND METHODS

This was a cross-sectional study. All the 16 general hospitals in Ogun state were mapped and one medical officer per hospital was identified and interviewed via telephone. The data obtained was used to fill a pre-tested structured questionnaire.

All hospitals in Ogun state which have a high number of diabetic patients attending their diabetic medical outpatient clinics were also identified. Out of these, one teaching hospital (Olabisi Onabanjo University Teaching Hospital, OOUTH) and two state hospitals (State hospital Ijebu-ode and state hospital Ota) were randomly selected to participate in the study. The first 40 patients attending diabetic services on consecutive clinic days were recruited in each of the three hospitals. This was based on what was considered to be feasible within the time frame and to allow a comparison between hospitals. Interviews were conducted using a structured questionnaire. The Principal Investigator (PI) conducted all the interviews except in some cases where the patient is well educated when the patients complete the forms themselves and, after completion, the PI went through the responses to make sure it is appropriately filled. In state hospital Ota, the required number of patients could not be identified due to time constraints so additional patients were recruited on ad-hoc basis from the general outpatient clinic.

**Figure 3:** Structure of diabetic related services in Ogun State



Note: This is the situation on the ground in Ogun state in terms of DR services. It may not be the accepted health system strategy.

This study was conducted according to the guidelines of the declaration of Helsinki. Ethical approval was given from the ethics committee of the London School of Hygiene and Tropical Medicine (LSHTM) and Olabisi Onabanjo University Teaching Hospital (OOUTH) Sagamu in Ogun State, Nigeria. Approval was also sought and obtained before collecting data from various hospital heads of department and units. An information sheet and consent form was given to each patient to read and sign. If any patient cannot read or write it was explained to them and they gave consent via thumbprint.

## RESULTS

The general hospitals don't have any ophthalmic staff except for one hospital with an ophthalmic nurse. They equally don't have any eye clinic (Table 2).

**Table 2:** Number of ophthalmic staff in 2010

| Ophthalmic staff | No. (%)                  |
|------------------|--------------------------|
| None             | 13 (93)                  |
| One              | 1 (7) (ophthalmic nurse) |

A total of 560 diabetic patients were seen at various medical out-patient clinics in the 16 general hospitals in Ogun state in the year 2010 (Table 3).

**Table 3:** Number of diabetics registered in 2010

| General Hospital | Town/Local government     | No. of diabetics registered |
|------------------|---------------------------|-----------------------------|
| Ijebu-Ife        | Ijebu-ife, (ijebu-east)   | 40                          |
| Odogbolu         | Odogbolu, (Odogbolu)      | 70                          |
| Ipokia           | Ipokia (Ipokia)           | 40                          |
| Ogbere           | Ogbere, (ijebu-east)      | 20                          |
| Ibiade           | Ibiade, (ogunwaterside)   | 20                          |
| Itori            | Itori, (Ewekoro)          | 40                          |
| Iperu            | Iperu-remo                | 60                          |
| Ijebu-Igbo       | Ijebu-igbo, (ijebu-north) | 30                          |
| Ikenne           | Ikenne, (Ikenne)          | 80                          |
| Ifo              | Ifo, (Ifo)                | 40                          |
| Ishara           | Ishara, (Remo north)      | 20                          |
| Imeko            | Imeko, (Imeko)            | 30                          |
| Aiyetoro         | Aiyetoro, (Yewa north)    | 50                          |
| Atan             | Atan, (Ijebu-northeast)   | 20                          |
| Total            |                           | 560                         |

Out of the 16 identified MOs in the general hospitals, fourteen were interviewed. The other two were unreachable for the duration of the study.

All the MOs were aware that diabetes affected the eyes (100%). All MOs refer diabetic patients with poor vision to an ophthalmologist (Table 4).

**Table 4:** Awareness of DR and need for screening

| Awareness that diabetes affects the eyes                   | No. (%)  |
|------------------------------------------------------------|----------|
| Yes                                                        | 14 (100) |
| No                                                         | --       |
| Referral to ophthalmologist of DM patient with poor vision |          |
| Yes                                                        | 14 (100) |
| No                                                         | --       |

The knowledge on how frequent fundus examination should be conducted varied, with 36% of the MOs saying the fundus should be examined at each visit to the clinic, 21% on weekly basis while 43% indicated monthly examination was adequate. (Table 4)

Only 43% of the MOs have access to an ophthalmoscope. The frequency of actual fundus examination varied with only 36% performing funduscopy on diabetics at each clinic visit.(Table 5).

**Table 5:** Current protocol and equipment for ophthalmic examination of diabetics

| How often diabetic eyes should be examined | No. (%) |
|--------------------------------------------|---------|
| At each visit to the clinic                | 5 (36)  |
| weekly                                     | 3 (21)  |
| monthly                                    | 6 (43)  |
| Availability of ophthalmoscope             |         |
| Yes                                        | 6 (43)  |
| No                                         | 8 (57)  |

Thirty six percent of the MOs attended the DR workshop of Eye Foundation Centre for the Prevention of Blindness (EFCPB) in 2008. All reported being interested in attending future workshop. A refresher course on how to use the direct ophthalmoscope to examine for DR and more exposure on DR were key areas that MOs want covered in future workshops.

**Table 6:** Attendance/impact of MO at previous DR workshop run by (EFCPB)

| Attendance at DR workshop of Eye foundation in 2008 | No. (%)                                                                                                                                 |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Attended                                            | 5 (36)                                                                                                                                  |
| Not aware                                           | 5 (36)                                                                                                                                  |
| Did not attend                                      | 3 (21)                                                                                                                                  |
| Blank                                               | 1 (7)                                                                                                                                   |
| MOs interested in attending future workshop         |                                                                                                                                         |
| Yes                                                 | 14 (100)                                                                                                                                |
| No                                                  | --                                                                                                                                      |
| What MOs want covered in future workshop            | <ul style="list-style-type: none"> <li>How to use the direct ophthalmoscope to examine for DR</li> <li>More exposition on DR</li> </ul> |

**Note:** The need to send diabetic patients for dilated funduscopy was stressed.

One hundred and twelve patients were interviewed. Their ages ranged from 19 to 90 years old. The mean age was 60.3 years.

**Table 7:** Distribution of socio-demographic characteristics of interviewed patients (N=112)

| Age group           | No. (%) |
|---------------------|---------|
| <50                 | 17 (15) |
| 50-59               | 32 (29) |
| 60-69               | 34 (30) |
| 70+                 | 29 (26) |
| Sex                 |         |
| Male                | 28 (25) |
| Female              | 84 (75) |
| Education           |         |
| No formal education | 24 (21) |
| Primary education   | 41 (37) |
| Secondary education | 25 (22) |
| Tertiary education  | 22 (20) |

**Table 8:** Distribution of patients by study hospital (n=112)

| Hospital of study        | No. (%) |
|--------------------------|---------|
| OOUTH, Sagamu            | 40 (36) |
| State hospital Ijebu-ode | 40 (36) |
| State hospital Ota       | 32 (29) |

About 79% of the patients were type-2 DM, 4% type-1 DM and 17% of did not know their type of diabetes. Of the patients interviewed, 41 (37%) had been advised to visit an eye doctor for further evaluation. (Table 8). Duration of diabetes ranges from <1 year to 27 years, mean is 6.8 years.

**Table 9:** Distribution of types of diabetes and patients told to see ophthalmologist (n=112)

| Type of DM               | No. (%) |
|--------------------------|---------|
| Type 1                   | 5 (4)   |
| Type 2                   | 88 (78) |
| Don't know               | 19 (18) |
| Told to visit eye doctor |         |
| Yes                      | 41 (37) |
| No                       | 71 (63) |

**Table 10:** Distribution of patients' awareness of diabetes affecting the eyes (n=112)

| Knows DM affects eyes | Total (%) |
|-----------------------|-----------|
| Not aware             | 57 (51)   |
| Aware                 | 55 (49)   |

**Table 11:** Distribution of patients by attendance of eye screening (n=112)

| Ever had eye exam because of their diabetes | No. (%) |
|---------------------------------------------|---------|
| Yes                                         | 39 (35) |
| No                                          | 73 (65) |
| Eye exam in the last 12 months              |         |
| Yes                                         | 26 (23) |
| No                                          | 86 (77) |

**Table 12:** Awareness of patients about eye examination (n=112)

| How often they think DM eyes should be examined | No. (%) |
|-------------------------------------------------|---------|
| ≤6 months or yearly                             | 18 (16) |
| When having poor vision                         | 40 (36) |
| Don't know                                      | 54 (48) |

**Table 13:** Comparison of diabetics who have had previous eye exam and those who have never

| Age group (years)                                | Ever had eye exam<br>No. (%) | Never had eye exam<br>No. (%) | (P-value*) |
|--------------------------------------------------|------------------------------|-------------------------------|------------|
| <49                                              | 3 (18)                       | 14 (82)                       | p = 0.096  |
| 50-59                                            | 9 (28)                       | 23 (72)                       |            |
| 60-69                                            | 12 (35)                      | 22 (65)                       |            |
| >70                                              | 15 (52)                      | 14 (48)                       |            |
| Sex                                              |                              |                               |            |
| Male                                             | 7 (18)                       | 21 (29)                       | p = 0.256  |
| Female                                           | 32 (38.1)                    | 52 (61.9)                     |            |
| Education group                                  |                              |                               |            |
| No formal education                              | 9 (38)                       | 15 (63)                       | p = 0.980  |
| Primary education                                | 14 (34)                      | 27 (66)                       |            |
| Secondary education                              | 9 (36)                       | 16 (64)                       |            |
| Tertiary education                               | 7 (32)                       | 15 (68)                       |            |
| Has diabetics been told to visit ophthalmologist |                              |                               |            |
| Yes                                              | 34 (83)                      | 7 (17)                        | p = 0.0001 |
| No                                               | 5 (7)                        | 66 (93)                       |            |
| How often diabetic should visit an eye doctor    |                              |                               |            |
| Every year or less                               | 11 (61)                      | 7 (39)                        | p = 0.012  |
| When having poor vision                          | 10 (48)                      | 11 (52)                       |            |
| When the physician say so                        | 6 (32)                       | 13 (68)                       |            |
| Don't know                                       | 12 (22)                      | 42 (78)                       |            |
| Hospital of study                                |                              |                               |            |
| OOUTH ,sagamu                                    | 19 (46)                      | 21 (54)                       | p = 0.117  |
| State hospital, ijebu-ode                        | 11 (27.5)                    | 29 (72.5)                     |            |
| State hospital, ota                              | 9 (28)                       | 23 (72)                       |            |

\*p-value from Chi Square or fishers exact

## DISCUSSION

In the general hospitals in Ogun state (Table 3), there are no eye clinics and no ophthalmic staff except for only one of the hospitals where there is an ophthalmic nurse (Table 2). All the MOs that were interviewed were aware that diabetes can damage the eyes, refer patient with poor vision to the ophthalmologist, believe that diabetics are at increased risk of other eye diseases and believe DR can be treated, so their awareness about DR is high.

Only 43% of the MOs have direct ophthalmoscope, and 36% examine the fundi of diabetics when seen routinely in the clinic (Table 5). This may be because of absence of ophthalmic instrument and ophthalmic staff, these might have discouraged them and they just refer to the ophthalmologist. Even though the MOs refer to the ophthalmologists, it will still be preferable that they all examine the fundus of their diabetic patients. They could be a good source of screening diabetics for DR and they will lessen the work load on the ophthalmologists who are only three in the whole state.

This study is comparable to the study in Yangon, Myanmar where majority of the General Practitioners (GPs) are aware that diabetes can affect the eyes and only 49% examine the fundus<sup>15</sup>.

In 2008, EFCPB organized a workshop on DR whereby all the healthcare providers in Ogun state were invited but only 36% of the MOs attended this workshop (Table 6). The aim of the workshop was to bring about awareness of DR and inform healthcare providers where DR can be treated. It also conducted practical demonstrations on how to perform an eye exam for DR. The low attendance showed that it was not adequately publicised as attested to by the MOs interviewed (36%). This type of workshop is not uncommon and it is recommended by the WHO<sup>16-18</sup>. All the MOs interviewed were willing to attend future workshops on DR where they would like updates on the use of the direct ophthalmoscope (this is what is available and affordable in General hospitals for now) and examination of the fundus for DR and more lectures on DR (Table 6).

The level of awareness of diabetic patients about DR is very low in this state. This is in spite of the fact that the hospitals where the study took place are 3 of the 6 key hospitals in the state (one tertiary and two states (secondary) (Table 8). Fifty one per cent of diabetics interviewed were not aware that diabetes affects the eye (Table 10). This is in contrast to the study in Yangon, Myanmar where 86% of the patients know that diabetes could affect the eye<sup>15</sup>. In this study, 37% said they were

told to see an ophthalmologist for an eye examination (Table 9). Only 35% of diabetics had ever had a dilated eye examination because of their diabetes. This may be compared to the study in Tanzania where 59% of diabetics reported for dilated fundoscopy at a particular point in time (ever) since they were diagnosed as diabetics<sup>14</sup> and the study by Onakpoya *et al*<sup>7</sup> where 28.9% had previous dilated eye examination.

Awareness of when to have an eye exam was also low: 36% of the diabetics think they can only visit an ophthalmologist when they have poor vision or when the physician or medical officer tells them to do so, 48% simply don't know. Only 16% think they should see the ophthalmologist at least yearly (Table 12). This also differs from the study in Yangon where for the diabetics there, 58% felt they should see the ophthalmologist regularly and 34% said it is only when they have problems with their eyesight<sup>15</sup>.

There is also a trend in this study which showed that some factors increase the rate at which diabetics might have had previous dilated eye exam. These include increasing age and longer duration of DM and as would be expected awareness that DM affects the eyes and, ever been told to visit an ophthalmologist and knowledge that they should visit an ophthalmologist within a year or less (Table 13). The proportion with eye exam was also higher at the teaching hospital compared to the state hospitals. There was no difference in proportion with eye exam by level of education or gender (Table 13). Some of these factors (like age, sex, duration of diabetes) compares with a previous study in Ile-Ife, Nigeria<sup>7</sup>.

In this study 18% of the diabetic patients' interviewed have had DR treatment referral. This agrees with the fact that 17.3% of 3.3% diabetics have DR based on the Nigeria blindness survey<sup>6, 13</sup>.

### LIMITATIONS OF THE STUDY

- (i) No private hospital was included in the study and so findings are not generalizable to private facilities.
- (ii) Semi-structured interviews could have been added or used. This would have added more information.
- (iii) The study sample of 40 consecutive patients from 3 hospitals could have been more. This could have made it more widespread and more representative of Ogun State. All the two tertiary and the four state hospitals could have been used but time and duration of study could not permit.
- (iv) Some patients (37) filled in the forms by themselves while for the rest data was collected by interview. This different method of data collection may have introduced some measurement bias. Semi structured interview could have been added to the patient interview. This could have given more information.
- (v) Medical records in all the hospitals in the state are in deplorable state except in the tertiary centres. This

has prevented knowing the number of diabetics that have been diagnosed with DR.

- (vi) This study excluded diabetics not attending health facilities and undiagnosed diabetics.

In spite of these circumstances, the study gave a good account of diabetic retinopathy needs in Ogun State of Nigeria.

### CONCLUSIONS

The medical officers in the general hospitals in the state are all aware that diabetes can cause DR. But less than half of them (43%) screen for DR. At the state hospitals, physicians/medical officers don't do dilated fundoscopy on diabetic patients and patients are referred to the ophthalmologist when they have poor vision. The majority of diabetic patients at the state hospitals and the general hospitals in Ogun state are not receiving a regular eye exam. The awareness among diabetics about DR is poor (49%) and only 35% have ever had dilated fundoscopy.

### RECOMMENDATIONS

There is need for:

- (i) Intensive health education of the populace (patients and medical staff) on DR that it is cost-effective to go for screening to prevent DR.
- (ii) Diabetic and ophthalmic services to work together interact and communicate. This will bring about more awareness among practitioners and patients and will increase screening activities which will ultimately reduce blindness due to DR.
- (iii) More awareness of all healthcare providers in Ogun State and the patients at large about the treatment centre for DR.

#### Long-term:

There is need for:

- (iv) Further work to find out the most cost-effective way to screen diabetics in this setting.
- (v) Capacity for eye screening needs to be increased at the hospitals where diabetics are attending. There is the need for training of residents in both diabetic and ophthalmic services in conducting DR examination.
- (vi) Advocacy for DM/DR in Ogun state. This will involve lobbying of the state legislators and influential government officials. Also campaigning to mobilize the public and media support for DM/DR.

### ACKNOWLEDGEMENTS

I would like to thank the following:

- (i) My supervisor Dr. Sarah Polack at the International Centre for Eye Health, London, for her advice, guidance and support in the course of this study.
- (ii) Dr. Kunle Hassan, the Chief Medical Director of Eye foundation group of hospitals in Nigeria for his total support at all times.

- (iii) The community ophthalmic nurses in Ogun state of Nigeria for their help in gathering materials for this study.
- (iv) All others who took part directly or indirectly in this study.

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# Ocular surface disease among glaucoma patients in Ibadan, South-West Nigeria

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## ABSTRACT

**Objective:** To study the frequency and severity of ocular surface disease among glaucoma patients attending the Eye Clinic of the University College Hospital, Ibadan, Nigeria.

**Methods:** A hospital-based, cross sectional study was carried out at the Eye Clinic of the University College Hospital, Ibadan. After a detailed ocular examination, each respondent completed an Ocular Surface Disease Index (OSDI) questionnaire and performed central visual field assessment. Participants were analyzed for the effect of anti-glaucoma topical medications (all BAK-preserved) and glaucoma severity on ocular surface disease.

**Results:** A total of 122 consecutive glaucoma patients were studied. Males accounted for 45.1%. Increasing daily drops of anti-glaucoma medication was significantly associated with increasing side effects such as redness, stinging and peppery sensations ( $p < 0.01$ ). Eighty four patients representing 68.9% had some form of OSD using the OSDI score. The OSDI scores and the number of patients with OSD significantly increased with increasing glaucoma severity ( $p < 0.01$ ).

**Conclusion:** Ocular surface disease was found to be associated with glaucoma severity and use of BAK-preserved topical anti-glaucoma medications.

**Key words:** Benzalkonium chloride, Glaucoma, Ibadan, Ocular surface disease

## INTRODUCTION

Ocular Surface Disease (OSD) is a multi-factorial disease of the tear film and ocular surface resulting in symptoms of discomfort, visual disturbance and tear-film instability with potential damage to the ocular surface<sup>1</sup>. The International Dry Eye Workshop of 2007<sup>1</sup> also defined it as a multi-factorial ocular condition that results from inadequate tear film production and/or increased tear evaporation, and may involve tear film degradation as well as damage to the ocular surface. It is accompanied with increased osmolarity of the tear film and inflammation of the ocular surface and affects a significant percentage of the population, especially those older than 40 years<sup>1,2</sup>. It can affect any race, is more common in women, and is one of the most frequent reasons for seeking eye care<sup>2-4</sup>. Several factors influence the prevalence of OSD, such as age and race. In addition, OSD is associated often with other ocular diseases, such as meibomian gland dysfunction and blepharitis<sup>1,5</sup>.

Glaucoma patients are presumably at a higher risk for developing OSD, as both glaucoma and OSD occur more commonly in older people<sup>6-10</sup>. Ocular surface disease occurring in glaucoma patients is however, thought to be multi-factorial and presence of additional anterior segment ocular disorders such as allergy, blepharitis, dry eye, or eyelid anatomical abnormalities may

further contribute to the onset of OSD<sup>11</sup>. Furthermore, glaucoma patients are usually treated with preservative-containing Intraocular Pressure (IOP) lowering eye drops that may contribute to OSD<sup>8-13</sup>. A deleterious effect of Benzalkonium Chloride (BAK) on the ocular surface has been demonstrated both *in vitro* and *in vivo* in both animals and humans<sup>13-16</sup>. Benzalkonium chloride, also known as alkyl dimethyl benzyl ammonium chloride is a cationic surface acting agent and has three main categories of use (a biocide, a cationic surfactant and, a phase transfer agent in chemical industry). Its application is wide and includes its use as preservatives in pharmaceuticals and personal care products such as eye, ear and nasal drops. Preservatives have detergent effect on the lipid layer of the tear film and can decrease the density of goblet cells in the conjunctival epithelium<sup>13-15</sup>. These actions results in reduction of the stability of the pre-corneal tear film, compromising its ability to provide protection and trophic factors to the cornea<sup>13,15,16</sup>.

## MATERIALS AND METHODS

This was a hospital-based cross sectional study among glaucoma patients. Consecutive patients aged 40 years and above seen at the Eye Clinic of the University College Hospital Ibadan, south-west Nigeria between October 2012 and December 2012 were recruited into the study.

Informed written consent was taken from all participants. The protocol was approved by the Institute for Medical Research and Training (IMRAT) of the University of Ibadan.

**Eligibility criteria for participants:** Patients with Primary Open-angle Glaucoma (POAG) already on medical treatment who were at least 40 years of age were eligible for the study. The following patients were excluded: patients with history of ocular surgery or trauma; any ocular laser surgery within the last six months; patients with punctal occlusion or cautery; history of blepharitis in the previous one year; use of topical ocular lubricating agents, tears substitute, or medications for other ocular conditions in the last two months; history of other ocular inflammatory conditions (e.g., herpes simplex viral keratitis). The presence of the following ocular findings were excluded: non-glaucomatous ocular conditions affecting visual function (e.g. cataract, retinal pathology, non-glaucomatous optic neuropathy); and patients with conditions that could be responsible for glaucomatous visual field defects such as pigmentary glaucoma, pseudoexfoliation syndrome (secondary glaucoma) and angle closure glaucoma. All patients with severe visual loss (from glaucoma) preventing them from performing the central visual field with their best correction on were excluded. Symptomatic or uncontrolled systemic diseases affecting visual function such as diabetes mellitus; suspected or diagnosed systemic inflammatory conditions such as rheumatoid arthritis, systemic lupus erythematosus or scleroderma, Sjogren's syndrome; patients with cognitive and hearing impairment, mobility impairment such as Parkinson disease were all excluded.

Primary open angle glaucoma was defined as the presence of glaucomatous optic neuropathy in at least one eye, corresponding visual field changes and gonioscopically open anterior chamber angle and no identifiable secondary cause for the glaucoma. Intraocular pressure was not considered in the criteria for diagnosis in this study, as could be high-tension or normal tension glaucoma<sup>17</sup>. The glaucoma severity was classified into mild (MD  $\leq$  6dB), moderate MD -6 to  $\leq$  12dB) and severe (MD  $\geq$  12dB) glaucoma using the 'Hodapp, Parrish and Anderson's Classification.

All participants were screened using the Ocular Surface Disease Index (OSDI) questionnaire. This is a self-administered, validated instrument for assessing the presence and severity of OSD symptoms<sup>18</sup>. The OSDI questionnaire includes 12 questions about the participant's past week experience with ocular symptoms, vision-related functioning and environmental triggers. Response options for each question were "all of the time" (score=4), "most of the time" (score=3), "half of the time" (score=2), "some of the time" (score=1), and "none of the time" (score=0). Questions about vision-related functioning or environmental triggers could also be answered with "not applicable" aside the listed options of scores of zero to four. In such situations, that

question was not factored into the final score calculation. The following vision related questions of the OSDI questionnaire were modified to sooth local relevance; 'driving at night': questions asked were disturbances in vision noticed while walking at night or sitting in the front seat of the tricycle and the effect of the headlamp of an oncoming vehicle. 'Computer/ATM': alternative question was effect of the phone screen on their eyes.

The total OSDI score was then calculated for each patient as illustrated below.

$$\text{OSDI score} = \frac{(\text{sum of scores for all questions answered}) \times 25}{\text{Total number of questions answered}}$$

The final total score ranges from 0 to 100. The OSDI scores classified as  $\leq 12$  = normal, 13 – 22 = mild OSD, 23 – 32 = moderate OSD, and  $\geq 33$  = severe OSD.

The current anti-glaucoma medication for each patient was recorded including the number, types and frequency of instillation. Combination medications were treated as one product when analyzing the total number of topical medications applied per day. Also each patient was asked for the presence or absence of side effects noticed with drug use and to list such symptoms.

**Statistical analysis:** Statistical analyses were conducted using Statistical Package for Social Sciences (SPSS, Inc, Chicago, Illinois, USA) for Windows (Version 17.0; Microsoft Corporation, Redmond, Washington, USA). Categorical variables such as visual acuity in the better eye, number of topical medications used, number of daily ocular drops of medication applied, demographic characteristics were assessed by Chi-square test with  $\alpha = 0.05$  and continuous variables such as visual field severity (MD), OSDI score were assessed using a two-sample *t*-test with two-sided  $\alpha = 0.05$ .

## RESULTS

A total of 122 consecutive patients with POAG who met the inclusion criteria were recruited over an eight weeks period. The mean age of the patients was 59.02 ( $\pm 10.08$ ) years and 51.6% were below 60 years of age, with a range of 40 to 85 years. Fifty five (45.1%) of the patients were males and Table 1 shows the sociodemographic spread of the patients. The average follow-up clinic visit of the patients in a year was 3.7, ranging from 2 – 6 visits per year. Twenty seven (22.1%) of the patients were hypertensive. Table 1 shows the sociodemographic spread of the patients.

Presenting Visual Acuity (VA) better than 20/40 in the better eye was seen in 99 (81.1%) of the patients while 8 (6.6%) patients presented with VA less than 20/200 in the better eye but with correction all had vision greater than 20/100. The mean IOP was 19.84 ( $\pm 6.72$ ) mmHg. The mean central visual field Mean Deviation (MD) was 9.04 ( $\pm 6.94$ ). The mean mild, moderate and severe glaucoma MD were 3.98 ( $\pm 1.07$ ), 7.04 ( $\pm 2.62$ ) and 20.66 ( $\pm 6.43$ ) respectively and the difference was statistically significant ( $p < 0.01$ ).

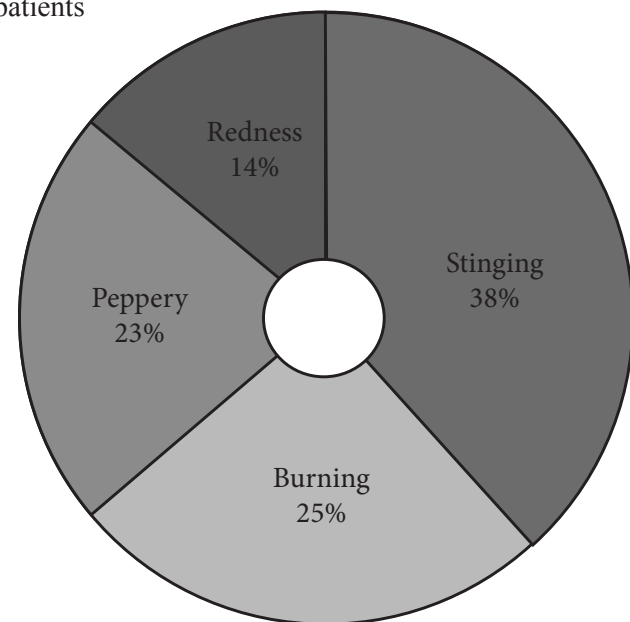
Eighty four (68.9%) patients had Ocular Surface Disease (OSD) in at least one eye using the Ocular Surface Disease index (OSDI) score.

**Table 1:** Sociodemographic characteristics of the participants

| Variable              | Frequency | (%)  |
|-----------------------|-----------|------|
| Age groups (years)    |           |      |
| <60                   | 63        | 51.6 |
| ≥60                   | 59        | 48.4 |
| Total                 | 122       | 100  |
| Gender                |           |      |
| Male                  | 55        | 45.1 |
| Female                | 67        | 54.9 |
| Total                 | 122       | 100  |
| Marital status        |           |      |
| Single/Widowed        | 15        | 12.3 |
| Married               | 107       | 87.7 |
| Total                 | 122       | 100  |
| Occupational status   |           |      |
| Unemployed            | 2         | 1.6  |
| Unskilled/Semiskilled | 40        | 32.8 |
| Skilled/Professional  | 55        | 45.1 |
| Retired               | 25        | 20.5 |
| Total                 | 122       | 100  |

Forty four patients (36.1%) reported side effects from applied eye drops. These side effects were stinging, burning, peppery sensations and redness of the eyes as shown in Figure 1.

**Figure 1:** Side effects of medications as reported by the patients



There was a statistically significant association between increasing number of topical daily medication and the presence of side effects. However, there was no significant association between duration on medications and side effects. This is depicted in Table 2.

**Table 2:** Topical medications and side effects in 122 patients

| Number of drops/day    | Patients with side effects<br>No. (%) | Patients without side effect<br>No. (%) | p value |
|------------------------|---------------------------------------|-----------------------------------------|---------|
| 1                      | 3 (13.64)                             | 19 (86.36)                              | <0.01   |
| 2                      | 5 (26.32)                             | 14 (73.68)                              |         |
| 3                      | 28 (38.36)                            | 45 (61.64)                              |         |
| 5                      | 6 (100)                               | 0 (100)                                 |         |
| 6                      | 2 (100)                               | 0 (100)                                 |         |
| Duration on medication |                                       |                                         | 0.10    |
| 6 months – 1 year      | 10 (31.25)                            | 22 (68.75)                              |         |
| >1 year – 2 years      | 4 (19.05)                             | 17 (80.95)                              |         |
| >2 years               | 30 (43.48)                            | 39 (56.52)                              |         |
| Total                  | 44 (36.1)                             | 78 (63.9)                               |         |

Table 3 shows the relative frequency of the various severity of the OSD among the patients using the OSDI score in the patients

**Table 3:** Frequency of ocular surface disease severity using the OSDI score

| Ocular surface disease (OSD) | Frequency | (%)  |
|------------------------------|-----------|------|
| Normal                       | 38        | 31.1 |
| Mild                         | 38        | 31.1 |
| Moderate                     | 31        | 25.5 |
| Severe                       | 15        | 12.3 |
| Total                        | 122       | 100  |

OSDI=Ocular Surface Disease Index Score

The association between evaluated factors such as gender and age on the OSDI score is shown in Table 4. Age stratified into < 60 years and ≥ 60 years resulted in OSDI score mean of 19.08 and 20.07 respectively. This increase with age was not statistically significant ( $p = 0.73$ ).

**Table 4:** Effect of evaluated factors on OSDI score

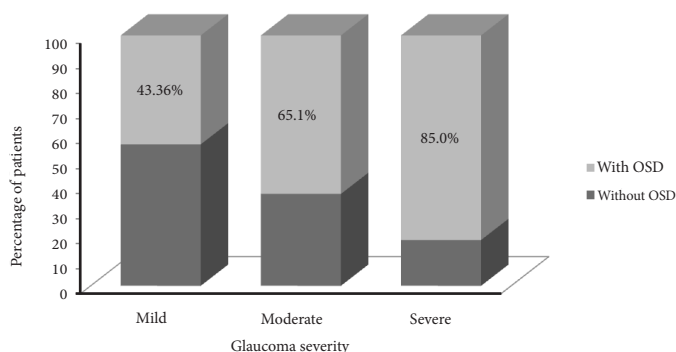
| Evaluated factors             | Gender         |               | P value |
|-------------------------------|----------------|---------------|---------|
|                               | Male           | Female        |         |
| No. of glaucoma patients      | 55             | 67            |         |
| No. of patients with OSD (%)  | 37 (67.27)     | 47 (70.15)    |         |
| OSDI Score, Mean (SD)         | 19.01 (15.23)  | 16.53 (16.41) | 0.35    |
| Age (years)                   | <60            | ≥60           |         |
| No of glaucoma patients       | 63             | 59            |         |
| No of patients with OSD (%)   | 43 (68.25)     | 41 (69.49)    |         |
| OSDI Score, Mean (SD)         | 16.98 (16.11)  | 18.91 (15.31) | 0.73    |
| Topical glaucoma medications* | On medications |               |         |
| No. of glaucoma patients      | 122            |               |         |
| No. of patients with OSD (%)  | 84 (68.90)     |               |         |
| OSDI Score, Mean (SD)         | 18.30 (16.10)  |               |         |

No. = number, OSDI score= ocular surface disease index score, \*All containing Benzalkonium chloride

Seventeen patients out of 39 with mild glaucoma had OSD (mean OSDI score = 10.89), 28 patients out of the 43 with moderate glaucoma had OSD (mean OSDI score = 14.53) and 34 of the 40 patients with severe glaucoma had OSD (mean OSDI score = 27.16). The frequency of OSD with glaucoma severity is depicted in Figure 2. There was a significant association between glaucoma severity and OSD occurrence ( $p < 0.01$ ).

On stratifying glaucoma severity into mild, moderate and severe groups, there was a statistically significant association between the stratified age groups and moderate glaucoma group ( $p < 0.01$ ) as depicted in Figure 2.

**Figure 2:** Glaucoma severity and ocular surface disease



## DISCUSSION

In this study about 69% of the patients had OSD using the OSDI score. This high frequency is similar to studies by Leung *et al*<sup>6</sup> and Garcia-Feijo *et al*<sup>19</sup> who reported a frequency of 59% and Barisic *et al*<sup>20</sup> who had 75%. Skalicky *et al*<sup>17</sup> however, reported a slightly lower frequency of 47.6% which is still quite high prevalence rate. Majority of the patients had mild to moderate OSD and only 12.3% of the total patients had severe OSD. This is in contrast to previous studies<sup>6,17,19</sup> listed above where the occurrence of severe OSD among glaucoma patients ranged between 20.3%<sup>19</sup> to 47%<sup>17</sup>. The reason for this difference is not clear, but race/geography may be a factor. Garcia-Feijo *et al*<sup>19</sup> in their study reported a notable difference in the mean (SD) OSDI scores among the different race/ethnic groups. They reported that in the Latino or mixed race/ethnicity had the highest mean OSDI score of 29<sup>21</sup> units, indicating moderate OSD. This score was significantly higher than the score for the Asian patients (mean [SD] = 17<sup>17</sup> units;  $P = 0.0001$ ) and the Caucasian patients (mean [SD] = 20<sup>17</sup> units;  $P = 0.009$ ), both indicating mild OSD. There was an increase in the mean score of OSD in the older age group in our study. Though this difference was not statistically significant, but after stratifying into glaucoma severity it was found to be significant among those with moderate glaucoma.

Preservative-containing topical medications (especially BAK) had been reported to hasten drying and thus the reduction in the stability of the pre-corneal tear film thereby reducing its ability to provide protection to the cornea<sup>12,14</sup>. Preservatives act as detergent on the lipid layer of the tear film, compromising its protective ability and decrease the goblet cell density, mucus granules and reticular sheets in the conjunctiva epithelium<sup>15</sup>. These mechanisms possibly explain the high level of OSD reported in this study.

Increased frequency of side effects with increasing number of daily anti-glaucoma topical medication was seen in this study. This may further explain the higher frequency of OSD in our patients. This is because multiple medications are indicative of more preservatives (BAK) the eye is exposed to daily and this can destabilize the ocular surface<sup>14,15,21</sup>. There was no significant association between the duration patients had been on medication and increased side effects in this study. The study by Barisic *et al*<sup>20</sup> where they had patients on topical medications of over ten years, however reported a statistically significant ( $p=0.042$ ) increase in the mean OSDI score with duration in years on medications. It is thus possible that duration on topical medications in our study may not have been long enough.

Previous studies<sup>6,17</sup> have shown a strong correlation between the use of BAK-containing topical medications and severe OSD. Skalicky *et al*<sup>17</sup> reported a significant risk for OSD in glaucoma patients on ≥3 drops and also in those on ≥4 drops daily of BAK-containing anti-glaucoma medications on univariate analysis. This significance was maintained in those on ≥3 daily drops

following multivariate regression analysis. In their study they also noted that increasing number of glaucoma medication was associated with more advanced glaucoma and suggested that this association may explain the observation they noted of increasing daily drops and increase risk of OSD. Leung *et al*<sup>6</sup> reported that after adjusting for age and sex on multivariate regression analysis, each additional BAK-containing eye drop was associated with approximately two times higher odds of showing abnormal results on the lissamine green staining test. Katz *et al*<sup>21</sup> in a multicenter controlled trial reported that switching from BAK-preserved latanoprost 0.005% to BAK-free travoprost 0.004% yielded significant improvements in symptoms of OSD in patients with glaucoma or ocular hypertension. This further reveals the adverse effect of preservative containing topical anti-glaucoma on the ocular surface health. This is so important in developing countries where most of the available drops contain BAK, preservative-free drops being much more expensive, and problems of storage due to poor power supply, thus not readily available.

The mean OSDI score was seen to significantly increase with increasing severity of glaucoma. This may not be unconnected to the increasing frequency and number of anti-glaucoma medications used with increasing glaucoma severity. A similar finding was reported by Skalicky *et al*<sup>17</sup>, who noted a significant relationship in their patients after age stratification. This suggests that the more severe the glaucoma the more the OSD in patients and this may adversely affect their visual function, hence the need to identify and treat the OSD component in glaucoma patients in order to give them the best functional visual outcome that is possible.

A limitation in our study is that we did not evaluate the relationship between the type of topical medication used and the OSDI.

In conclusion, OSD is common in patients with glaucoma. The frequency increased with increasing glaucoma severity and worse with increasing total daily BAK- containing anti-glaucoma medications. The adverse effect from these agents can negatively impact on compliance, which may result in the reduction in the optimum benefit expected from their use.

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## Primary synovial cell sarcoma of the socket: Case report

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### ABSTRACT

We report the first case of primary synovial cell sarcoma of the socket and the seventh of the globe and orbit in literature. Synovial cell sarcomas are relatively common intermediate to high grade malignant soft tissue tumours often with an initial indolent course and may present as a masquerade syndrome as in this case where a 12 year old female initially presented with a unilateral cataract of the right eye and cataract surgery was done with a posterior capsular intraocular lens implant. The patient was seen about 5 years later with endophthalmitis and anterior staphyloma for which evisceration was done. Seven months later the patient presented yet again with a mass in the right socket. Debulking surgery was done following an incisional biopsy for histopathology which showed a biphasic synovial cell sarcoma. Bcl-2 was positive on immunohistochemistry confirming the diagnosis. The patient was treated with chemotherapy followed by radiotherapy and has been healthy with no evidence of recurrence and is on regular follow up.

**Key words:** Synovial, Sarcoma, Socket, Masquerade syndrome, Immunohistochemistry

### INTRODUCTION

Synovial cell sarcomas are relatively common intermediate to high grade malignant soft tissue tumour often with an initial indolent course. It typically presents in adolescents and young adults (15-40 years of age). There may be a mild (M: F 1.2:1) male predilection. The most common location for these tumours is within the soft tissues adjacent to large joints, such as the knee and popliteal fossa. While these tumours arise near joints, it is rare for them to arise from the joint itself and despite the name; they do not arise from synovial structures, such as joints, tendon sheaths and bursae. Synovial cell sarcomas account for 2.5-10% of all soft tissue sarcomas<sup>2,3</sup>. Its name is derived from the fact that microscopically it resembles normal synovium, however it stains for epithelial markers (epithelial membrane antigen and cytokeratin) unlike synovium. It has also been found in many locations that does not have normal synovium such as the orbit. They have non-specific appearance macroscopically; varying from well to poorly defined heterogeneous masses with frequent areas of haemorrhage and necrosis. These sarcomas are divided histologically into 4 sub types; monophasic fibrous: 50-60%, biphasic: 20-30%, poorly differentiated: 15-25%, monophasic epithelial: very rare<sup>1</sup>. Cytogenetic aberration of the t(X;18) translocation is highly specific, seen in over 90% of cases<sup>2-4</sup>.

Synovial cell sarcomas are commonly located at the extremities: 80-95%<sup>4</sup> [lower limb: 60-70%], [upper limb: 15-25%], [from soft tissues: 90-95%], [from joint: 5-10%]; head and neck: 5% [hypopharynx or parapharyngeal space, CNS<sup>1</sup>, conjunctiva<sup>2</sup>, orbit<sup>5-9</sup>]; chest wall and viscera: rare (lung)<sup>3</sup>, kidney, prostate, oesophagus, heart, pericardium, pleura<sup>1</sup>. The differential diagnosis include pleomorphic undifferentiated sarcoma [malignant fibrous

histiocytoma (MFH)-fibrosarcoma and liposarcoma], other sarcomas [osteosarcoma and chondrosarcoma] and metastatic carcinoma. Treatment involves a combination of surgery and usually adjuvant radiotherapy ± chemotherapy. Radiotherapy is particularly useful in treating tumours where an adequate clear margin cannot be achieved, and ideally radiotherapy is administered pre-operatively. Good prognostic variables include: small size, located in extremity, younger age < 20 years of age, solid homogenous mass, presence of calcification, biphasic histology (controversial). Poor prognostic variables include: large size (> 5cm) - most important factor, located in the trunk or head and neck, older patients, cystic/haemorrhagic components, marked heterogeneity, histology, poorly differentiated histology, rhabdoid cells, extensive tumour necrosis, high nuclear grade, p53 mutations, high mitotic rate (> 10 mitoses/10 high-power field). Overall 5 year survival is between 36-76% with both local recurrence (30-50%) and distant metastases (40%) being common<sup>1</sup>.

### CASE REPORT

We report a case of a twelve year old female patient, who was referred to the Kenyatta National Hospital (KNH), Nairobi from Garissa Government Hospital (GGH), Kenya, with a right socket mass for further investigations and management in December, 2013. The patient had a history of progressive swelling of the right socket 2 months prior to presentation at GGH. She initially developed poor vision and a white reflex (leukocoria) of the right eye at the age of 8 years and was diagnosed with cataract. Cataract surgery was done with a posterior capsular intraocular lens implant in 2008. Her vision improved. There was no history of fever, anorexia, weight

loss, trauma, squint or proptosis. Past medical history was insignificant. No family history of ocular tumour, phthysical eye or blindness. Systemic examination was normal.

In March, 2013, 5 years later, the patient presented to GGH with persistent headache, ocular pain, poor vision and a swelling in the right eye. A diagnosis of endophthalmitis with anterior staphyloma was made and evisceration was done. The patient was well until in October, 2013, 7 months later, when she developed a growth in the right socket which was initially small but rapidly increased in size over a few weeks prompting her to present to GGH again. Systemic examination revealed a right preauricular lymphadenopathy. The patient was referred to KNH for further investigations and management.

In KNH, the patient was in fair general condition with right preauricular lymphadenopathy which had no skin changes or differential warmth, measuring 2mm by 2mm, well defined, firm, non-tender, discrete, mobile and not attached to overlying or underlying structures. There was a mass arising from the right socket free from the eye lids and orbital rim. It measured 18mm by 23mm, reddish in colour, infected and had a whitish discharge, non-tender and soft with a necrotic area overlying it. The left eye vision was 6/6 with normal anterior and posterior segments. Systemic examination was normal.

An incisional biopsy of the right socket mass was done for histopathology and immunohistochemistry. The mass dramatically increased in size following the incisional biopsy, measuring 40mm by 50mm, overlying the lower eye lid, right cheek, nose and upper lip (Figure 1). Debulking surgery was done with wide margins.

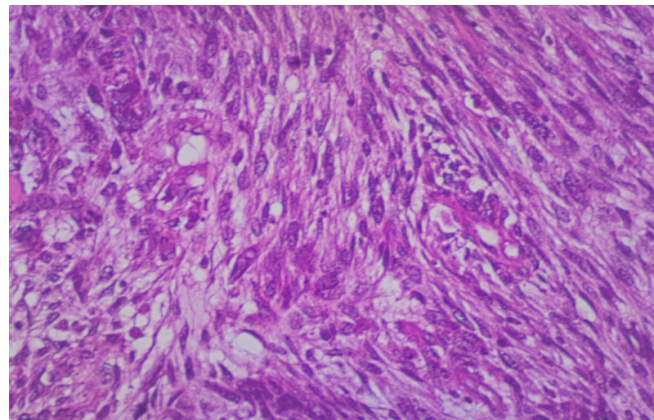
**Figure 1:** Patient after incisional biopsy when the lesion developed rapid growth



The histopathology results showed small round blue cells. Biphasic tumour composed of sheets of highly anaplastic spindle cells with irregularly shaped nucleus with high

mitotic rate ( $> 10$  mitoses/10 high-power field). The epithelioid component was composed of cellular nests of epithelioid cells that were also seen to form epithelial linings (Figure 2).

**Figure 2:** Spindle and epithelioid cells of biphasic synovial cell sarcoma of the socket



**Immunohistochemistry showed:**

Bcl-2 – Positive  
Desmin – Negative  
EMA – Negative  
CD 99 – Negative

A diagnosis of primary orbital synovial cell sarcoma of the socket was made. She was treated with chemotherapy and radiotherapy. She received 12 courses of VAC-Cis (Vincristine, Adriamycin, Cyclophosphamide and Cisplatin). She is on follow up with no signs of recurrence for 2 years now (Figure 3).

**Figure 3:** Patient after debulking surgery and chemo radiotherapy showing the right socket



## DISCUSSION

This patient presented a diagnostic dilemma considering the various pathologies she presented with. It is possible that the cataract and staphyloma may have been different pathologies and unrelated. There have been a few cases of primary synovial cell sarcoma of the orbit<sup>2</sup> and the conjunctiva<sup>2</sup> reported but there has not been a case of the socket following evisceration reported as yet and this might as well be the first case. This is the seventh case of primary synovial cell sarcoma of the globe and orbit reported in literature.

Synovial cell sarcomas are relatively common intermediate to high grade malignant soft tissue tumour often with an initial indolent course as seen in our patient. The name is derived from the fact that microscopically it resembles normal synovium, however it stains for epithelial markers (epithelial membrane antigen and cytokeratin) unlike synovium. It has also been found in many locations that do not have normal synovium such as the socket as in this case. It has non-specific appearance macroscopically, varying from well to poorly defined heterogeneous masses with frequent areas of haemorrhage and necrosis<sup>2-4</sup> as evident in this case report.

## CONCLUSIONS

Orbital synovial cell sarcoma is a rare condition with few cases reported in literature. This case had a more complicated past ocular events which might have been unrelated pathologies. Immunohistochemistry was very useful in confirming the diagnosis in our case report. Chemo-radiotherapy is useful in treating incompletely excised primary synovial cell sarcoma.

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# Solar retinopathy following religious ritual ceremony: A case report from Blantyre, Malawi

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## ABSTRACT

Solar retinopathy is a retinal damage as a result of direct or indirect exposure to the solar radiation. It usually occurs following direct viewing of an eclipse without adequate protective devices. It may also occur following prolonged gazing at the sun, during sun bathing, and in patients with psychiatric disorders such as schizophrenia or drug intoxication.

We discuss the clinical presentation, diagnosis and treatment of a 26 year old woman who developed solar retinopathy after prolonged gazing at the sun during a religious ritual.

**Keywords:** Solar retinopathy, Eclipse retinopathy, Maculopathy, Ultra-violet radiation

## INTRODUCTION

Solar retinopathy is a retinal damage as a result of direct or indirect exposure to solar radiation<sup>1</sup>. It usually occurs as a result of viewing of an eclipse without adequate protective devices. There are also reports of solar retinopathy in the following prolonged direct viewing of sunlight in religious ritual ceremonies, during sunbathing, and in patients with psychiatric disorders through schizophrenia or drug intoxication<sup>1</sup>.

The damage in solar retinopathy is a photochemical injury unlike thermal injury. Ultra-violet (UV) radiation and short wavelength visible light leads to generation of reactive oxygen species, subsequently leading to oxidative retinal tissue injury. Studies have shown that retinal pigment epithelial and outer segments of photoreceptors are the most susceptible to injury in solar retinopathy<sup>2,3</sup>.

## CASE REPORT

A 26 year old woman presented at the out-patient department at the Lions Sight First Eye Hospital in Blantyre, Malawi in December 2014 with one week history of sudden loss of vision in both eyes. She reported attending a religious event where she was instructed to gaze directly at the sun for one minute by the spiritual leader. She noted blurring of her sight immediately after looking at the sun. Her past ocular and systemic history was unremarkable.

On examination, visual acuity was 6/36 in both eyes, which did not improve with the pinhole test and refraction. The anterior segment intra-ocular pressure and pupils were normal in both eyes without cells in the vitreous. Fundoscopy revealed a small round hypopigmented, yellowish-white, lesion on the foveae in both eyes (Figures 1 and 2).

**Figure 1:** Colour fundus photograph of the right eye showing a small, yellowish-white lesion on the fovea

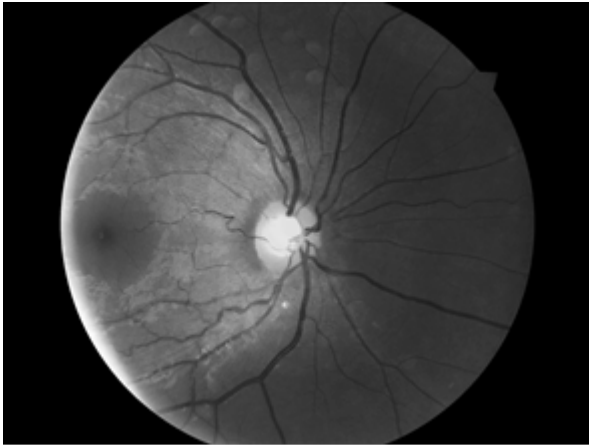


**Figure 2:** Colour fundus photograph of the left eye showing a small, yellowish-white lesion on the fovea

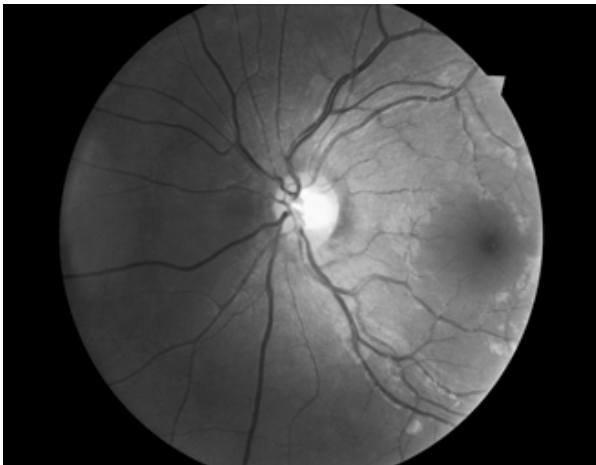


The fundus photographs were also viewed under a gray scale (Figures 3 and 4). Both optic discs were normal. Amsler's grid (white lines on black background) did not reveal any metamorphopsia.

**Figure 3:** Red-free image of right eye fundus



**Figure 4:** Red-free image of left eye fundus



The patient was advised not to look directly at the sun again. She was started on a course of oral steroids for 2 weeks. She was advised to return for follow up, which was scheduled at 2-week intervals. On the first follow up visit, the best corrected visual acuity had improved to 6/18. One month later, vision returned to normal, achieving 6/6 in both eyes. Despite the good visual prognosis, there was no change in size and appearance of the foveal lesions.

## DISCUSSION

Solar retinopathy has been reported in some religious rituals involving gazing at the sun<sup>5</sup>. Solar retinopathy can even occur with very minimal exposure to solar radiation<sup>6,7</sup>. Our patient also developed solar retinopathy at a local religious gathering where she was told to look at the sun for a minute. Young patients, like our patient, are at high risk of developing solar retinopathy because the young natural lens is very clear and thus does not absorb much of the harmful radiation, thereby exposing retina to the radiation<sup>8</sup>.

The patient in this report presented at our eye hospital with a visual acuity of 6/36 one week after the exposure. Our clinical findings were consistent with the solar retinopathy described by other authors<sup>9</sup>. Our patient had yellow hypopigmented foveal lesions in otherwise normal eyes without prior history of retinal disease. The bilateral involvement in our patient is the most commonly reported, although unilateral involvement has also been described<sup>8</sup>.

The use of steroids in patients with solar retinopathy is controversial. Some studies have shown improvement in vision in one to two months from severely reduced vision to normal vision without use of any treatment like steroids<sup>10</sup>. Our patient recovered vision from as early as 2 weeks after the exposure, and regained normal vision by 4 weeks. This rate of recovery is similar to what MacFaul<sup>8</sup> reported among patients with solar retinopathy. He reported that full visual acuity recovery can be expected within a period of one month to 6 weeks if the patient shows early visual acuity recovery and if the rate of recovery of visual acuity in the earliest stages is high. Otherwise vision recovery can go on up to a period of 6 months after the incident<sup>5</sup>.

Relevant investigations in patients with solar retinopathy include visual field, fundus autofluorescence and optical coherence tomography, which are not available at our institution. Visual field is important in patients with solar retinopathy because it may detect central and para-central scotoma<sup>8</sup>. These may cause reading problems or dissatisfaction in a patient with normal visual acuity. Because of reduction of lipofuscin, the area damaged by solar radiation appears to show reduced autofluorescence and is surrounded by a hyperfluorescence ring<sup>11</sup>. Optical coherence tomography would confirm the diagnosis, detect subtle changes and predict the prognosis<sup>9</sup>. Brue *et al* proposed that findings on OCT suggest damage to outer segment of the photoreceptors as a marker of severe solar retinopathy which can result in permanent visual decrease.

## CONCLUSION

Solar retinopathy is hardly described in literature and seems to be a rare condition. There is a need to increase public awareness on how to prevent ocular injury from harmful sun radiation.

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