

Pattern of Ocular Conditions among Patients Attending an Eye Clinic in Ghana

Agyemang-Mireku Felix*

Eye Clinic, Volta River Authority Hospital, Akosombo, Ghana

*Corresponding author: Agyemang-Mireku Felix, Eye Clinic, Volta River Authority Hospital, Akosombo, Ghana, Tel: +233 501362368; E-mail: drpseudo91@gmail.com

Received date: March 23, 2017; Accepted date: April 12, 2017; Published date: April 14, 2017

Copyright: © 2017 Felix AM. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

Purpose: The aim of the study was to determine the pattern of ocular conditions among patients who attended the Salvation Army Eye Clinic at Wiamease in the Ashanti Region of Ghana in 2016.

Method: A retrospective study of all patients attending the Salvation Army eye clinic at Wiamease in 2016 was done.

Results: A total of 1000 folders were used in the study. There were 382 males (38.20%) and 618 females (61.80%) with a male to female ratio of 1:1.6. The mean age was 45.99 years (SD= ± 27.69). The commonest eye disorder encountered was conjunctivitis (39.70%). This was followed by cataract (24.40%), glaucoma (9.70%) and refractive errors (8.90%). 96.72% of cases of cataract and 85.57% of cases of glaucoma occurred in those above 40 years. Of those with refractive error, there were 40.45% with myopia, 34.83% with astigmatism and 24.72% with hyperopia. Conjunctivitis and cataract were significantly higher in females with p values of 0.008 and 0.000 respectively using the chi square test. However, there was no significant difference in the prevalence of glaucoma and refractive errors between males and females with p values of 0.189 and 0.255 respectively. Presbyopia was significantly higher in males with p values of 0.017.

Conclusion: Conjunctivitis, cataract, glaucoma and refractive errors were the major ocular conditions seen in this study. Efforts aimed at reducing ocular morbidity should target these conditions.

Keywords: Conjunctivitis; Cataract; Refractive error; Myopia; Hyperopia; Astigmatism; Presbyopia; Ocular condition; Pattern

Background

Ocular diseases affect every individual in this world, with the only difference being in the pattern of occurrence of disease depending on age, gender, region, and climatic conditions. The pattern of eye diseases and causes of blindness in developing and developed countries and often in different communities vary [1]. The majority of these ocular conditions which can lead to blindness are either potentially preventable or curable.

Numerous studies on the pattern of ocular conditions in developed countries have been conducted. Information is however scanty about the extent of ocular morbidity in developing countries, particularly for non-vision impairing conditions (NVIC), although these constitute the majority of consultations in eye clinics [2,3].

The Wiamease community of Ashanti Region is a typical rural farming community that contributes to a significant percentage of Ghana's vegetable and other crop production. Rural communities and healthcare facilities have limited resources to address many health-related needs. It is necessary for a research to be done to investigate the pattern of ocular conditions among people in the community in order to provide a substantive guide for policy makers on the intervention programmes and projects to be carried out in the community to help improve the eye health of the people.

Methods

A prospective cross-sectional study involving 1000 randomly selected subjects attending the Salvation Army Eye Clinic in Wiamease in 2016 was done. Wiamease is a town 71.7 km from Kumasi, the capital city of the Ashanti Region of Ghana.

The sample size was calculated using the formula: $n = Z^2 p(1-p)/d^2$

Where:

p* is the assumed population proportion=0.7

d* is the margin of error=0.03

With a (CI) confidence interval of 95% "Z"=1.96

$n = 1.96^2 \times 0.7(1-0.7)/0.03^2 = 897$

$10/100 \times 897 = 90$

Minimum sample size=987 participants. 1000 participants were involved.

Informed consent was obtained from all subjects after the procedure and aim of the study was described to them. Subjects were also told they could withdraw from the study at any time. Multiple visits of participants were not included in the study. Participants were captured only once. The study was approved by the Ethics and Research committees of the Salvation Army Eye Clinic and the Department of Optometry and Visual Science, Kwame Nkrumah University of Science and Technology, and was carried out in accordance with the tenets of the declaration of Helsinki.

The demographic data such as age and gender of the patients were recorded in a simple recording form that was developed. Detailed ocular examination was done. Distant visual acuity (VA) was measured using the Snellen's VA chart at 6 m. Patients with poor VA (<6/9) underwent a pinhole vision to differentiate refractive errors from pathological conditions. Refractive error was diagnosed when a VA worse than 6/9 improved on pinhole test. Bruckner test was performed to detect refractive errors in children less than 5 years. Examination of the eyelid margins, conjunctivae, the cornea and anterior segment of the eye was performed with the aid of a slit lamp, pentorch and a magnifying loupe. Hirschberg test and coveruncover test were also carried out to diagnose strabismus and latent squint. Posterior segment examination was performed after dilating pupil with 0.5% mydriacyl using direct and indirect ophthalmoscope and fundus contact lenses. Refraction was performed routinely under cycloplegia. The diagnosis arrived at was also recorded.

Data analysis was performed using SPSS version 23.0 (IBM Corporation, Armonk, NY, USA). Results were summarised and presented as tables and chi square test was used for test of association. For all statistical tests, the decision was significant if the p-value is < 0.05. Statistical analyses like frequency, cross tab were used to describe most of the findings.

Results

The ages of patients ranged from 1 week to 110 yrs with a mean age of 45.99 yrs (SD=± 27.69). The ages of male patients ranged from 1 month to 110 yrs with a mean of 39.27.

Years (SD=± 27.85) whereas the female patients had ages from 1 week to 98 yrs with a mean of 50.15 yrs (SD=± 26.77). There were 382 males (38.20%) and 618 females (61.80%) with a male to female ratio of 1:1.6. Twenty-six point three per cent (26.30%) of the patients were 20 years and below, 17.60% were aged from 21 to 40 years and 56.10% were above 40 years. Table 1 show the age and gender distribution of the patients seen.

Age group (yrs)	Male (%)	Female (%)	Total (%)
0-10	71(7.10)	63(6.30)	134 (13.40)
11-20	56(5.60)	73(7.30)	129 (12.90)
21-30	47(4.70)	38(3.80)	85 (8.50)
31-40	36(3.60)	55(5.50)	91 (9.10)
41-50	41(4.10)	42(4.20)	83 (8.30)
51-60	24(2.40)	60(6.00)	84 (8.40)
61-70	43(4.30)	97(9.70)	140 (14.00)
71-80	41(4.10)	144(14.40)	185 (18.50)
Above 80	23(2.30)	46(4.60)	69 (6.90)
Total	382 (38.20)	618 (61.80)	1000 (100.00)

Table 1: Age and gender distribution of the patients.

The commonest eye disorder encountered was conjunctivitis (39.70%). This was followed by cataract (24.40%), glaucoma (9.70%) and refractive errors (8.90%). There was no abnormality in 2.00% of

the patients. 96.72% of cases of cataract and 85.57% of cases of glaucoma occurred in those above 40 years. Of those with refractive error, there were 40.45% with myopia, 34.83% with astigmatism and 24.72% with hyperopia.

Table 2 shows pattern of ocular diseases. Conjunctivitis and cataract were significantly higher in females with p values of 0.008 and 0.000 respectively using the chi square test. However, there was no significant difference in the prevalence of glaucoma and refractive errors between males and females with p values of 0.189 and 0.255 respectively. Presbyopia was significantly higher in males with p values of 0.017.

Condition	Number of Patients Diagnosed	Percentage (%)
Anterior uveitis	13	1.3
Aphakia	14	1.4
Cataract	244	24.4
Conjunctivitis	397	39.7
Corneal opacity	14	1.4
Dislocated Lens	2	0.2
Dry Eye Syndrome	5	0.5
Foreign Body	9	0.9
Glaucoma	97	9.7
Hypertensive Retinopathy	6	0.6
Keratitis	27	2.7
Maculopathy	7	0.7
Normal eye	20	2
Nystagmus	2	0.2
Pinguecula	1	0.1
Posterior uveitis	1	0.1
Presbyopia	16	1.6
Prosthetic eye	1	0.1
Pterygium	23	2.3
Ptosis	2	0.2
Refractive Error	89	8.9
Sub-conjunctival haemorrhage	2	0.2
Toxoplasmosis	2	0.2
Trachoma	6	0.6
Total	1000	100

Table 2: Pattern of ocular conditions.

Among the males, the most predominant ocular condition diagnosed was conjunctivitis (45.03%) followed by cataract (15.97%), refractive error (10.21%), glaucoma (8.12%) and keratitis (3.66%). There was no abnormality in 2.36% of the male patients.

Similar trend was found among the female patients. The commonest ocular condition among the females was conjunctivitis (36.41%). This was followed by cataract (29.62%), glaucoma (10.68%), refractive error (8.09%) and keratitis (2.10%). 1.78% of the female patients had no abnormality. Table 3 shows the cross tabulation of ocular condition and gender.

Condition	Gender		Total
	Male	Female	
Anterior uveitis	5	8	13
Aphakia	6	8	14
Cataract	61	183	244
Conjunctivitis	172	225	397
Corneal opacity	6	8	14
Dislocated Lens	0	2	2
Dry Eye Syndrome	2	3	5
Foreign Body	5	4	9
Glaucoma	31	66	97
Hypertensive Retinopathy	3	3	6
Keratitis	14	13	27
Maculopathy	1	6	7
Normal eye	9	11	20
Nystagmus	0	2	2
Pinguecula	1	0	1
Posterior uveitis	0	1	1
Presbyopia	11	5	16
Prosthetic eye	1	0	1
Pterygium	8	15	23
Ptosis	1	1	2
Refractive Error	39	50	89
Sub-conjunctival haemorrhage	0	2	2
Toxoplasmosis	2	0	2
Trachoma	4	2	6
Total	382	618	1000

Table 3: Cross tabulation of ocular conditions and gender.

In young patients 20 yrs and below, the commonest eye disorders were conjunctivitis (71.86%) and refractive error (9.51%). There was no abnormality in 6.84% of these young patients. In adults above 20 yrs, the commonest eye disorders were cataract (32.84%), conjunctivitis (28.22%), glaucoma (12.62%), refractive error (8.68%), keratitis (2.85%), pterygium (2.58%) and presbyopia (2.17%).

Tables 4, 5 and 6 show the age distribution of the eye disorders seen. Conditions that were in very small frequencies are grouped as "Other".

They include: dislocated lens, nystagmus, pinguecula, posterior uveitis, prosthetic eye, ptosis, subconjunctival haemorrhage and toxoplasmosis. Patients below 21 years were classified as young ones, those between 21 and 60 as adults and above 60 as seniors.

Age Group (Yrs)	Conjunctivitis (%)	Cataract (%)	Refractive error (%)	Glaucoma (%)	Keratitis (%)	Pterygium (%)
≤ 10	113(28.46)	1(0.41)	7(7.87)	0 (0)	5(18.52)	0 (0)
11-20	76(19.14)	1(0.41)	18(20.22)	4(4.12)	1(3.70)	4(17.39)
21-30	56(14.11)	2(0.82)	11(12.36)	3(3.09)	3(11.11)	2(8.70)
31-40	55(13.85)	4(1.64)	9(10.11)	7(7.22)	2(7.41)	4(17.39)
41-50	27(6.80)	8(3.28)	13(14.61)	10(10.31)	3(11.11)	4(17.39)
51-60	23(5.79)	14(5.74)	17(19.10)	8(8.25)	5(18.52)	6(26.09)
61-70	20(5.04)	68(27.87)	9(10.11)	22(22.68)	2(7.41)	2(8.70)
71-80	19(4.79)	102(41.80)	4(4.49)	36(37.11)	5(18.52)	1(4.35)
81+	8(2.02)	44(18.03)	1(1.12)	7(7.22)	1(3.70)	0 (0)

Table 4: Age distribution of ocular conditions.

Age Group (Yrs)	Presbyopia (%)	Corneal opacity (%)	Anterior Uveitis (%)	Aphakia (%)	Foreign Body (%)	Maculopathy (%)
≤ 10	0 (0)	0 (0)	1(7.69)	0(0)	1(11.11)	0(0)
11-20	0 (0)	0 (0)	1(7.69)	0(0)	1(11.11)	1(14.29)
21-30	1 (6.25)	1(7.14)	2(15.38)	0(0)	3(33.33)	0(0)
31-40	3(18.75)	1(7.14)	1(7.69)	0(0)	1(11.11)	0(0)
41-50	6(37.50)	4(28.57)	2(15.38)	0(0)	1(11.11)	2(28.57)
51-60	3(18.75)	2(14.29)	2(15.38)	1(7.14)	1(11.11)	0(0)
61-70	1 (6.25)	2(14.29)	3(23.08)	3(21.43)	0(0)	3(42.86)
71-80	2(12.50)	2(14.29)	3(23.08)	7(50)	1(11.11)	1(14.29)
81+	0 (0)	2(14.29)	0(0)	3(21.43)	0(0)	0(0)

Table 5: Age distribution of ocular conditions.

Age Group (Yrs)	Hypertensive Retinopathy (%)	Trachoma (%)	Dry Eye Syndrome (%)	Other (%)
≤ 10	0(0)	4(66.67)	0(0)	2(13.38)
11-20	0(0)	1(16.67)	1(20)	2(13.38)
21-30	0(0)	0(0)	1(20)	0(0)
31-40	0(0)	1(16.67)	0(0)	1(7.69)
41-50	1(16.67)	0(0)	1(20)	1(7.69)
51-60	0(0)	0(0)	2(40)	0(0)

61-70	3(50)	0(0)	0(0)	2(13.38)
71-80	1(16.67)	0(0)	0(0)	3(23.08)
81+	1(16.67)	0(0)	0(0)	2(13.38)

Table 6: Age distribution of ocular conditions.

Majority of eyes (45.33%) had presenting visual acuity better than 6/18, 39.00% had visual acuity between 6/60-6/18 while 15.67% had visual acuity worse than 6/60. 200 eyes (10.00%) had no visual acuity recorded for them.

In the right eye, 44.26% had presenting visual acuity better than 6/18, 40.73% had visual acuity between 6/60-6/18 while 15.01% had visual acuity worse than 6/60. 94 eyes (9.40%) had no visual acuity recorded for them.

In the left eye, 46.42% had presenting visual acuity better than 6/18, 37.25% had visual acuity between 6/60-6/18 while 16.33% had visual acuity worse than 6/60. 106 eyes (10.60%) had no visual acuity recorded for them.

Discussion

The study shows that females (61.8%) were more in attendance than males (38.2%) at the eye clinic. This is because of the proximity of the centre to their homes, which enables the females to seek medical help on their own without being dependent on their spouses or other family members.

A similar study by Adeoye and Omotoye [4] in south west Nigeria reported a female preponderance. Similar results showing a female preponderance was also seen in the National Blindness Survey conducted by Brilliant et al. [5], where the survey took place at the rural areas thereby enabling the females for easy access to eye care services. This is different from most hospital based studies where there is a male preponderance [6-8].

More adults had ocular problems in this study than children. Ajaiyeoba [9] reported a similar trend though the difference observed in his study was not statistically significant. A likely explanation for this is that children may not be able to adequately articulate their problems and hence may not present to the hospital until the features are prominent enough to be noticed by their parents or guardians.

Conjunctivitis was the commonest ocular morbidity accounting for 39.70%, followed by cataract (24.40%), glaucoma (9.70%) and refractive errors (8.90%). Conjunctivitis was the commonest ocular morbidity in a similar study by Adenuga and Samuel [4] with a prevalence of 42%. Other studies reported it as the third leading cause of ocular morbidity with prevalence of less than 20% [4,10-12]. Kumah et al. [13] in their study reported it as the condition with the second highest prevalence.

It was also the major cause of eye disease in the paediatric age group in this series. This agrees with other hospital based studies as well as school eye health surveys that have also reported it as either the commonest [8,9,14-16] or the second most common [2,7,10] cause of eye disease in children. Conjunctivitis was significantly higher in females ($p=0.008$). The reason for gender-related difference is not certain but could be due to the relative differences in response to health seeking behaviour.

Cataract and glaucoma had prevalence of 24.40% and 9.70% respectively in this series. Similarly, Adeoye and Omotoye [4] reported figures of 26% for cataract and 10.9% for glaucoma in a study in south west Nigeria. Amadi et al. [12] however reported less than 5% for both disease conditions. This difference may be due to the fact that their study had a mean age of 30.5 years while the mean age for this study was 45.99 years.

Both disease conditions are commoner with increasing age and in this study the prevalence was statistically greater in those aged 40 yrs and above. Cataract was significantly higher in females ($p=0.000$). As elsewhere, females have slightly higher rates of cataract incidence for reasons that are not completely known. However, there was no significant difference in the prevalence of glaucoma between males and females ($p=0.189$). Uncorrected refractive errors constitute important ocular health problems across the globe [17,18]. It has impact on quality of life, and has educational and socioeconomic consequences. In this present study it was the fourth commonest cause of ocular morbidity with a prevalence of 8.90%.

Similar studies reported refractive error as the third [6,19], second [4] and commonest [11,17,20] cause of ocular morbidity. In a study by Kumah et al. [13] in Ghana, the most prevalent condition was refractive error (26.30%).

The low prevalence of refractive error in this study could be attributed to ignorance as some patients fail to complain of poor vision to eye care providers because of negative perception about spectacle wear and the cost involved in getting one. No significant difference was noticed in refractive error due to gender ($p=0.255$). This is in agreement with previous report by Iakho and Mohamed Ali [19].

In the present study myopia was the most common refractive error seen among the patients. This was followed by astigmatism and then hyperopia. This agrees with the previous clinical studies in Nigeria, which show that myopia is the most common refractive cause of visual impairment [3,5]. However, Ayanniyi et al. [13,14] in a private optometry practice in AdoEkiti Nigeria and Bagaiya and Pam [16] in Kaduna State North Central Nigeria among University community both found hyperopia to be the commonest refractive error.

This hospital based study however agrees with other studies in Africa and among black Africans who found myopia as the commonest refractive error, but at a lower prevalence than what is seen among the European and South East Asian Nations. The prevalence of myopia is on the increase worldwide and especially in the South East Asian countries [21-24].

75% of those diagnosed of presbyopia in this study were above 40 years. The youngest age of presentation of 30 years in this study compares with 32 years reported by Adenuga and Samuel and 33 years reported by Bernice and Emmanuel [18]. Ayanniyi et al. [13,14] in a similar study also reported the youngest age of presentation of 30 years. Africans Uncorrected refractive errors constitute important ocular health problems across the globe [22]. It has impact on quality of life, and has educational and socioeconomic consequences. In this present study it was the fourth commonest cause of ocular morbidity with a prevalence of 8.90%.

Similar studies reported refractive error as the third [4,19], second [4] and commonest [11,17,20] cause of ocular morbidity. In a study by Kumah et al. [13] in Ghana, the most prevalent condition was refractive error (26.30%).

The low prevalence of refractive error in this study could be attributed to ignorance as some patients fail to complain of poor vision to eye care providers because of negative perception about spectacle wear and the cost involved in getting one. No significant difference was noticed in refractive error due to gender ($p=0.255$). This is in agreement with previous report by Iakho and Mohamed Ali [19].

In the present study myopia was the most common refractive error seen among the patients. This was followed by astigmatism and then hyperopia. This agrees with the previous clinical studies in Nigeria, which show that myopia is the most common refractive cause of visual impairment [3,5]. However, Ayanniyi et al. [13,14] in a private optometry practice in AdoEkiti Nigeria and Bagaiya and Pam [16] in Kaduna State North Central Nigeria among University community both found hyperopia to be the commonest refractive error.

This hospital based study however agrees with other studies in Africa and among black Africans who found myopia as the commonest refractive error, but at a lower prevalence than what is seen among the European and South East Asian Nations. The prevalence of myopia is on the increase worldwide and especially in the South East Asian countries [25-28].

75% of those diagnosed of presbyopia in this study were above 40 years. The youngest age of presentation of 30 years in this study compares with 32 years reported by Adenuga and Samuel [4] and 33 years reported by Bernice and Emmanuel [18]. Ayanniyi et al. [13,14] in a similar study also reported the youngest age of presentation of 30 years. Africans Presbyopia was significantly higher in males than females ($p=0.017$). It could be that males do more near work than females in the study area. This is in agreement with previous report by Iakho and Mohamed Ali [19]. A female preponderance for presbyopia was observed in studies by Patel and West [29-33], Ayanniyi et al. [13,14] and Adenuga and Samuel [4].

Majority of eyes (45.33%) had presenting visual acuity better than 6/18, 39.00% had visual acuity between 6/60-6/18 while 15.67% had visual acuity worse than 6/60. Comparable study by Waziri-Erameh and Omoti [34-39] reported similar findings with majority of patients (70.18%) with visual acuity better than 6/18, 25.49% with visual acuity between 6/60-6/18 while 4.33% had visual acuity worse than 6/60.

However, one study by Hassan et al. [40-45] reported higher percentage of patients with visual acuity between 6/60-6/18 (46.34%) followed by visual acuity better than 6/18 (39.84%) and then visual acuity worse than 6/60 (13.82%). The higher case of satisfactory visual acuity (better than 6/18) could be a reason for the low prevalence of refractive error in this study.

Conclusion

In conclusion, the leading causes of eye disease in this study were conjunctivitis, cataract, glaucoma and refractive errors. There were more female in attendance than males. The pattern of ocular disorders observed in this study is similar to the findings from other parts of the developing world in spite of variability of methods for calculating causes. This type of study is helpful to have idea about the epidemiology of any ocular disorder.

It is necessary to organize community education and ensure early treatment to reduce the prevalence of these diseases in the general population. A more extensive survey would help in generating the updated information about the status of ocular morbidity in the community in general and the prevalence of blindness in particular.

Health education programs should target older age groups specifically and the population in general. The availability and accessibility of eye care services, particularly cataract surgery and refraction services should be increased.

References

1. Kawuma M (2000) Eye diseases and blindness in Adjumani refugee settlement camps, Uganda. *East Afr Med J* 77: 580-582.
2. The authors acknowledge the support of Dr. Edith Ayissi Menga, Dr. Abraham Opare of Asokwa Children's Hospital, Kumasi and also the staff of Salvation Army Eye Clinic in Wiamoase during the study.
3. Kamali A, Whitworth JAG, Ruberantwari A, Mulwanyani F, Acakara M, et al. (1999) Causes and prevalence of non-vision impairing ocular conditions among a rural adult population in SW Uganda. *Ophthalmic epidemiology* 6: 41-48.
4. Adeoye AO, Omotoye OJ (2007) Eye disease in Wesley Guild Hospital, Ilesa, Nigeria. *Afr J Med Med Sci* 36: 377-380.
5. Brilliant LB, Pokhrel RP, Grasset NC, Lepkowski JM, Kolstad A, et al. (1985) Epidemiology of blindness in Nepal. *Bull World Health Organ* 63: 375-386.
6. Badhu BP, Shrestha SP (1997) Pattern of incurable blindness at BPKIHS. *Nepal Med Assoc* 37: 370-372.
7. Quigley HA, Broman AT (2006) The number of people with glaucoma worldwide in 2010 and 2020. *British journal of ophthalmology* 90: 262-267.
8. Rajkarnikar S, Gurung A (2010) Pattern of ophthalmological diseases in the patients of Shree Birendra Hospital. *Medical Journal of Shree Birendra Hospital* 9: 30-37.
9. Ajaiyeoba AI, Scott SC (2002) Risk factors associated with eye diseases in Ibadan, Nigeria. *African Journal of Biomedical Research* 5: 1-3.
10. Adenuga OO, Samuel OJ (2012) Pattern of eye diseases in an Air Force Hospital in Nigeria. *Pak J Ophthalmol* 28: 144-148.
11. Naidoo K, Gichuhi S, Basáñez MG, Flaxman SR, Jonas JB, et al. (2014) Prevalence and causes of vision loss in sub-Saharan Africa: 1990-2010. *Br J Ophthalmol* 98: 612-618.
12. Naidoo K, Gichuhi S, Basáñez MG, Flaxman SR, Jonas JB, et al. (2014) Prevalence and causes of vision loss in sub-Saharan Africa: 1990-2010. *Br J Ophthalmol* 98: 612-618.
13. Nwosu SN (1998) Ocular problems of young adults in rural Nigeria. *Int Ophthalmol* 22: 259-263.
14. Kumah BD, Abdul-Kabir M, Opoku-Yamoah V, Adade S (2015) Prevalence of ocular morbidities among basic school children in the Kwabre East District of Ghana. *Int J Health Allied Sci* 4: 111-114.
15. Bodunde OT, Onabolu OO (2004) Childhood eye diseases in Sagamu. *Nig Journal of Ophthalmol* 12: 6-9.
16. Ajaiyeoba AA, Isawumi MA, Adeoye AO (2006) Prevalence and causes of eye diseases amongst students in south-western Nigeria. *Annals of African Medicine* 5: 197-203.
17. See JLS, Wong TY, Yeo KT (1998) Trends in the pattern of blindness and major ocular diseases in Singapore and Asia. *Annals-Academy of Medicine Singapore* 27: 540-546.
18. Sethi S, Sethi MJ, Saeed N (2008) Pattern of common eye diseases in children attending outpatient eye department Khyber Teaching Hospital. *Pak J Ophthalmol* 24: 166-170.
19. Abah ER, Oladigbolu KK, Samaila E, Gani-Ikilama A (2011) Ocular disorders in children in Zaria children's school. *Niger J Clin Pract* 14: 473-476.
20. Casson RJ, Chidlow G, Wood JP, Crowston JG, Goldberg I (2012) Definition of glaucoma: clinical and experimental concepts. *Clinical & experimental ophthalmology* 40: 341-349.
21. Ajaiyeoba A (1994) Childhood eye diseases in Ibadan. *Afr J Med Med Sci* 23: 227-231.

22. Amadi AN, Nwankwo BO, Ibe AI (2009) Common ocular problems in Aba metropolis of Abia State, eastern Nigeria. *Pak J Soc Sci* 6: 32-35.
23. Adio AO, Alikor A, Awoyesuku E (2011) Survey of pediatric ophthalmic diagnoses in a teaching hospital in Nigeria. *Niger J Med* 20: 105-108.
24. Dandona L, Dandona R, Naduvilath TJ, McCarty CA, Srinivas M, et al. (1999) Burden of moderate visual impairment in an urban population in southern India. *Ophthalmology* 106: 497-504.
25. Iakho KA, Mohamed Ali AB (2015) Pattern of eye diseases at tertiary eye hospital in Sudan (Makah Eye Hospital, Khartoum). *Albasar Int J Ophthalmol* 3: 15-18.
26. Akinsola FB, Majekodunmi AA, Obowu CB, Ekanem EE (1995) Pattern of eye diseases in adults 16 years and above in Alimoso local government areas of Lagos State. *Nig Postgrad Med J* 2: 56-61.
27. Bastola P (2012) The pattern of ocular morbidity, findings from a study conducted in western remote hilly region of Nepal. *Nepal J Med Sci* 1: 35-38.
28. Edema OT, Okojie OH (1997) Pattern of eye diseases in Benin City, Nigeria. *Afr J Med Pract* 4: 86-90.
29. Adegbehingbe BO, Majekodunmi AA, Akinsola FB, Soetan EO (2003) Pattern of refractive errors at Obafemi Awolowo University Teaching Hospital, Ile-Ife, Nigeria. *Niger J Ophthalmol* 11: 76.
30. Adeoti CO, Egbewale BE (2008) Refractive errors in Mercyland Specialist Hospital, Osogbo, Western Nigeria. *Niger Postgrad Med J* 15: 116-119.
31. Ayanniyi AA, Fadamiro CO, Adeyemi JA (2010) Common refractive errors among the Ekitis of southwestern Nigeria. *J Med Med Sci* 1: 401-406.
32. Malu K, Ojabo C (2014) Refractive errors in patients attending a private hospital in Jos, Nigeria. *Niger J Clin Pract* 17: 106-111.
33. Ayanniyi AA, Folorunso FN, Adepoju FG (2010) Refractive ocular conditions and reasons for spectacles renewal in a resource limited economy. *BMC Ophthalmol* 10: 12.
34. Bagaiya T, Pam V (2003) Refractive errors in Kaduna, Nigeria. *Niger J Surg Res* 5: 106.
35. Katz J, Tielsch JM, Sommer A (1997) Prevalence and risk factors for refractive errors in an adult inner city population. *Invest Ophthalmol Vis Sci* 38: 334-340.
36. Sperduto RD, Seigel D, Roberts J, Rowland M (1983) Prevalence of myopia in the United States. *Arch Ophthalmol* 101: 405-407.
37. Lam CS, Goldschmidt E, Edwards MH (2004) Prevalence of myopia in local and international schools in Hong Kong. *Optom Vis Sci* 81: 317-322.
38. Lin LL, Shih YF, Tsai CB, Chen CJ, Lee LA, et al. (1999) Epidemiologic study of ocular refraction among schoolchildren in Taiwan in 1995. *Optom Vis Sci* 76: 275-281.
39. Porter RS, Kaplan JL, Homeier BP (2009) *The Merck manual home health handbook*. Merck & Company.
40. Quek TP, Chua CG, Chong CS, Chong JH, Hey HW, et al. (2004) Prevalence of refractive errors in teenage high school students in Singapore. *Ophthalmic Physiol Opt* 24: 47-55.
41. Bernice O, Emmanuel OS (2006) Risk factors for early presbyopia in Nigerians. *Nigerian Journal of Surgical Sciences* 16: 7-11.
42. Waziri-Erameh JM, Omoti AE (2009) Presenting visual acuities in a referral eye center in an oil-producing area of Nigeria. *Middle East African journal of ophthalmology* 16: 80.
43. Foster A, Johnson GJ (1990) Magnitude and causes of blindness in the developing world. *Int Ophthalmol* 14: 135-140.
44. Hassan MB, Olowookere SA, Adeleke NA, Akinleye CA, Adepoju EG (2013) Patterns of presentations at a free eye clinic in an urban state hospital. *Nigerian journal of clinical practice* 16: 145-148.
45. Patel I, West SK (2007) Presbyopia: prevalence, impact, and interventions. *Community Eye Health* 20: 40-41.