Nigerian Journal of Ophthalmology 2010;18 (2) 57-61

Refractive Error Status in Bayelsa State, Nigeria

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SUMMARY

Background: Refractive errors affect the whole spectrum of the population without regard to age, gender, race and ethnic group. Uncorrected refractive errors have severe consequences for the individual, family and society. This study , is the first of its kind, to document the distribution of refractive errors in Bayelsa State.

Methods: Records of patients who presented between January 2004 and October 2005 in Okolobiri General Hospital—the government-subsidized eye clinic in Okolobiri, Bayelsa State—for treatment were examined. Myopia was defined as ≥- 0.50DS; hyperopia as ≥+ 1.00DS; while astigmatism was defined as ≥- 0.25DC. Emmetropia was defined as spherical power of –0.25D to +0.75D. Results of the right eye were used for analysis. Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 10.

Results: A total of 654 patients were analyzed. There were 319 male and 335 female patients (48.8% and 51.2% respectively)with an age range of 5 – 86 years. Mean age was 42.18 years (SD 13.1, 95% CI = 41.17 – 43.19 years). Significant refractive errors were observed in 355 cases (54.3%), while 299 (45.7%) were emmetropic. Of the 355 with refractive error, 181 (51%) were men and 174 (49%) were woman.

Astigmatism was the commonest refractive error (n=162, 45.7%) followed by myopia (n = 113, 31.8%) and hyperopia (n = 80, 22.5%). The range of refractive power was as follows: astigmatism, - 0.25DC to – 1.75DC. Myopia, - 0.50D to - 9.00D; hyperopia, + 1.00DS to + 11.00DS; More male patients have hyperopia and myopia while more female patients have astigmatism. Presbyopia as indicated by the use of near addition, was present in 490 (74.9%) of the subjects.

Conclusion: Significant refractive error was present in over half of patients presenting in the period under analysis. The range of refractive errors recorded will assist in planning self-sustaining low-cost refractive error services in the state.

Key words: refractive error, presbyopia, astigmatism, Bayelsa State, Nigeria.

INTRODUCTION

In the last few years considerable attention has been drawn to the contribution of refractive errors to global cause of visual impairment and blindness. This resulted from the realization that previous global estimates of blindness and visual impairment have underestimated the contribution of refractive error. The use of best corrected visual acuity rather than presenting visual acuity has led to this underestimation.

Refractive errors (myopia, hyperopia and astigmatism) affect the whole spectrum of the population without regard to age, gender, race and ethnic group. Uncorrected or under-corrected refractive errors can have severe consequences for the individual, family and society. This includes lost educational and employment opportunities, as well as economic cost to the family and government. Smith and Smith have estimated that the annual worldwide productivity cost of blindness is $168 billion.[1] Uncorrected refractive error has also been linked with poverty. It has been noted that

> . . . without appropriate optical correction, millions of children are losing educational opportunities and adults are excluded from productive working lives, with severe economic and social consequences. Individuals and families are pushed into a cycle of deepening poverty because of their inability to see well.[2]

In 2002, the estimated global visual impairment was put at 161 million from all causes, excluding refractive error.[3] This value rose to 314 million in 2004 when refractive error was included in the estimation.[4] Refractive error alone affected 153 million (8 million blind, 145 million low vision), thus making refractive error the leading cause of low vision and the second leading cause of blindness following cataract which remained the leading cause of blindness globally.

Various studies have documented the prevalence of refractive errors in different population groups. Among adult Chinese populations in Singapore, the overall prevalence of myopia, hyperopia and astigmatism was 38.7%, 28.4% and 37.8%, respectively. The prevalence of high myopia (>- 5.00D) was 9.15%.[5] The prevalence of myopia in India has been reported to be 29% in adults 30 years and older[6] and 22% in Bangladesh[7] where refractive error was the second leading cause of visual impairment, following cataract. The study also reported the prevalence of hyperopia (>+0.50D) to be 20.6% in Bangladesh. A recent national survey in Pakistan reported that refractive error is the commonest cause of moderate visual impairment (VA <6/18 to ≥6/60) accounting for 43%, followed by cataract.[8] A hospital-based

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survey in Central Region, Ghana has shown that refractive error is the cause of 29.2% of visual impairment, second only to cataract.[9] Refractive error is the second leading cause of low vision (VA = 6/24 – 6/60) in Ethiopia accounting for 25.5%.[10]

Studies in different parts of Nigeria have documented refractive error findings. The results of these studies vary considerably. In Ile-Ife, Osun State, 54.9% of the patients examined over a 12 month period had refractive error with a preponderance of myopia present in 22.7% of those with refractive errors,[11] whereas hyperopia was the commonest refractive error in Kaduna (21.7%).[12]

There has been no study documenting the distribution of refractive error in Bayelsa State, the aim of this study was to determine the distribution of refractive error in this area.

METHODOLOGY

A retrospective study of records of consecutive patients who visited the eye unit between January 2004 and October 2005 were retrieved for the study. All patients who visited the clinic for refraction were included, except in cases where lenses did not improve vision or details of the refractive findings were not recorded. Demographics like age, sex, etc were extracted from the records. Refractive error included myopia, hyperopia and astigmatism. Myopia was defined as ≥- 0.50DS; hyperopia as ≥+ 1.00DS while astigmatism was defined as ≥- 0.25DC. Emmetropia was defined as spherical power of –0.25D to +0.75D. Every patient who needed a reading addition was considered as having presbyopia, particularly if there was a history of difficulty in reading fine print. All refractions were carried out using a streak retinoscope; while all examinations carried out by an optometrist (one of the authors) and crosschecked by another optometrist. The results of the right eye were used for analysis and for computing spherical equivalent. The data were analyzed using the Statistical Package for Social Sciences (SPSS) version 10.

RESULTS

A total of 671 case records were retrieved for the study. Using the exclusion criteria indicated above, the records of 654 subjects were reviewed for analysis—a response rate of 97.6% — 319 male and 335 female patients (48.8% and 51.2%, respectively) aged 5 – 86 years. The mean age of the subject was 42.18 years (SD 13.1, 95% CI = 41.17 – 43.19 years) table 1. The mean age of male and female patients was 45.32 (95% CI = 43.85 – 46.78) and 39.19 years (95% CI = 37.88 – 40.51). This difference was significant (p = 0.000).

Table 1. Age and sex distribution of subjects

AGE RANGE (years)	SEX		TOTAL (n, %)
	MALE (n, %)	FEMALE (n, %)	
5 – 14	12 (1.8)	12 (1.8)	**24 (3.6)**
15 – 24	16 (2.4)	37 (5.7)	**53 (8.1)**
25 – 34	18 (2.8)	41 (6.3)	**59 (9.1)**
35 – 44	93 (14.2)	139 (21.3)	**222 (35.5)**
45 – 54	118 (18.0)	82 (12.5)	**200 (30.5)**
55 – 64	39 (6.0)	15 (2.3)	**54 (8.3)**
65 – 74	17 (2.6)	7 (1.1)	**24 (3.7)**
75 – 84	5 (0.8)	2 (0.3)	**7 (1.1)**
85 – 94	1 (0.2)	0 (0.0)	**1 (0.2)**
Total	**319 (48.8)**	**335 (51.2)**	**654 (100)**

p = 0.550

Significant refractive errors were observed in 355 (54.3%) while 299 (45.7%) were emmetropic. Of the 355 with refractive error, 181 (51%) were male and 174 (49%) were female patients. The refractive status of the subjects was independent of gender (^{2} = 2.111, p = 0.550). It was, however, dependent on the age of the subjects (p=0.000) see table 2.

Table 2. Refractive status of subject by age group

Age group (years)	Refractive status				Total
	Emmetropia	Hyperopia	Myopia	Asitgmatism	
5-15	8	2	8	8	26
16-45	205	26	56	88	375
45-86	86	52	49	66	253
Total	299	80	113	162	654

Hyperopia was present in 80 subjects which represented 22.5% of those with refractive error. Similarly, myopia and astigmatism was present in 113 and 162 subjects representing 31.8% and 45.7% of those with refractive error. More male patients have hyperopia and myopia, while more women have astigmatism, (see figure 1).

The range of refractive power is as follows: myopia: - 0.50D to - 9.00D; hyperopia:, + 1.00DS to + 11.00DS; and astigmatism: 0.25DC to – 1.75DC. The spherical equivalent was computed using the subjective refraction of the right eye. The mean spherical equivalent (MSE) was – 0.17DS (SD = 1.695, 95% CI = - 0.304 to – 0.043). A comparison of the MSE between male and female patients showed higher male levels, although this difference was not significant (t = - 0.496, p = 0.620). Male MSE was – 0.207DS (SD = 1.654, 95% CI = - 0.389 to – 0.0248) and female MSE was - 0.1413DS (SD = 1.735, 95% CI = - 0.3277 to – 0.04519).

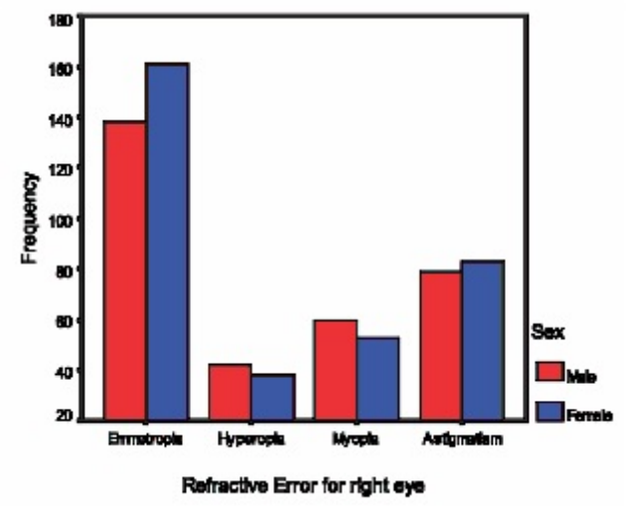

Figure 1. Distribution of refractive status by sex.

Presbyopia as indicated by the use of near addition was present in 490 (74.9%) of the subjects. The male patients accounted for 51.8% of the presbyopia while female patients accounted for 48.2%. The mean reading addition was 1.9546 (SD = 0.5160, 95% CI = 1.9088 – 2.0004). The reading addition prescribed ranged from + 1.00D to + 5.00D. The majority of reading additions were between + 1.50D to + 2.50D, which accounted for 82.9% of the total additions prescribed (see figure 2).

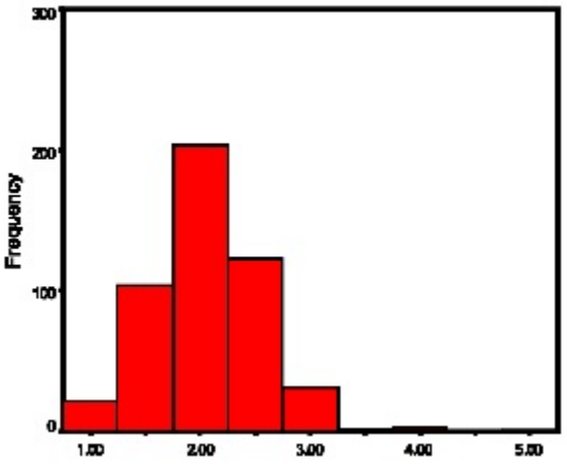

Figure 2. Histogram showing the distribution of reading additions.

The independent *t* test for the mean difference showed that the mean reading addition was significantly different for both male and female patients ($t = 3.580$, $p = 0.000$). The mean reading addition for male patients was + 2.0335D (SD = 0.56, 95% CI = 1.9643 – 2.1027); for female patients was + 1.8697D (SD = 0.4499, 95% CI = 1.812 – 1.9274) —see figure 3.

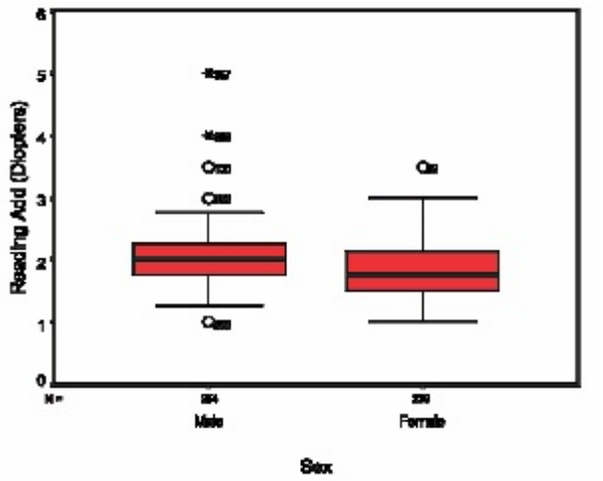

Figure 3. Box plot of reading addition and gender.

The minimum age at which a subject was prescribed with a reading addition was 30 years. The mean presbyopic age was 46.58 years, SD = 8.12. The Pearson correlation coefficient showed that there was a positive correlation between age and reading addition. (r = 0.654, p = 0.000). The scatter plot shows the relationship between reading addition and age in figure 4.

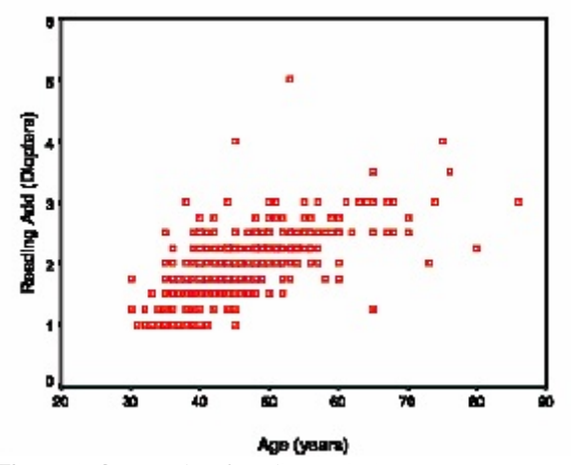

Figure 4. Scatter plot of reading against age.

DISCUSSION

This report provides a preliminary study of refractive error status in Bayelsa State. Being hospital-based, the study has the inherent limitation of hospital-based studies. These include, but are not limited to, selection bias, poor recording systems and inconsistent data sources. The selection bias results from the fact that only those with a subjective awareness of the visual problem will present for examination. Secondly, the figures may be bloated, due to

the free eye care services provided by the government, including free spectacles, whenever prescribed. Poor record keeping and filing systems are a recurring concern in health facilities in developing countries. Notwithstanding the aforementioned limitations, the results of the present study can be used for planning refractive error services and evaluating the government's free eye care services.

Our results indicated that refractive error was present in 54.3% of the patients. This figure appears high compared to other studies in Ghana[9] and Ethiopia,[10] but consistent with studies from Pakistan.[8] It is also consistent with a clinic-based study in Ile–Ife.[11] A recent hospital based study in Ghana showed that refractive error was present in 44.3% of the subjects studied.[13] A community-based study in Rivers State showed that up to 32.1% of the population had low vision, resulting from uncorrected refractive errors if presbyopia is excluded.[14] These differences may largely be accounted for by the varied criteria for defining the various types of refractive error observed in different studies. It may also be responsible for the variation in the preponderance of the types of refractive errors. The World Health Organization (WHO) and the International Agency for the Prevention of Blindness (IAPB), both separately and in their joint initiative, VISION 2020: The Right to Sight, have been working very hard to put uncorrected refractive error on the blindness prevention agenda and to develop strategies for the elimination of this simple avoidable cause of vision loss.[15]

In this study, astigmatism was the commonest refractive error followed by myopia and then hyperopia. In Kaduna, hyperopia was the commonest spherical ametropia, present in 21.7% of the subjects, though in that study hyperopia was defined $\geq$ + 0.25D.[12]

The magnitude of severe near visual impairment due largely to presbyopia has not been well documented.[15] Our study showed that 74.9% of the subjects had presbyopia. These figures are high when compared to 31.8% reported for southwest Nigeria[11] and 56% for northern Nigeria[12]. A comparison of the age of presentation for presbyopia shows that Bayelsa is lower (30 years) compared to Ile-Ife (36 years). This may not be unrelated to the fact that there is a free eye care service in place in Bayelsa State, where spectacle lenses are provided at no cost to the patients. The majority of additions prescribed ranged between + 1.50D to +2.50D. This is instructive from the point of view of planning for refractive error services. Stocking reading lenses in this range can serve the need of about 83% of the presbyopic population.

Our study has shown that refractive error is a common reason for presentation to the eye clinic in Bayelsa State. It has become essential to plan and find the solution to uncorrected refractive error. The free eye care programme may have contributed to the uptake of refractive error services in the state.

CONCLUSION

The review of the case records of the patients attending the refraction clinic of the general hospital, Okolobiri , Bayelsa State, has shown the pattern of the refractive error within the general population of the area. Every effort must be made to meet the goals of VISION 2020 and eliminate uncorrected refractive error within this current decade. This will save the community a lot of money when those needlessly blind or visually impaired do not have to depend on others to exist. With this information, a plan for setting up self-sustaining and low-cost lens dispensing services can be made. With the aid of inexpensive dispensing machines, good quality lenses can be stocked, and the range which will fit into the needs of the general population can be made available. With good management, a dispensing technician can also be employed to assist the optometrists on ground to offer complete refractive care to the patient within the hospital. This way, the Durban declaration [15] is honoured.

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