

Vision screening to detect refractive errors in three selected secondary schools in Birnin Kebbi, North West, Nigeria

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ABSTRACT

Objective: The objective of this study was to determine the prevalence of uncorrected refractive error among students in three selected secondary schools in Birnin Kebbi metropolis as many children with poor vision due to refractive error remain undiagnosed and perform poorly in schools. **Materials and Methods:** This was a cross-sectional study that was conducted over a period of 2 months (May-June 2014). A total of 614 students were included from three randomly chosen secondary schools in Birnin Kebbi, Nigeria. Subjects were selected using random sampling technique from the list of students available through the help of their class teachers. Visual acuity (VA) was measured with a Snellen chart, while students with subnormal vision ($VA \leq 6/9$) were examined using pinhole, and subsequently referred for detailed eye examination and retinoscopy evaluation. **Results:** The age range was from 11 to 20 years comprising 50.8% ($n = 312$) males and 48.2% ($n = 302$) females. Refractive error in either eye was present in 30 (4.8%) children. Of these, myopia was diagnosed in 18 (60%) children, and then hyperopia in 7 (23.3%), and astigmatism in 5 (16.7%) subjects. Spectacle coverage was low as only three pupils were found to be using glasses with lack of awareness and lack of access to eye care services as major barriers. **Conclusions:** Uncorrected refractive error is found among secondary schools students in Birnin Kebbi, and there is a need for the establishment of regular and effective school vision screening program to detect and refer patients for treatment.

Keywords: Myopia, refractive error, school eye health, vision 2020, vision screening

INTRODUCTION

Refractive error is a common condition that could lead to visual disability and blindness in children.^[1] Uncorrected refractive errors remain a public health problem among different population groups studied in Nigeria and elsewhere.^[2-9] Among school children, it has a considerable impact on learning and academic achievement especially in Low and Middle income countries.^[10,11] Uncorrected refractive error in school children and its impact on academic achievement have recently received attention, especially in developed

countries.^[12] The significance of visual impairment due to uncorrected refractive errors especially in school children drives from the fact that compared to cataract which is the leading cause of blindness, refractive error account for twice the number of blind person-years as cataract.^[12] Children with refractive errors are less opportune for correction until they are significantly visually impaired and have difficulty performing specific visual tasks before they are brought for an eye examination especially in poor resource communities.^[12] Regular eye screening program in schools will help in early detection and correction of refractive errors.

Nigeria by virtue of its population is estimated to bear nearly 25% of Africa's childhood blindness and visual impairment burden.^[13] Prevalence report of ocular morbidity across school children in Nigeria is often in excess of 10%.^[2-8] Despite the lack of information about the costs and benefits of school vision screening and the frequency with which it should be carried out, it is

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important to screen children's vision regularly during school years.^[13]

To the best knowledge of the authors, school vision screening has not been conducted previously within the study area, therefore, the aim of this research was to assess the prevalence of refractive errors among secondary school pupils in Birnin Kebbi metropolis. The specific objectives include determining the prevalence of uncorrected refractive errors among secondary school pupils within the study area; to determine the types of refractive error and to assess the reasons for the lack of treatment.

MATERIALS AND METHODS

This was a prospective cross-sectional study that was conducted over a period of 2 months from May–June, 2014 in three randomly selected secondary schools in Birnin Kebbi, the capital of Kebbi State, Nigeria. The three schools were selected randomly from the list of all secondary schools in Birnin Kebbi. There are 25 registered secondary schools in Birnin Kebbi metropolis as obtained from the state ministry of education. Pupils in the three selected secondary schools that consented were enrolled in the study by simple random sampling technique from the list of pupils available to the researchers through the help of their class teachers. Pupils that refuse consent and those that were absent during the period of the study were excluded.

Sample size was determined using the formula:^[14]

$$N = \frac{Z^2 pq}{d^2}$$

where N is the minimum sample size, Z , 1.96 which corresponds to a 95% confidence level, P , the prevalence of 10% (0.1). This was based on a previous similar study conducted in Nigeria.^[6]

$$q = 1 - P = 0.9$$

d = precision level set at 3% (0.03)

$$N = \frac{1.96^2 \times 0.1 \times 0.9}{0.03^2} = 576$$

When adjusted for a probable nonresponse of 5%, this becomes 600. Hence, a minimum sample size of 600 pupils was determined.

Demographic details of all eligible participants were recorded on a proforma, and the visual acuity (VA) of study participants was measured by the authors. Distance

VA was tested at a distance of 6 meters within the school premises under the shade in a well-illuminated area using Snellens chart, pupils with VA < 6/6 in either eye were re-tested with a pinhole and if there is improvement a plus or minus lens was used subjectively to determine their refractive errors. All pupils with subnormal VA ($\leq 6/9$ in either eye and for those without improvement with pin hole) were referred to Federal Medical Center for detailed eye examination by Ophthalmologist and objective retinoscopy by the Optometrist. Those that had improvement with minus lenses were recorded as myopia while those that improved with plus lenses were recorded as hyperopia and those that had improvement with cylindrical lenses were recorded as astigmatism.

The study was approved by the Research Ethics Committee of the Federal Medical Centre, Birnin Kebbi. A letter was written to the State Ministry of Education (SME) explaining the purpose of the study and approval was obtained. Another letter was written to the Principal of each of the selected secondary schools to explain the purpose of the study, and this was facilitated by a communication from the SME. Individual consent was obtained from all the study participants.

Training and pilot survey were conducted prior to the study to ensure standardization and data quality. Data were entered into SPSS 15.0 (IBM Corp., NY, USA) and analyzed using simple frequencies. Categorical variables were compared using Chi-square, $P < 0.05\%$ was considered as statistically significant.

RESULTS

A total of 614 pupils were examined comprising 200 pupils from two secondary schools and 214 from the third school. About 312 (50.8%) were males while 302 (49.2%) were females. The mean age of study participants was 15.5 years (± 2.12 standard deviation) with age range 11-20 years. The VA was 6/6 in the right eye and left eye of 587 pupils and 589 pupils respectively as indicated in Table 1. About 30 pupils had VA worse than 6/6 in either or both eyes. The VA was retested with pinhole and with correction as indicated in Table 2. The prevalence of refractive error was found to be 4.8% among the studied cohort. The prevalence of uncorrected refractive error was found to be 4.4% as only three students that needed glasses were found to be wearing spectacles. Myopia was found to be the most common refractive error in 18 (60%) of pupils with refractive errors and slightly more in female as

detailed in Figure 1. Among 27 pupils with uncorrected refractive error, 14 (46.7%) reported the barrier to using glasses as not been aware of the error while 11 (36.7%) reported not taken to the Hospital as their major challenge, the result is depicted in Figure 2. The prevalence of amblyopia was found to be low at 0.16%.

DISCUSSION

The prevalence of refractive error in this study was lower than what was reported from other studies conducted in Nigeria,^[3-7,15] this is largely because the other studies included other morbidities of the eye aside refractive errors. However, even in those studies refractive error was found to be the commonest cause of

ocular morbidity among school children.^[2-7] The finding of 4.8% prevalence of refractive error in this study is however similar to other studies reported in other parts of Africa.^[16-18] The difference between the index study and other similar studies is that emphasis in the current study is on refractive error, which is considered a leading cause of treatable blindness in children in many part of the world, including Nigeria.^[3-9]

Vision 2020; The Right to Sight, a global initiative launched by a coalition of the nongovernmental organization and the World Health Organization to eliminate avoidable visual impairment and blindness on a global scale included refractive errors as a priority disorder within the first phase of the program.^[19] In order to make progress in developing countries there is a need to emphasize on school eye health program to detect and refer children with refractive errors to eye health facilities for treatment.

The prevalence of uncorrected refractive error of 4.4% as obtained in this study is well above the recommended minimum for regular school eye health program as vision screening is recommended in areas where prevalence of refractive errors exceeds 2%.^[20] Vision screening can be performed by middle-level ophthalmic personnel to detect refractive errors through the measurement of VA and using pinhole to detect any improvement in vision. This technology is appropriate and simple to use in resource-limited setting such as our environment. School teachers are an invaluable addition to human resources needed in the global initiative of Right to Sight as they can assist in detecting pupils with visual disabilities to be brought to an ophthalmologist. Very few schools in Uganda and other parts of Africa ensure that children are screened for visual disorders before joining schools.^[18] In the latest global estimate of visual impairment due to refractive error; 12.8 million children in the age groups 5-15 years were visually impaired from

Table 1: Unaided visual acuity in the right and left eye of study participants

Visual acuity	Right eye, n (%)	Left eye, n (%)
6/6	587 (95.6)	585 (95.3)
6/9	4 (0.7)	4 (0.7)
6/12	15 (2.4)	17 (2.7)
6/18	3 (0.5)	3 (0.5)
6/24	2 (0.3)	2 (0.3)
6/60	3 (0.5)	3 (0.5)
Total	614 (100.0)	616 (100.0)

Table 2: Visual acuity in the right and left eye of study participants with pinhole and with correction

Visual acuity	Right eye, n (%)	Left eye, n (%)
With pinhole		
6/6	23 (76.7)	23 (76.7)
6/9	6 (20.0)	6 (20.0)
6/24	1 (3.3)	1 (3.3)
Total	30 (100.0)	30 (100.0)
With correction		
6/6	29 (96.7)	29 (96.7)
6/12	1 (3.3)	1 (3.3)
Total	30 (100.0)	30 (100.0)

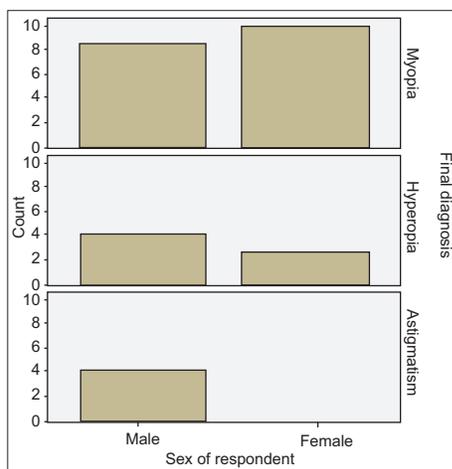


Figure 1: Proportion of refractive errors based on sex of the study participants

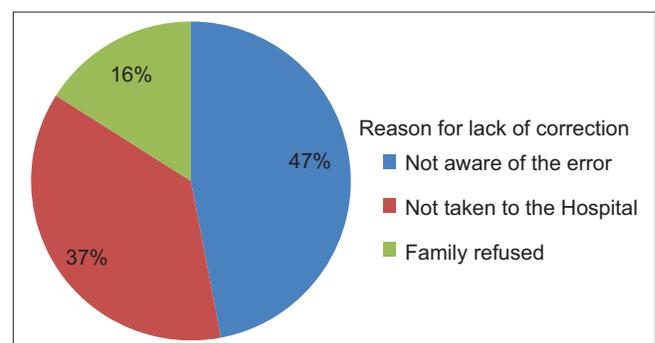


Figure 2: Barriers to lack of treatment among the study participants

uncorrected or inadequately corrected refractive error, and this represent a prevalence of 0.96% globally.^[12]

Myopia was found to be the most common form of refractive error in this study (2.9%); this is similar to other studies in Nigeria and elsewhere.^[15,21] Myopia in other studies was found to be more common in urban children than in their rural counterparts.^[1,22,23] This may probably be related to increased use of the eyes for close work among urban school children than their rural counterparts as environmental factors had been documented to be risk factors for myopia. In this study, myopia was mainly low myopia and was commoner in females, but there was no statistically significant difference ($P = 0.085$). Myopia is more common in younger ages, and significant number of children will improve with age. Hyperopia was found to have a prevalence of 1.1%, while astigmatism accounted for 0.8% among the studied cohort.

Majority of children were not using glasses mainly because they were not aware of the error or because they were not taken to eye facility for examination. Most of the children with uncorrected refractive error are asymptomatic, and hence screening helps in early detection and timely interventions. In countries with high attendance of children in schools, vision screening is recommended.

There are an estimated 500 million people mostly in developing countries including children that do not have access to the eye examination and affordable correction.^[12] Many are not aware that there is a cure for their compromised vision or have no one to provide treatment or cannot afford the appliances they need for correction.^[12] Early vision screening would, therefore, bring teachers, parents or caregivers attention to their children visual statuses.

The prevalence of amblyopia in this study was found to be very low at 0.16%, nevertheless its occurrence in school children point to poor access to eye care services since amblyopia requires urgent diagnosis and prompt and aggressive treatment if low vision and blindness are to be avoided in school-aged children.

CONCLUSION

The findings from this study underscore the need for establishment of effective school eye health screening program and intensive health education campaign on the need for parents and teachers to bring school children to eye facilities routinely as part of preschool

entry requirement in other to detect and effectively treat this avoidable cause of visual impairment and blindness as envisaged in Vision 2020; the Right to Sight initiative.

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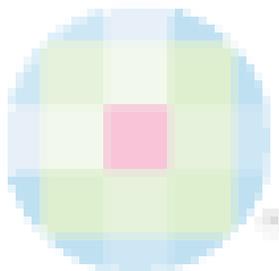
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