

**ORIGINAL ARTICLE****SCREENING OF PRIMARY SCHOOL CHILDREN FOR REFRACTIVE ERROR IN SOUTH-SOUTH NIGERIA****Ibeinmo Opubiri<sup>1\*</sup>, Chinyere Nnenna Pedro-Egbe<sup>2</sup>****ABSTRACT**

**BACKGROUND:** Vision screening study in primary school children has not been done in Bayelsa State, South-South Nigeria. This study was therefore conducted to screen primary school children for refractive error in Bayelsa State and use the data to plan for an effective school Eye Health Program.

**METHODS:** A cross sectional study on screening for refractive error in school children was carried out in Yenagoa Local Government Area of Bayelsa State in June 2009. A multistage sampling technique was used to select the study population (pupils aged 5-15 years). Visual acuity for each eye was assessed by an Ophthalmic nurse and Optometrist outside the classroom, at 6 meters distance. Those with visual acuity of 6/9 or less were presented with a pinhole and the test repeated. Improvement of visual acuity with pinhole was considered refractive error. Funduscopy was done inside a poorly lit classroom. Data was analyzed with EPI INFO version 6.

**RESULTS:** A total of 1,242 (658 females and 584 males) Pupils were examined. About 97.7% of eyes had normal vision of 6/6 while 49 out of 56 eyes, with visual acuity of 6/9 or less, improved with pinhole. Twenty seven pupils had refractive error, giving a prevalence of 2.2%. Refractive error involved both eyes in 22 pupils (81.5%) with the 8-10 years age range having the highest proportion (40.7%) of cases followed by 11-13 years age range (37.0%).

**CONCLUSION:** The prevalence of refractive error in school children in Bayelsa State, South-South Nigeria was low.

**Keywords:** Refractive error, Screening, School children.

**INTRODUCTION**

Refractive error is an optical defect intrinsic to the eye which prevents the light from being brought to a single focus on the retina thus reducing normal vision (1). Refractive error is a major contributor to visual impairment which is a significant cause of morbidity in children worldwide (2). Since children do not usually complain of visual difficulties, early detection and prompt treatment of eye disease is important to prevent vision problems and eye morbidities which could affect their learning ability, personality and adjustment in school (3,4).

Vision screening is the search for unrecognized eye disease or defect by means of rapidly applied

test, examinations or other procedures in apparently healthy individuals (5). A screening test is not intended to be a diagnostic test, it is only an initial examination. Those who are found to have positive test results are referred to an ophthalmologist for further diagnostic work-up and treatment (5).

A study on vision screening for refractive error among school children is yet to be carried out in Bayelsa State, South-South Nigeria. In a study on vision screening in primary school children in Enugu Nigeria, the prevalence of refractive error was 7.4% (6). Faderin in her study on refractive error in pupils of Army children primary school in

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Lagos, Nigeria found a prevalence of 7.3% (7). A similar study on vision survey of school children in a rural community in South-East Nigeria observed a lower refractive error prevalence of 4.2% (8).

Kawuma and Mayeku in Uganda found the prevalence of refractive errors in primary school children to be 11.6% (9). The Kawuma study contrasted with a similar study by Wedner in rural Tanzania which showed a low prevalence of 1% for refractive error in school children aged 7-19 years (10). The lower prevalence in the Wedner study is likely to be due to the reason that only the proportion of pupils with a visual acuity of less than 6/12 were considered in the study.

Padhye *et al* in their study of the prevalence of uncorrected refractive error among urban and rural school children in Maharashtra, India, observed that the prevalence of uncorrected refractive error was higher in urban school children (11).

The Nigerian operational plan for the implementation of the vision 2020; The Right to Sight document (2007-2011), proposed the establishment of school eye health screening in each Local Government Area to identify all cases of visual impairment (12). Early detection of a vision problem can have educational, behavioural and certainly, quality of life benefits (13). There is currently no existing school health services program in Yenagoa LGA. This study is expected to provide relevant data for the effective planning of School Eye Health Programs for the State.

## MATERIALS AND METHODS

Yenagoa Local Government Area (LGA) is in Bayelsa State, South-South Nigeria. Records in the Bayelsa State Ministry of Education showed there are 68 public and 18 (approved) private primary schools in Yenagoa LGA with a combined estimated student population of 35,802 pupils. There are 3 education zones in Yenagoa LGA.

A cross sectional study on screening for refractive was conducted on primary school children in Yenagoa Local Government Area of Bayelsa State, South-South Nigeria in June 2009. Children in primary basic 1 to 6 and aged 5 to 15 years were included in the study. The United Nations children fund [UNICEF] definition of

childhood as a period of life before 16 years of age was used. Children in Special Schools for the blind in the Yenegoa LGA were excluded from the study.

The tools and consumables used during the vision screening study include: Snellen's visual acuity chart (alphabet and tumbling E), measuring tape (to measure 6 meters reading distance), trial lens frame, occluder, pinhole, pen torches with batteries, magnifying loupe, direct ophthalmoscope, educational posters, stationeries, acetaminophen (syrup and tablets), antistine privine eye drop, alomide eye drop and chloramphenicol eye drop/ointment.

A multi-stage sampling technique was used to select pupils in the study population. Stage 1 sampling involved the selection of 3 clusters based on the three Educational Zones in the LGA. The second stage sampling involved stratification of schools into public and private, and in stage 3, five schools were selected (4 public and 1 private) based on the ratio of schools in the clusters and the population of pupils in the schools. The schools were randomly selected from a sampling frame of schools in each zone (public separated from private). All pupils in the selected schools were included in the study. The minimum sample size of 1,123 was determined using a formula for single population proportion assuming a prevalence of 8.3% (Rivers State, Nigeria), margin of error of 2.5%, design effect of 2 and non-response rate of 20%.

Ocular examination included visual acuity (VA) with and without pinhole using Snellens alphabet and illiterate E chart. Visual acuity was assessed outside the class room at a distance of 6 meters. Pen torch and magnifying loupe was used to examine the anterior segment of the eye. Funduscopy was done with a Welch Allen direct ophthalmoscope inside a poorly lit part of the classroom. VA was determined separately for each eye and where it was  $\leq 6/9$ , a pinhole was presented and the test repeated. An improvement of the VA with pinhole was considered refractive error and a VA of  $\leq 6/12$  was regarded as reduced vision. A pilot study was carried out three days to the study in a primary school not in the study sample. Students with ocular disorders needing further investigation and treatment were referred to an easily accessible tertiary health facility

within the Local Government, with a predesigned referral form.

Ethical clearance was obtained from the Ethics Committee of the University of Port Harcourt Teaching Hospital and written consent from the Bayelsa State Ministry of Education and the Yenegoa Local Government Basic Education Authority. Personal data were recorded in a predesigned and pretested questionnaire and analysed using the Epidemiological information software - EPI INFO version 6 and scientific calculator.

The following operational definitions for the purpose of this study;

Visual acuity of 6/6 or better was considered as normal.

Refractive error was considered as unaided distant visual acuity of 6/9 or less which improved with pinhole.

## RESULTS

There were 1,295 pupils in the class registers of the selected primary schools. Forty two pupils (3.2%) were absent from school on the screening days, giving a coverage rate of 96.8%. Of the 1,253 pupils screened, 11 were excluded from the study as they were at least  $\geq 16$  years. The primary 5 class, with 228 (18.3%) pupils had the highest number of pupils per class. Of the 1,242 pupils examined, 1,043 (84%) were from public schools and 199 (16%) from private schools, giving an approximate public to private pupil ratio of 5:1. Children aged 8–13 years made up 77.8% of the study population (Table 1). There were 658 (53%) females and 584 (47%) males, giving a slight female preponderance - ratio of 1.1:1 (Table 1).

Table 1: Age and Sex Distribution of the study population, in Nigeria, 2009.

Age range	Male	Female	Total	Percentage
5–7	112	121	233	18.76
8–10	254	251	505	40.66
11–13	195	266	461	37.12
14–15	23	20	43	3.46
<b>Total</b>	<b>584</b>	<b>658</b>	<b>1242</b>	<b>100%</b>

A total of 2,427 (97.7%) eyes had visual acuity of 6/6 (Table 2). Fifty six eyes had visual acuity of  $\leq 6/9$ . Twenty six eyes (1%) had reduced vision (VA  $\leq 6/12$ ) while two pupils (0.1%) had visual acuity

of  $<6/18$  in the better or worse eye (Table 2). One pupil (0.05%) with visual acuity of Hand Motion was the only case of monocular blindness recorded in the study (Table 2).

Table 2: Unaided Visual acuity in the study population, in Nigeria, 2009.

Eyes	6/6	6/9	6/12	6/18	6/24	HM	Total
<b>Right</b>	1212(48.8%)	15(0.6%)	9(0.4%)	5(0.2%)	1(0.05%)	0	1242
<b>Left</b>	1215(48.9%)	16(0.6%)	6(0.2%)	4(0.2%)	0	1(0.05%)	1242
<b>Total</b>	2427(97.7%)	31(1.2%)	15(0.5%)	9(0.4%)	1(0.05%)	1(0.05%)	2484

\* Hand Motion (HM)

Of the 56 eyes with visual acuity of  $\leq 6/9$  presented with a pin hole, 49 eyes (87.5%) improved in their visual acuity (Table 3). Forty three (76.7%) of the 56 eyes with VA of  $\leq 6/9$  presented with pinhole, improved to 6/6 vision (Table 3). Twenty two (88%) of the 26 eyes with

visual acuity of  $\leq 6/12$  improved in VA when presented with pin-hole (Table 3).

A total of 27 pupils had refractive error, giving a prevalence of 2.17%. Refractive error involved both eyes in 22 pupils (81.5%) and one eye in 5 pupils (18.5%). The 8-10 year age-range

had the highest proportion (40.7%) of cases of refractive error followed by the 11-13 year age group (37%) as shown in table 4. Both sexes were

almost equally affected by refractive error (Table 4).

Table 3: Visual Acuity with Pin Hole in the study population, in Nigeria, 2009.

Eyes	6/6	6/9	6/12	6/18	NI	Total
Right	22(37.5%)	3(5.3%)	1(1.8%)	1(1.8%)	3(5.3%)	29
Left	21(39.2%)	1(1.8%)	0	0	4(7.1%)	27
<b>Total</b>	<b>43(76.7%)</b>	<b>4(7.1%)</b>	<b>1(1.8%)</b>	<b>1(1.8%)</b>	<b>7(12.4%)</b>	<b>56</b>
Total =56, 100%			*No improvement (NI)			

Table 4: Age and sex distribution of refractive error in study, in Nigeria, 2009.

AGE RANGE	SEX		TOTAL	PERCENT
	M	F		
5 – 7	1	2	3	11.11
8 – 10	7	4	11	40.74
11 – 13	5	5	10	37.04
14 – 15	1	2	3	11.11
<b>TOTAL</b>	<b>14</b>	<b>13</b>	<b>27</b>	<b>100</b>

## DISCUSSION

The visual experience of a child plays a significant role in his/her psychological, physical and intellectual development (13). Visual impairment due to refractive error is a significant cause of morbidity in children worldwide (14-15). Many of the causes of visual impairment in childhood are avoidable, being either preventable or treatable (15). Children with visual impairment need urgent attention as delay in treatment can result in amblyopia (16).

The prevalence of refractive error in this study falls within the World Health Organisation prevalence of 2-10% worldwide (10). Also, the prevalence in this study was close to that observed by Chuka-Okosa in her study on refractive error in rural school children in Nkanu West LGA of Enugu State, South-Eastern Nigeria where she reported a prevalence of 1.97% (17). The case definition for refractive error was however different in the Chuka-Okosa study as only pupils with VA of less than 6/9 were further investigated for refractive error. On the other hand, Ajaiyeoba in his study on blindness and visual impairment among school children in a rural community in South Western Nigeria, observed a lower refractive error prevalence of 0.87% (18).

Comparatively, Balogun's study on vision screening among pupils from both public and private primary schools in Lagos Island observed a very high refractive error prevalence of 21% (19). The very high prevalence observed in Balogun's study may be related to the cosmopolitan nature of Lagos and the large heterogeneous population of Lagos. The studies by Nkanga in Enugu and Faderin in Lagos, both in cosmopolitan cities, also observed a high prevalence (7.4% and 7.3% respectively) of refractive error (6,7). The differences in the prevalence of refractive error in these studies, may also in part, be related to differences in sample size and methodologies used in identifying pupils with refractive error. In our study there may have been under diagnosis of cases of refractive error, as some pupils having 6/6 vision with possible astigmatism, may have been missed. However, being a Screening exercise simple methods were used to identify pupils with refractive error who will further benefit from more detailed refraction and treatment.

In this study 97.7% of eyes had normal vision while those with visual acuity of 6/9 or better were 98.9%. Similarly, the study by Ugochukwu on vision survey in primary school children in South-

Eastern Nigeria observed that 96.5% of students had visual acuity of 6/9 or better (8).

The prevalence of pupils with an uncorrected visual acuity of 6/12 or less in this study was 1%. The refractive error study in children (RESC) carried out in Durban South Africa, involving children 5-15 years of age, found a prevalence of uncorrected visual acuity (VA of 6/12 or less) of 1.4%, decreasing to 0.32% with correction (20). A similar study (RESC) in Nepal had a prevalence of 2.9% of uncorrected visual acuity of 6/12 or less (21). In the study (RESC) in China, Zhao found a high prevalence of uncorrected visual acuity of 6/12 or less, in at least one eye to be 12.8% and this decreased to 1.8% after correcting for refractive error (22).

Refractive error was responsible for most of the cases of reduced vision (84.6%) in this study. The prevalence of visual impairment in this study was 0.1% with refractive error making up 50% of this Ajaiyeoba in his study observed that refractive error accounted for 58% of visual impairment (19). The Ajaiyeoba study involved primary school pupils aged between 4-24 years and this may partly account for the higher percentage of visual impairment which increases with age. The study by Ugochuku which had similar case definitions with our study showed a lower prevalence of visual impairment, with refractive error accounting for 33% of cases (8).

The 8-10 year age-range had the highest proportion (40.7%) of cases of refractive error followed by the 9-13 year age group (37%). However over 75% of the study population falls within the 8-13 years age range. The 14-15 years age range with 3.1 % of the study population accounted for 11.1% of cases of refractive error.

It was observed in this study that materials (visual acuity chart, vision recording book and other items) given to trained school teachers, were not being used but firmly locked up as "souvenirs" in the head teachers office, a situation that will not allow for an effective school eye health program. Some of the reasons given by the teachers for not using the reading materials included the fact that there was no supervision from the State ministry of education and also, that they needed some incentives in the form of monthly allowances, as this exercise was not really, part of their job description.

Vision screening should routinely be done at school entry, midway through school and at completion of primary school, for early detection and treatment of eye diseases. The School Eye Health Screening Program should however, be strengthened to provide among other things, spectacles for students to correct refractive errors, after proper ophthalmological assessment.

The school eye health program can be integrated with the primary health care program in order to increase awareness on the common eye diseases in children and measures taken to prevent or treat them. This synergy will allow for effective monitoring of the school eye health program, as the ministry of education lacks the required capacity for the effective running of this program, a situation that was observed in this study.

Though this study showed the magnitude of refractive error in school children in Bayelsa State, the findings cannot be entirely representative of the general children population.

In Conclusion, the prevalence of Refractive Error in primary school children in south-south Nigeria was 2.2 % and most eyes (97.7%) had normal vision.

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