

## ORIGINAL RESEARCH

# Prevalence of eye diseases among school children in a rural south-eastern Nigerian community

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## ABSTRACT

**Introduction:** Vision has an essential role in a child's development, and visual deficit is a risk factor not only for altered visio-sensory development, but also for overall socioeconomic status throughout life. Early detection provides the best opportunity for effective treatment of eye and vision problems in children. Therefore, timely screening is vital to avoid lifelong visual impairment. There is a paucity of data regarding the causes of eye disease among rural children in Nigeria. The aim of this study was to determine the prevalence and causes of eye disease among children residing in rural communities in Nigeria.

**Methods:** A cross-sectional survey was conducted to determine the prevalence and common causes of ocular morbidities in primary school children in Abagana, a rural community in Njikoka Local Government Area of Anambra State, South-East Nigeria. Children aged 6–16 years in all 8 primary schools were registered, interviewed and their eyes examined. Data were analyzed according to age, sex, type of ocular disorder and causes of visual impairment. Frequency and percentages were calculated with univariate analysis and parametric method.

**Results:** The census population consisted of 2092 children, 1081 (51.7%) males, with a male to female ratio of 1.07:1. Ocular disorders were found in 127 (6.1%) of the population. The most common ocular disorders in this community were vernal conjunctivitis 61 (2.9%) followed by refractive error 14 (0.7%). Amblyopia, which is avoidable, was the most common cause of visual impairment.

**Conclusion:** Study findings indicated that early detection through early eye screening; health education and access to a quality eye care facility will reduce the burden of eye disease and blindness among rural Nigerian children.

**Key words:** eye disease, Nigeria, rural children, school health.



## Introduction

The prevalence of blindness in children varies from approximately 0.3 per 1000 children in wealthy regions of the world, to 1.2/1000 in the poorer countries or regions<sup>1</sup>. There are three main reasons for this<sup>2</sup>. First, diseases that can lead to blindness such as measles, vitamin A deficiency, and ophthalmia neonatorum are still prevalent in poor regions of the world. Second, there are fewer well equipped facilities and personnel trained in managing treatable causes of blindness in poorer countries. Third, in rural areas ignorance, poverty and superstition contribute to disease causation and propagation, and work against treatment and prevention. These factors collectively impact negatively on the perception of eye diseases and encourage the use of harmful traditional eye medications which can result in avoidable blindness.

Incidence data are very difficult to obtain, but it has been estimated that there are 8 new blind children for every 100 000 children each year in industrialized countries<sup>2</sup>. In developing countries, approximately 500 000 children become blind every year – one every minute – and approximately half of these children die in one to two years<sup>3</sup>. Available data indicate that the prevalence of childhood blindness varies from 1.2/1000 children in very low income world regions to 0.3/1000 children in high income regions<sup>4</sup>.

The high number of blind years resulting from childhood blindness was one reason for the control of childhood blindness to become a priority for the World Health Organization/International Agency for Prevention of Blindness (WHO/IAPB) Vision 2020: The Right to Sight Programme<sup>5</sup>. Children who are blind must overcome a lifetime of emotional, social and economic difficulties, which also affect the family and society<sup>1</sup>. Loss of vision in children influences their education, employment and social activities<sup>1</sup>. Childhood blindness is second only to adult cataracts as a cause of blind person years. Approximately 70 million blind person years are due to childhood blindness worldwide<sup>6</sup>.

Vision has an essential role in a child's development, and a visual deficit is a risk factor not only for altered visio-sensory development, but also for overall socioeconomic status throughout life<sup>7</sup>. Timely screening for the early detection of eye and vision problems in children is vital to avoid lifelong visual impairment. Early detection provides the best opportunity for effective treatment<sup>6</sup>.

The benefits of regular eye screening in children that includes a comprehensive eye examination has been recognized worldwide, including in developed economies<sup>8</sup>. Early corrective measures for deficits detected would greatly assist in reducing childhood blindness and related morbidity. In a study among school children in Oman, 28 765 (6.9%) of the 416 157 children examined were found to have defective vision<sup>9</sup>. In Pakistan, of a total of 38 575 schoolchildren, 2065 (5.3%) were found to have refractive errors. Early treatment reduces the incidence of avoidable childhood visual impairment and blindness.

School-age children (6-15 years) represent 20–30% of the total population in most low income countries<sup>10</sup>. For Nigeria this translates to 20–30 million children. In some states in Southern Nigeria, 80% of children attend school and can therefore be reached by healthcare programs<sup>11</sup>. Therefore, school children are an important, large target group for early detection of eye diseases and prevention of blindness<sup>12</sup>.

Not all ocular conditions result in visual impairment. In Pakistan, the prevalence of non-vision-impairing conditions is 14.6%<sup>13</sup>; however, affected individuals may need frequent clinic visits which may impact on academic performance. Sufferers of allergic conjunctivitis tend to experience quality of life reduction related to general health<sup>14</sup>. Of more concern in rural settings is the potential use of harmful traditional eye medication and improper use of proprietary medications such as steroids for vernal keratoconjunctivitis and other conditions, which may result in vision impairing complications.



## *Aim*

There are little data on the causes of ocular morbidity in children in rural communities in Nigeria. This study targeted primary school children in a rural community of Anambra State, Nigeria, with the aim of determining the prevalence of ocular disorders and their common causes, and applying these findings to prevention of blindness programs.

## *Context*

Abagana is a rural community in Anambra State, Nigeria. It has 8 primary schools with 2336 pupils and 128 teaching staff. There is one community health center and a comprehensive health center of the University of Nigeria Teaching Hospital with only a nurse who has ophthalmic training. There is no ophthalmologist or optometrist in the community. However, there are 25 consultant ophthalmologists and 10 optometrists practicing at both private and public hospitals in the urban city of Enugu, approximately 100 km from rural Abagana.

It has been observed that after work force and work load issues, financial factors are the greatest threat to rural practice viability<sup>15</sup>. In Nigeria no financial incentives are offered to healthcare personnel working in rural areas. Several studies have reported the effective use of teachers for initial eye screening of school children as a way of resolving health personnel shortage challenges<sup>8,16</sup>. In a study in Tanzania, a simple screening by teachers correctly identified 80% of pupils with bilateral poor eyesight, with 91% specificity<sup>16</sup>. Currently in Nigeria school health services provide immunization services through the national immunization scheme, general health education and minimal routine eye screening programs.

## Methods

After obtaining verbal informed consent from parents and school heads, all available and eligible children aged 6 years to under 16 years ( $n=2092$ ) in the 8 primary schools in Abagana

were interviewed and examined for this cross-sectional study.

Visual acuity was measured outdoors for each child by an ophthalmic assistant using the standard Snellen eye-test chart placed at 6 m. When visual acuity was  $<6/9$ , a pinhole was used to re-test. Recorded visual acuities were further cross-checked by an author to ensure validity.

Using the Modified WHO/PBL eye examination record, a trained assistant collected the required personal data and ophthalmic history. The sections on visual assessment and ocular examination were completed by an author who is a consultant ophthalmologist.

External eye examination was performed using a pen torch and a simple magnifying head loupe. A direct ophthalmoscope was used to examine the posterior segment of the eye. Where necessary (eg visual acuity  $< 6/18$  and did not improve with pinhole test, with no obvious identifiable causative factor), dilated funduscopy was performed using short-acting dilating eye drops (0.5% Tropicamide<sup>®</sup>). Ocular alignment was evaluated with corneal reflex test and cover-uncover tests.

Refractive error was considered when subnormal visual acuity improved with a pinhole test. Amblyopia was also considered in a child with subnormal visual acuity in the absence of external eye, anterior and posterior segment pathology.

Children with minor eye problems were treated, while those with major eye conditions were referred to the University of Nigeria Teaching Hospital for further evaluation and management.

Data were analyzed using Statistical Package for Social Sciences (www.spss.com). Univariate analysis and the parametric method were used to calculate frequency, percentage, and 95% confidence intervals (CI). Comparison of percentages was by  $\chi^2$  test.



## Ethics approval

Ethical clearance for the study was obtained from the Health Research Ethics Committee (HREC) of the University of Nigeria Teaching Hospital, Enugu (approval numbers not issued). The study was adequately explained, and refusal of participation by parents, teachers or children was respected.

## Results

Of 2336 primary school pupils, 2274 reported for participation but only 2092 were examined. Of the 244 not examined, 62 were eligible but absent from school on the day of visit, while 182 were excluded due to age. There were more males ( $n=1081$ ; 51.7%) than females, giving a male to female ratio of 1.07:1. The 6–10 years age group constituted 52.7% of the subject population (Table 1).

Refractive error and corneal scar were the main causes of subnormal vision (Table 2). Bilateral low vision was seen in 6/2092 (0.3%), caused mainly by amblyopia which was diagnosed in 3 out of the 6 children who had low vision. No child was found to be blind according to WHO classification. However, monocular blindness was found in 4/2092 (0.2%) of children, due to chorioretinal scars, congenital glaucoma, traumatic cataract and traumatic optic neuropathy, contributing 25% each to the causes of monocular blindness.

Of the 2092 school children seen, a total of 6.1% (CI 0.03–0.13) had ocular disorders of various types (Table 3), some occurring bilaterally. Vernal conjunctivitis was the commonest disorder at 48% of all ocular disorders, followed by 11.01% refractive error and 7.1% subconjunctival hemorrhage.

## Discussion

Most of the children in this study were found to have normal vision. This may be attributed to the absence of environmental factors known to cause blindness in children (eg vitamin A deficiency) and the positive impact of the

sustained rural immunization program against measles by the Federal Ministry of Health. This could be strengthened by the deployment of adequate human resources and the provision of an affordable and accessible eye care facility for the rural populace to eliminate childhood blindness.

The age group with the lowest number of school children was 14–16 years (3.7% of the population studied) which was similar to 5.2% in a rural study by Oragwu<sup>17</sup>. However these numbers are relatively high because this age group should be in secondary school, and may be the result of poverty, ignorance and altered priorities in rural communities delaying the entry of children into formal schooling. The slight preponderance of males in the total number of children studied despite more females at the entry level age-group (6–9 years) was due to the retention of males as age-groups and academic class levels increased. This reflects the socio-cultural gender bias of the Igbo tribe in South-Eastern Nigeria<sup>18</sup>, among whom male gender is preferred and limited financial resources are directed to boys' education. This gender bias leads to socioeconomic limitations for girls. Increased education to encourage female participation in education, and the provision of free education, especially in rural areas, is indicated.

The 0.5% prevalence of visual impairment found in this study is lower than findings in other studies by Nkanga<sup>19</sup> (0.72%), Yoloye<sup>20</sup> (7.4%), Onyekwe<sup>21</sup> (4.1%) and Mohammed<sup>22</sup> (18%). These differing results may be due to differences in study areas, age groupings and definitions of visual impairment. For instance, the study of Onyekwe et al combined both primary and secondary school subjects, while Yoloye's definition of visual impairment as visual acuity of 6/9 to 3/60 would tend to produce a higher prevalence of visual impairment when compared with the present study.

According to the WHO definition, no case of blindness was found in this study, as in a similar study in Ethiopia<sup>22</sup>. In Nkanga and Dolin's study, the prevalence of blindness was 0.05%<sup>10</sup>. This low prevalence is consistent with a low global prevalence of blindness in children<sup>23</sup>. In addition, most blind children would be in schools for the blind, and some blind children would be concealed at home due to stigma and ignorance of the fact that the child could be helped.



**Table 1: Age and sex distribution of the study subject**

Age group (years)	Sex		Total
	Male	Female	
6-9	500	600	1100
10-13	533	382	915
14-16	48	29	77
Total	1081	1011	2092

**Table 2: Causes of bilateral subnormal, low vision and unilateral blindness among school children aged 6–16 years old**

Cause	Vision – n (%)			Total (N=2092) n (%)
	Subnormal (VA <6/9-6/18)	Visual impairment (VA <6/18->3/60)	Unilateral blindness (VA<3/60)	
Refractive error	14(70)	-	-	14 (0.7)
Corneal scar	3(15)	-	-	3 (0.1)
Amblyopia	3(15)	3 (50)	-	6 (0.3)
Macular scar	-	1 (16.7)	1 (25)	2 (0.1)
Albinism	-	1 (16.7)	-	1 (0.05)
Congenital glaucoma	-	1 (16.7)	1 (25)	2 (0.1)
Traumatic cataract	-	-	1 (25)	1 (0.05)
Traumatic optic neuropathy	-	-	1 (25)	1 (0.05)
Total	20 (100)	6 (100)	4 (100)	27 (1.5)

VA, Visual acuity.

**Table 3: Distribution of ocular disorders according to age**

Ocular disorder	Age (years) – n (%)			Total n (%)
	6-9	10-13	14 -16	
Vernal conjunctivitis	27 (21.3)	31 (24.4)	3 (2.4)	61 (48.1)
Refractive error	6 (4.7)	6 (4.7)	2 (1.5)	14 (11.0)
Subconjunctival haemorrhage	7 (5.6)	2 (1.5)	-	9 (7.1)
Ptosis	5 (3.9)	1 (0.8)	2 (1.5)	8 (6.2)
Amblyopia	1 (0.8)	5 (3.9)	-	6 (4.7)
Hordeolum externa	4 (3.1)	1 (0.8)	-	5 (3.9)
Miscellaneous	8 (6.2)	15 (11.8)	1 (0.8)	24 (18.9)
Total	58 (45.8)	61 (48)	8 (6.2)	127 (100)



However, in this study 4 (0.2%) of the 2092 children examined had visual acuity of  $<3/60$  in one eye, which corresponds to monocular blindness. The four contributing causes were congenital glaucoma, traumatic cataract, optic neuropathy resulting from blunt trauma to the brow, and macular chorioretinal scar. In Oragwu's study<sup>17</sup>, the 3 (0.18%) cases of monocular blindness were due to traumatic cataract, phthisis bulbi and squint. That trauma was responsible for 50% of the present cases and 100% of Oragwu's suggests that simple preventive measures to reduce the occurrence of ocular injuries may significantly reduce the prevalence of monocular blindness in childhood in this study area.

This study found a 6.1% prevalence of ocular disorders, which is lower than in the studies of Nkanga and Dolin<sup>10</sup>, Yoloye<sup>20</sup>, and Bhar and Abiose<sup>24</sup>. This may be due to differences in the study areas and the period of study as some ocular disorders have seasonal variability. It may also be a reflection of improved healthcare delivery over time.

The commonest ocular disorders identified were vernal conjunctivitis, followed by refractive error. Refractive error was commonest in a similar study in Enugu Nigeria<sup>10</sup>, while trachoma ranked highest in similar studies in Ethiopia<sup>22</sup>, and India<sup>25</sup>. This variation may be attributed to differences in study areas and populations, with the Ethiopian and Indian studies performed in trachoma-endemic communities. Although vernal conjunctivitis was the major cause of morbidity in this study, it rarely causes visual impairment, except where harmful traditional eye medication is used, as is common in rural Nigeria. However, in this study refractive error was the cause of subnormal vision in 70% of the children presenting with reduced visual acuity. This is slightly higher than was found in a study by Naidoo et al<sup>26</sup>, where refractive error accounted for 63.4% of causes of reduced vision in 191 eyes. While this study was school-based involving 2092 children, the study by Naidoo et al was community-based involving 5599 children. In addition, in this study subnormal vision was defined as visual acuity  $<6/9$ , while in Naidoo et al's study it was  $<6/12$ . The definition

used in the present study would result in a higher number of children diagnosed with subnormal vision. Overall, this underscores the importance of regular eye screening of children because early correction of vision is necessary to prevent amblyopia.

Most of the curable and preventable ocular disorders found were due to factors for which there are intervention programs. For instance monocular blindness from traumatic cataract is curable surgically (if the lens is the only structure affected), while amblyopia can be prevented by early detection and treatment. Such interventions can be enabled by regular vision screening of children; intensive eye health education of children, parents and teachers; and the provision of human and infrastructural resources to cater for eye health, especially in rural areas.

### *Limitations*

A major limitation of this study is that it was school based, which may not reflect the clinical conditions in this community where a significant number of children may not attend school due to poverty. Also, due to the logistical challenges of a daytime study, it was difficult to recognize and diagnose night blindness. The study did not evaluate diagnoses recognized and reported by the child, parent/guardian or teachers.

### **Conclusion**

This study found a prevalence of 6.1% of ocular disorders among the primary school children in Abagana, Nigeria. The commonest cause of visual impairment was amblyopia, which is preventable, and most cases of visual impairment were either curable or preventable. Vernal conjunctivitis was the commonest ocular disorder, followed by refractive error, neither of which contributed to visual impairment. Infective disorders did not feature as important causes of ocular morbidity. Access to preventative strategies and programs, as well as prompt and appropriate attention to curable causes



will drastically reduce ocular morbidity and blindness among children in rural Nigeria. To achieve this, eye care workers must be encouraged to work in rural areas with the provision of modern facilities to guarantee viability of rural practice. Only then will equitable access to quality eye care services significantly reduce the burden of eye diseases and blindness among rural Nigerian children.

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