The Prevalence of Visual Acuity Impairment among Children in Nigeria – A Systematic Review

Nasiru S. Kangiwa¹, Basiru Shuaibu¹, Buhari Aliyu¹, Isiyaku M. Gwarzo³, Kabiru A. Ladan¹, Shahzad Ahmad³, Kamaldeen O. Sanusi¹,², Kamaldeen O. Sanusi¹,², Kabiru A. Ladan¹, Murtala B. Abubakar²

¹Department of Physiology, Faculty of Basic Medical Sciences, College of Health Sciences, Usmanu Danfodiyo University PMB 2254 Sokoto, Nigeria.
²Centre for Advanced Medical Research and Training, Usmanu Danfodiyo University, P.M.B. 2346, Sokoto, Nigeria.
³Department of Human Physiology, Faculty of Basic Medical Sciences, College of Health Sciences, Bayero University, Kano.

Abstract
Background: Blindness is a major health problem, and there is an increasing trend of visual acuity impairment among children in developing countries. Vision loss in childhood has serious implications in all stages of a child's growth and development. It poses social, educational and occupational challenges, with affected children being at greater risk of developing behavioural, psychological and emotional problems, lower self-esteem and poorer social integration. The study aimed to assess the prevalence of visual impairment among children in Nigeria.

Method: A systematic review of papers published on the prevalence of visual acuity impairment among children in the country was carried out. We covered works published in Google Scholar, PubMed, ResearchGate, ScienceDirect, and African Journals Online. Primary search terms included the combination of the following keywords; “prevalence”, “visual acuity”, “visual impairment”, “children”, “Nigeria”. The database search for published articles was done without date restriction till 1 December 2021. The review was restricted to primary research published in English and peer-reviewed journals.

Results: Fourteen studies met the inclusion criteria out of the 56 studies reviewed. In Nigeria, the prevalence of visual acuity impairments ranged from 1.7% to 26.1%.

Conclusion: The prevalence of visual acuity impairment among children in Nigeria is in epidemic proportions. There is a need to pay attention to proper health education; early detection and appropriate management of impaired vision to fight against this health disorder.

Keywords: Children, Nigeria, Prevalence, Visual acuity, Visual impairment

Introduction
The primary source of integration between living organisms and the external environment is the visual system which is one of the most important sensory systems (1). Visual acuity is the clarity of vision which is dependent on the shortness of the retinal focus within the eye and the sensitivity of the interpretative faculty of the brain (2). Visual acuity impairment (VAI) is a prototype non-communicable disease with psychological and physical consequences in the population which is originating from demographic and epidemiologic transition (3). Worldwide, there are an estimated 19 million children with VAI (4). It has been suggested that VAI amongst children can be associated with a low standard of living and reduced educational opportunities (5). According to the World Health Organization (WHO), the International Classification of Diseases 11 (2018) classifies visual acuity worse than 6/12 to 6/18 as mild VAI; visual acuity worse than 6/18 to 6/60 as moderate VAI; visual acuity worse than 6/60 to 3/60 as severe VAI, and visual acuity worse than 3/60 as Blindness (6). For this review, the term "VAI" will be used to refer to all forms of low visual acuity ranging from moderate visual impairment to blindness.

VAI and blindness are more common amongst rural dwellers who are usually unemployed, have a low educational background and have low standards of living (7). In Nigeria, a study conducted by Kyari et al (2009) (8) indicated that the risks of VAI are higher among illiterate participants. Darge et al (2017) (1) conducted a study involving 378 school children in Addis Ababa, the capital city of Ethiopia, and reported a prevalence of VAI of 5.8%. Consequently, the authors recommended the establishment of a school-based vision programme.

Globally, the prevalence of visual acuity impairment varies from one region to another, with an estimated fourfold increase in low and middle-income countries compared to high-income countries (). Additionally, the major causes of VAI are different in developed countries like China, Saudi Arabia and developing countries like Nigeria and Ethiopia.
Uncorrected refractive error, lesion of the optic nerve and higher visual pathway are the most common causes in the developed countries, whereas in developing countries corneal scarring from measles, vitamin A deficiency, use of harmful traditional eye remedies, ophthalmia neonatorum, and rubella cataracts are the major causes (9).

Furthermore, it has been reported that refractive error is the second leading cause of blindness after cataracts (10). WHO and International Agency for the prevention of VI in a consultation hosted by the International Council for the education of the visually handicapped in Bangkok, Thailand recommended medical examination of children in schools for the blind as a means of identification of children with visual impairment (11). Uncorrected refractive error impacts the individual and the community by reducing the educational opportunities and employment options of the individual (12). Also, another finding by Ajaiyeoba et al showed that the most common causes of VAI and blindness in south-western Nigeria were refractive error, followed by corneal opacities and cataracts (13). Similarly, in Botswana, the commonest treatable or avoidable causes of blindness and VAI are the refractive error of about 38%, while congenital cataracts contributed to about 63% of such impairment (14).

In Nigeria, a similar study conducted by Nwakuche et al (2019) (15), reported that the major causes of VAI are cataracts, glaucoma, and uncorrected refractive error and 50% of all the cases are treatable or preventable (16).

However, in developing countries such as Nigeria, visual impairment services are inadequate, due to the low level of reporting on the demography, epidemiology and prevalence of visual impairment cases (17). Owing to the tendency for the adverse and devastating effects of VAI in the coming years, there is a necessity for the awareness of the prevalence to better prepare for the social and economic consequences in the country. There is a need to highlight the visual impairment status in all regions of Nigeria, this is because in coming decades the ageing of the Nigerian population and workplace practices, may increase the adverse and devastating effects of VAI on our society. This systematic review, therefore, evaluates the prevalence of VAI among children in Nigeria.

Methods

Eligibility criteria

The inclusion criteria are:
1. Studies that involved both sexes.
2. Studies in children 5-16 age groups.
3. Studies in which the location of the study was stated.

The exclusion criteria include studies in adult population, studies in pre-school children less than 5yrs of age, and studies in population associated with diseases or injuries.

Search criteria

We conducted a systemic review of studies published online by searching through databases without date restriction till 1st December 2021. The following online databases were searched: Google scholar, PubMed, ResearchGate, Science Direct and African Journals Online. Primary search terms included the combination of the following keywords; “prevalence”, “visual acuity”, “visual impairment”, “children”, “Nigeria”. The review was restricted to primary research published in English and peer-reviewed journals. Only epidemiological studies which stated measures of prevalence of visual impairment among children were included. In this systemic review, the studies that met the inclusion criteria were reviewed based on the following variables of interest: sample size, sampling method, participant characteristics including gender, age and the prevalence rates of visual impairment.

In the article selection process, two reviewers independently carried out the online search and screened the retrieved articles. Discrepancies were thereafter resolved by consensus.

Results

The literature search yielded 56 articles but only fourteen met the inclusion criteria (Figure 1). The full-text articles were subsequently downloaded for review. The prevalence of VAI ranged from 1.7% to 26.1%. The lowest prevalence of 1.7% was reported at Imo (15), while the highest prevalence of 26.1% was reported at Nnewi, Anambra state (2). Four of the studies reviewed were carried out in the South-South region of Nigeria (two from Rivers and the other two from Bayelsa and Cross River states). Two studies were conducted in the Southwestern part of Nigeria (Lagos and Ogun state) while six studies were from the South-Eastern region of Nigeria (two from Anambra state and the other two from Imo and Abia state, one from Enugu, and one from a study that assessed the whole South-East region). The only study from the North is the one from a North Central state (Kwara).

In 2013, a cross-sectional survey in primary school children aged 6-16 years in Abagana, a rural community in Njikoka Local Government Area of Anambra State, South-East Nigeria, reported a prevalence of 6.1% VAI among 2092 participants (18). The VAI was reported to be mainly caused by...
amblyopia. In addition, Ebri et al. (2019) conducted a cross-sectional study on the prevalence of VAI and refractive errors in school learners in Calabar, Cross River State. The subjects were classified by sex (51.3% female and 47.7% male) and the age range was 10 to 18 years. In females, the prevalence of VAI was higher (19.6%) than in males (8.2%); and both showed an increase with age. Nwakwuche et al. (2019), conducted a multistage study in Owerri, the capital city of Imo state (South-East Nigeria). The participants were stratified into age group range of 8-16, 17-25, 26-34, 35-43, 53-61, and 62-70 years and above. The prevalence of VAI in children (8-16 years) was 1.7%, and increase with an advance in age although the author did not state the difference between genders. In a recent descriptive cross-sectional study by Ezegwui et al., (2021) in school children aged 5–15 years in Enugu State, a prevalence of 7.5% was reported among 1167 participants. This was from the uncorrected, presenting and best-corrected visual acuity prevalence of 3.6%, 3.5% and 0.4% respectively. Here, myopia was observed to be more common than refractive error. Similarly, a regional survey by Maduka-Okafor and colleagues (2021) in South-East, which recruited participants from Anambra, Enugu, Ebonyi, Abia, and Imo State, reported a prevalence of 7% among 5,723 school children in both urban and rural communities (21). This was from the presenting, uncorrected, and best-corrected visual acuity of 3.4%, 3.4% and 0.2% respectively.

Atowa et al. (2018) conducted a population-based descriptive cross-sectional study among school children in Ifo, Ifo Local Government Area of Ogun State (South West, Nigeria), on the prevalence of visual impairment and ocular morbidities; a total of 1308 children aged between 5 to <16 years with 56% (734) females and 44% (574) males participated in the study. The study concluded that the prevalence of visual impairments was 6.7% with no statistical records for the gender differences and changes in age. Moreover, Okoro and Odeyemi (2013) conducted a study to assess the visual acuity status in primary school pupils in Lagos. Among 183 participants of 5 to 11 years of age, a prevalence of 3.3% was reported (25). A descriptive cross-sectional study was conducted by Sharma (2018) on the visual acuity status of school children at Nnewi, Anambra State (South-East, Nigeria). The study recruited 134 students aged 9 to 17 years with 58% (72) female and 42% (56) male students from Nnewi secondary schools. According to their finding, the prevalence of VAI was 26.1% among the participant. However, the authors did not state the difference between gender and age group.

In South-South Nigeria, Opubiri and Pedro-edge (2013) conducted a cross-sectional study on screening for refractive error in school children in Yenagoa Local Government Area of Bayelsa State. A multi-stage sampling method was used for the selection of the participants with the age range of 5-15 years. A total of 1242 children participated in the study, consisting of 658 females and 584 males. From their findings, 97.7% of pupils had normal VAI. The study concluded that the prevalence of VAI was 2.2%, and was largely due to refractive errors. The study also established that the age range within 8-10 years had the highest proportion (40.7%), then followed by the 9-13 years old age range (37%). There were no statistical differences observed along with the age groups and gender.
that the said value would not accurately represent the population in the percentage calculation. This means differences among the gender in the study. Similarly, in Port Harcourt, a prevalence of 5.9% was reported by Tabansi et al., (2009) among 1,234 primary school children. About 73% of the cases were reported to be as a result of refractive error (27). In addition, among 271 pupils between the ages of 5 and 15 years in public primary schools in Gokana Local Government Area of Rivers State, 10.3% were reported to have VAI. 57.1% of which were males and 42.9% were females (28).

In the North-Central region of the country, the prevalence of 19.9% VAI was reported among 1393 participants from primary schools in Ilorin, Kwara State (29). This was the only reported study retrieved for this region. Table 1 shows the summary of findings from the studies that were included in this review.

### Discussion

This review showed that the prevalence of visual acuity impairment among children in Nigeria ranged from 3.3% to 6.7% in the South-West, 2.2% to 10.3% in the South-South, 1.7% to 26.1% in the South-East, and 19.9% in the North-Central region of Nigeria. The lowest and highest prevalence reports were from the same region of the country, the South-East. The 1.7% prevalence could be as a result of the as a result of the design of the study, which incorporated the children and adult population, thus, reducing the sample size of the children population and also including the adult population in the percentage calculation. This means that the said value would not accurately represent the prevalence among the children population. In addition, a 7% prevalence from a recent regional survey conducted by Maduka-Okafor et al., (2021) (21), which cut across the 5 States of the South-East has the largest sample size and close to being the study that represent the true prevalence of VAI in children of the region. From studies in different parts of the world, the highest reported prevalence of VAI among children from Nigeria is higher than the prevalence report of 19.6% found in Pakistan (4). Also much higher than 8.0% found in Sekela Woreda, North-West Ethiopia (7), 5.8% found in Addis Ababa, Ethiopia (3), 6.7% found in Makelle, Ethiopia (5), 3.54% found in medina, Saudi Arabia (3), 3.7% found in Ireland (10) and 7.70% found in China (30). These variations in the prevalence of visual acuity impairment across different racial and age groups had also been noted by the WHO (6).

A systematic review of cross-sectional studies showed that women uptake for VAI surgery is about half that for men in low and middle-income countries (3,31). In this review, we determined the prevalence rates of VAI among children, but at the same time, the prevalence rates varied in these fourteen studies and we observed a significant heterogeneity. The result from this review shows that the South-Eastern region of Nigeria has the highest prevalence rate of VAI, probably as a result of the highest number of reports from the region. It is also evident that most of the reviewed studies were published during the past decades and this underscores the necessity for supplemental studies in which the visual acuity of

### Table 1. Summary of prevalence rate of visual acuity impairment (VAI) among children in Nigeria.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Age (years)</th>
<th>Sample Size</th>
<th>Study Location (Region)</th>
<th>Prevalence of VAI</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11-15</td>
<td>537</td>
<td>Abia (South-East)</td>
<td>16.8%</td>
<td>(22)</td>
</tr>
<tr>
<td>2</td>
<td>5-15</td>
<td>1,020</td>
<td>Onitsha, Anambra (South-East)</td>
<td>18.7%</td>
<td>(20)</td>
</tr>
<tr>
<td>3</td>
<td>8-16</td>
<td>371</td>
<td>Imo (South-East)</td>
<td>1.7%</td>
<td>(15)</td>
</tr>
<tr>
<td>4</td>
<td>8-16</td>
<td>134</td>
<td>Nnewi, Anambra (South-East)</td>
<td>26.1%</td>
<td>(2)</td>
</tr>
<tr>
<td>5</td>
<td>5-15</td>
<td>5,723</td>
<td>Anambra, Enugu, Ebonyi, Abia, and Imo state (South-East)</td>
<td>7%</td>
<td>(21)</td>
</tr>
<tr>
<td>6</td>
<td>5-15</td>
<td>1,167</td>
<td>Enugu (South-East)</td>
<td>7.5%</td>
<td>(20)</td>
</tr>
<tr>
<td>7</td>
<td>6-16</td>
<td>2,092</td>
<td>Abagana, Anambra (South East)</td>
<td>6.1%</td>
<td>(18)</td>
</tr>
<tr>
<td>8</td>
<td>5-11</td>
<td>183</td>
<td>Akoka, Lagos (South-West)</td>
<td>3.3%</td>
<td>(25)</td>
</tr>
<tr>
<td>9</td>
<td>9-15</td>
<td>1,308</td>
<td>Ifo, Ogun (South-West)</td>
<td>6.7%</td>
<td>(21)</td>
</tr>
<tr>
<td>10</td>
<td>4-15</td>
<td>1,393</td>
<td>Ilorin, Kwara (North Central)</td>
<td>19.9%</td>
<td>(29)</td>
</tr>
<tr>
<td>11</td>
<td>5-15</td>
<td>271</td>
<td>Gokana, Rivers (South-South)</td>
<td>10.3%</td>
<td>(28)</td>
</tr>
<tr>
<td>12</td>
<td>5-15</td>
<td>1,234</td>
<td>Port Harcourt, Rivers (South-Bouth)</td>
<td>5.9%</td>
<td>(27)</td>
</tr>
<tr>
<td>13</td>
<td>8-10</td>
<td>1,242</td>
<td>Bayelsa (South-East)</td>
<td>2.2%</td>
<td>(26)</td>
</tr>
<tr>
<td>14</td>
<td>13-15</td>
<td>4,241</td>
<td>Calabar, Cross River(South-South)</td>
<td>7.9%</td>
<td>(19)</td>
</tr>
</tbody>
</table>
children is determined across the different geopolitical zones of Nigeria, especially in the northern part of the country where there are paucity of information in this regard.

This review indicated that the prevalence of visual impairment among children in Nigeria is high. There is therefore the need for relevant agencies involved in health management in the country to pay attention to eradicate this menace since most of the causes of visual impairment have been identified from indigenous studies.

However, considering the implication of visual anomalies for economic achievement, as well as overall well-being, this review could provide useful information for policymakers in planning, evaluation and provision of health care services to children.

Limitation

In the present review, only the prevalence of visual acuity impairment among the children was reviewed. In addition, no available report on the prevalence on the prevalence of VAI in the Northern Western and North-Eastern parts of Nigeria. This might limit the interpretation and generalization of the result of this study.

References

7. Zelaem M, Abebe Y, Adamu Y, Getinet T. Prevalence of visual impairment among school children in three primary schools of Sekela Woreda, Amhara regional state, north-west Ethiopia. S A G E o p e n M e d [I n t e r n e t] . 2 0 1 9 M a y 1 0 ; 7 : 2 0 5 0 3 1 2 1 1 9 8 4 9 7 6 9 – 7 0 . A v a i l a b l e f r o m : h t t p s ://pubmed.ncbi.nlm.nih.gov/3205693.

Annals of Basic and Medical Sciences Vol. 3 No. 1 Jan - Jun. 2022 199 ISSN: 2782-7550 (Print) ISSN: 2782-7542 (Online)

https://www.abms.udusok.org
doi.org/10.51658/ABMS.202231.7