Prevalence and Associated Child Characteristics Factors of Visual Impairments among Primary School Pupils in Bende and Umuahia North Local Government Area Nigeria

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Abstract- Visual impairments (VI) among school children have implications in all aspects of child's development. This study was aimed at determining the prevalence, types and knowledge on visual impairments among primary school pupils in Bende and Umuahia North of Abia State Nigeria. The study was designed as a descriptive cross-sectional study investigating visual impairment in primary school pupils from selected schools in the study LGAs. A random sampling technique was used in selecting the schools and the pupils addition, Descriptive analysis was performed using distribution tables and charts, Chi square test was used to test to association between variables in the data. the results show that 4.3% of the pupils had visual impairments (VI), of which 64.8% were boys, but no evidence of association between VI and gender was established in this study. Refractive errors were the leading cause of VI (63%) screened of VI. Significant association was found between age and VI at 5% level (p=0.030, χ2=8.947) and the 6-10 years old were the most affected age group at 6.6%. Also, significant association was found between the primary level of the children and the occurrence of VI (χ2 = 8.335; p = 0.015). In conclusion, VI is still a challenge among primary school pupils and there is need to enforce policies on constant screening for VI in primary schools to encourage early detection and treatment.

Indexed Terms- Visual Impairments, Prevalence Child Characteristics, Pupils

I. INTRODUCTION

Visual impairment in children pose major challenge in school aged children ranging from childhood development and future achievements including schooling, work, leisure, family relations and societal contributions in general. It represents a decreased ability to see often defined as a best corrected visual acuity of worse than either 20/40 or 20/60, which causes problems not fixable by usual means, such as glass wears or contact lenses. [1]. The classifications of visual impairment include mild vision loss which indicates the presence of better eye vision with best possible glasses correction of 20/30 to 20/60, , moderate or low vision (20/70 to 20/200), severe (20/200 to 20/400), Blindness (20/400 to 20/1,000) : near total blindness (More than 20/1,000) and total blindness (No light perception) [2]

The consequences of visual impairment among school aged children are particularly huge considering that vision is so fundamental to many aspects of child early development including motor skills, cognitive development and social adaptation, all of which are associated with reduction in social child educational performance (World Health Organization, 2023) [3]. The educational challenges faced by children with a vision impairment vary considerably. In addition to reduced visual acuity, pathogenic factors significantly contribute to a student's visual ability, in terms of font requirements, contrast and lighting (Loh et al., 2021) [4].

The International Agency for the Prevention of Blindness (IAPB) has reported that not less than 450 million children around the world suffer vision related conditions that required treatments (IAPB, 2023) [5]. Also, up to 90 million children are reported to be experiencing some sort of vision loss globally (Bourne, 2021) [6]. The ability to see with a clear perception of detail, colour and contrast and to distinguish objects visually (otherwise known as vision) tends to deteriorate naturally with age (American Optometric Association, 2024) [7]. Not less than 2.2 billion people around the globe are challenged with visual impairments of which up to 1 billion could have possibly been prevented (World

Health Organization, 2023) [1]. Most of the case would have been corrected even with glasses, medicine and surgery during their school child age. It is also estimated that 40% of children are blind from eye conditions that could have been prevented or could be managed if the child had access to eye care services (Bourne, 2021) [6]. However, school children with visual impairments leading to vision loss that cannot be corrected with glasses, contacts, or other methods (including surgery) are likely to have partial or complete vision loss (blindness) in no distant period (Garvin, 2018) [8].

Children, who are blind or visually impaired need to be found as early as possible so they can be examined, treated, referred, or rehabilitated. A rising prevalence of visual impairment among primary school age pupils has been reported in parts of sub-saharan region (Legesse, Abdissa, Begna & Lemma, 2024; Mvilongo et al., 2024) [9,10]. Thus in most sub-saharan countries, school aged children with visual impairment and blindness always record the lowest educational enrolment (Le Fanu, Schmidt & Virendrakumar, 2022 [11], because of their condition. Many of such children are more likely to experience denial of education (Le Fanu, Schmidt & Virendrakumar, 2022) [11], In Nigeria adequate attention and concerns have not been given to education for pupils with visual impairments. This sad fact almost guarantees that these children face a lifetime of poverty and illiteracy [12].

Clearly the present study was aimed at estimating the prevalence of VI and its association with child characteristics factors among Primary school pupils in Bende and Umuahia North LGAs. The findings of this study is expected to trigger proper visual acuity checks before admission to schools, and will also encourage annual school eye screening, provision of vitamin A supplementation to primary school children and consequently for improvements in child development school performance among pupils.

II. MATERIALS AND METHODS

Study Design
The research adopted a descriptive cross-sectional survey which was used to investigate the pattern of visual impairment and blindness in Bende North LGA, and Umuahia North LGA of Abia state. Only children that at least one of the parents/ guidance were reached were included in the study.

Study Area
Bende Local Government is one of the LGA in Abia State. It is located at 5o 23` N 738E has many 13 communities namely; Nkpa, Ntalakwu, Bende, Ezukw, Igbere, Item, Itumbuzo, Ugwueke, Umu-Imenyi, Umuhu-Ezechi, Alayi, Ozuitem and Uzuakoli with the total population of about 128.227 based on 2006 population census. Neighboring communities include Afipko, Ohaozara, Ohaofia, Arochukwu, Ikwuano and parts of Cross River state. Bende is predominantly, occupied by farmers and petty traders. Bende is blessed with so many natural resources like Phosphate, Laterite, Gravel and Lime Stone.

It is also one of the three agricultural back bone of Abia State. The people cultivate yam, cassava, coco yam and harvest Palm oil plantation for commercial and personal consumption. Umuahia North is part of Umuahia which is the capital city of Abia State in Southeastern Nigeria.

It covered an area of 250km^2 and has a population of 220,660. Umuahia North's indigenous ethnic group is the Igbo. Cities and villages in the LGA include Umuahia, Umukabia, Umuawa-Alaocha, Amaogwugwu, Umuagu, UmuekwuleOfeme, Amafo-Isingwu. Umuahia North is well known as being an agricultural market center since 1916. It is also a railway collecting point for crops such as yams, cassava, corn (maize), taro, citrus fruits, and palm oil and kernels. They are many schools within Bende North LGA, and Umuahia North. There are many public and private primary schools with a total of as 22,879 pupils enrolment in the schools in the area.

Study Population
The study focused on the primary schools within Bende North LGA, and Umuahia North, LGA of Abia state. The total population of pupils in Bende and Umuahia North LGA was gotten from the State universal basic education board office (SUBEB). There are 26 public primary schools with a total of 16,278 pupils' enrolment in the schools. There were also another 19 private primary schools containing 6,601 pupils in the area.

Sample Size Determination
The Fishers formula for sample size involving prevalence and other related studies was used in estimating a sample size of 692 from the formula [sample size (n) as n $=\frac{z^2P\,(1-P)}{d^2}$], where Z represents standard normal, p is the initial prevalence and d is the minimal error. The estimated sample size was rounded up to 700.

Sampling Technique
Cluster sampling method was used to group the primary schools into two clusters of Bende and Umuahia Norh. A total of 10 primary schools were

selected comprising of 5 schools from each of the LGAs, The selected primary schools in Bende LGA include four (4) public schools (Okwu Community Primary school Olokoro; Umuosu Community School; Mbom central school; Central Primary school Umuahia) and one (1) private primary school (Hilltop Nursery and Primary school). In Umuahia North; three public primary schools were selected (Amaohoro Primary school, Ibeku primary school and Igbere primary school) while two (2) private primary schools were also selected (Brighter day academy and Wesley primary school).

Systematic sampling was used to sample the pupils from the selected schools. The total number of pupils required in each school was first calculated, and was used to divide the required sample size in each case to arrive at an interval number. The interval number was used to select the students from their list in the school attendance register. At occasions whereby consent was not obtained for the selected student, the next student on the list was selected. The process continued until the required sample size for the study was completed.

Instrument for Data Collection
From the study, a specially designed examination protocol was used for data collection. Guided and self-administered, closed and open-ended Questionnaires were also used on pupils, The questionnaire was classified into sections, with section A focusing mainly on the characteristics of the pupils and other sections were designee in line with the study objectives.

Other instruments required included Snellen's charts, torches, batteries, a 6-meter tape measure, an ophthalmoscope, a trial set, a retinoscope, Applanation tonometer, dark curtains, stationery, a vehicle for transport and drugs. The drugs used were Mydriatic Cocktail for pupillary dilatation before fundoscopy and Cyclopentolate for Cycloplegic refraction.

Method of data collection
The pupils were assessed of their Visual acuity (VA) by four trained research assistants. The required protocol for VA testing were followed. The VA equal to or greater than 6/18 in the better eye were given free treatment for simple ailments but where excluded from the rest of the examination procedures. The pupils were also assessed of their basic characteristics using a questionnaire. These include age, gender and class of study.

Ophthalmic Examination
Ophthalmic examination for visual impairment was performed by the ophthalmic professionals. To measure VA, the required protocol for VA testing were followed. The pupils were positioned 6 metres (20feet) from the Snellen's chart of letters or numbers in decreasing sizes. They were asked to close one eye with the palm of hand at a time, and read the lines of the smallest numbers or letters visible to them. That was recorded with the distance number (6m) first, and the smallest figures read second, separated by slash (/) e.g. 6/18 or 20/60. Where vision is so poor that figures in the chart cannot be read at six meters, the chart is moved closer to the pupil and the vision recorded for example, as 3/60. On situations that the pupils cannot see the figures on the chart at close range of half a meter, the examiner waves hand so as to determine if the patient can see hand movement and thus recorded HM.

Also, whereby the student still cannot see hand movement, then it is determined if focal light from a torch may be projected by each of the four retinal quadrants and recorded as Perception of Light (PL) with accurate or inaccurate projection if projected in all four quadrants, or if projected in some or none respectively. If light from the torch cannot be seen, then VA is recorded as "No Perception of Light" (NPL).

Method of data analysis
The collected data were analyzed using IBM SPSS Statistics version 25.0. Initial analysis include descriptive analysis. Thus, the results were presented in frequency tables and figures where applicable, to describe the data characteristics distributions. Chi-Square test of independence was applied to establish the associations between Visual impairment and child characteristics such as age group, gender and class category. Probability value (p) was used to interpret significance. A p-value of equal or less 0.05 was considered significant.

Ethical Consideration
The study received ethical approval from the ethical committee of School of Health Technology, Federal University of Technology Owerri. Also, study approval was obtained from the Headmasters/Mistress of the primary schools used in the study. However, a verbal consent was sought and obtained from each pupil through their parents/ guardians and teachers. Participation in the study was made voluntary.

III. RESULTS

Distribution for Demographic Characteristics of the study Children
The output on Table 1 represents the frequency distribution of the studied pupils. On the overall, it

showed that the pupils between 6-10 years had the highest with 350(50%) followed by 11-15 years with 300(42.9%). Majority 370(52.9%) of the participated pupils were boys while 330(47.1%) were girls. Up to 380 (54%) were in primary 5-6. The frequency distribution of the pupils based on private on public school of study is also contained in the table.

Table 1 Age and Frequency Distribution of the Studied Pupils

	Total	
Variables	Freq (N=700)	Percent (%)
Age		
< 6 years	3	0.4
6-10 years	350	50.0
11-15 years	300	42.9
16-20 years	47	6.7
Total	700	100
Gender		
Boys	370	52.9
Girls	330	47.1
Total	700	100
Class		
Primary 1-2	30	4.3
Primary 3-4	290	41.4
Primary 5-6	380	54.3
Total	700	100

Prevalence of Visual Impairment among Pupils Studied

Among the primary school pupils studied, 670(95.7%) had normal visual acuity while 30(4.3%) showed visual impairment (VI). Hence the prevalence of visual impairment was found to be 4.3% among the study group (Figure 1).
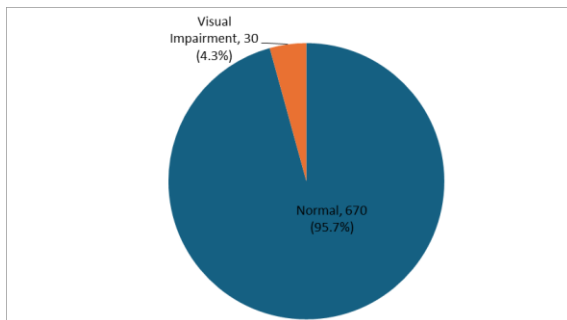

Figure 1: Prevalence of Visual Impairment among Pupils Studied

Classifications of Visual Impairment among Pupils Studied

A total of 670 (95.7%) of the respondents had normal visual acuity while 30(4.3%) had visual impairment (VI). There was no case of severe visual impairment (SVI) and blindness (Table 2).

Table 2: Pattern of Visual Impairment (VI) among the Studied Pupils

V.A Category	Frequency	Percentage
6/6- 6/18 (Normal)	670	95.7
< 6/18- 6/60 (V.I)	30	4.3
<6/60- 3/60 (S.V.I)	0	0.0
< 3/60 (Blind)	0	0.0
Total	700	100.0

Normal visual acuity, visual impairment (VI), severe visual impairment (SVI)

Refractive Errors on VI Pupils

The most common refractive error found among the studied pupils with visual impairment include Hypermetropia (63%), Myopia (20%) and Astigmatism (17%) (Figure 2).
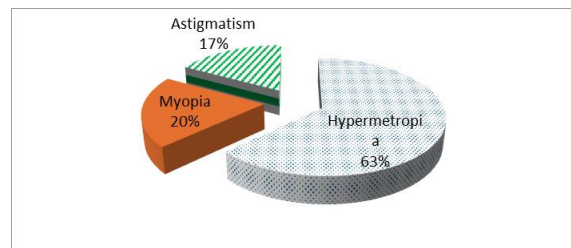

Figure 2: Types of Refractive Errors

Visual Impairment by Age of Pupils

The age groups most represented were the 6-10 years at 76.6%, followed by the 11 -15 years at 20%. None of the less than six years had VI, though they were just 3 pupils in that age group (Figure 3).
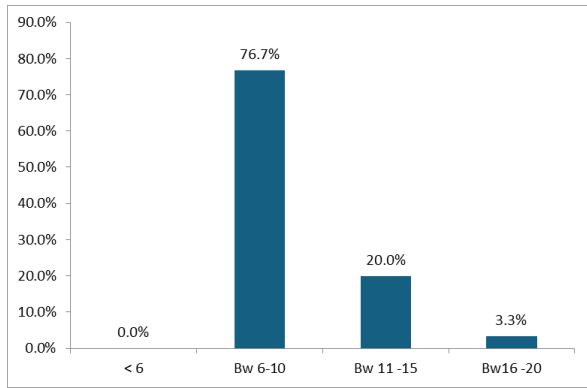
Figure 3: Percentage Distribution of VI by Age of Pupils

In Table 3, the age group of 6 -10 years old were the most affected age group for VI, followed by the age group 16 -20 (2.1%) and 11 -15 (2.0). None of the children below 6 years ole were found with VI, though only three of such children were seen at prenursery stage. Significant association was found between age and VI in this study (p=0.030, χ2=8.947).

Visual impairment, by gender shows that VI was slightly higher among boys (19: 5.1%) than among girls (11: 3.3%). The Chi-square test for difference in distribution of VI among gender could not establish evidence of statistically significant at 5% level in this study (P =0.245, χ2= 1.381). For the class category VI was highest among the primary 1-2 pupils (13.3%) follows by primary 3-4 children (5.2%). Statistical test for significance showed that significant association was found between the primary level of the children and the occurrence of VI among the study group at 5% level of significance (χ2 = 8.335; p = 0.015).

Table 3 : Association Between VI and child chrematistics (Age, gender and class of study) and VI

Child Characteristics	Presence of Visual Impairments (VI)				Total	Chi-sq (χ2)	P
	Yes	%	NO	%			
Age							
< 6	0	0.0	3	100.0	3		
6-10	23	6.6	327	93.4	350		
11 -15	6	2.0	294	98.0	300		
16 -20	1	2.1	46	97.9	47		
Total	30	4.3	670	95.7	700	8.947	0.030
Gender							
Boys	19	5.1	351	94.9	370		
Girls	11	3.3	319	96.7	330		
Total	30	4.3	670	95.7	700	1.381	0.245
Class of study							
Primary 1-2	4	13.3	26	86.7	30		
Primary 3-4	15	5.2	275	94.8	290		
Primary 5-6	11	2.9	369	97.1	380		
Total	30	4.3	670	95.7	700	8.335	0.015

IV.   DISCUSSION

The aim of the study on prevalence and pattern of visual impairment among primary school pupils in Bende and Umuahia North LGA, Abia state Nigeria was successfully achieved. The prevalence of VI among the study group was found as 4.3%. The age groups most represented in this study were 6-10 and 11-15 years. The normal school age children (5-19 year olds) are reflected in the National Health Sector Strategic Plan (NHSSP II) as well as Nigeria Education Sector Support Programme (NESSP) [13]. Majority of the respondents therefore were within the expected age category for primary schools. The age groups of over 20 and less than 6 years are not normally expected in primary schools either because they are over age or under age [13]. Visual impairment was found more in the boys than in the girls but that may have occurred by chance since gender was not

established as a significant association factor with VI in this study.

The prevalence of visual impairment in this study was 4.3%. This rate is a bit above 3.9%, found in a systematic review study in Nigeria (Eze et al., 2024) [14], but lower than 7.3%, reported from cross River State Nigeria (Ekpenyong et al., 2020),[15] and by far lower than 28% in Delta Nigeria (Moyegbone et al.,2023) [16]. It is with *0.2 to 7.8 per 10,000 children* estimated in low and middle-income countries (Yekta et al., 2022) [17]. However, it is that far above the global estimate of 2.2% [3], and therefore it is of public health importance.

The prevalence of VI is influence by age. The children age group that suffers visual impairment varies with significant degrees of ill health, nutritional deficiencies and morbidity that unequivocally impede effective learning and realization of their full productive potential [17]. This study found the 6 -12 years old as the most affected age group but that was not in tandem with 13-19 years reported in another Nigerian study (Moyegbone *et al.,*2023) [16]. Both age categories are characterized by rapid growth that includes rapid anterior- posterior diameter of the eye (from the posterior corneal surface to the retina, normally 22 to 26mm). Hence possible reason for differences in prevalence can be explained by the difference in the socio-economic status of the study area (Ekpenyong *et al.* 2020; [15].

Similar to the findings in this study, refractive errors are reported as the major cause of VI in children in some other studies (Ekpenyong *et al.* 2020; Moyegbone *et al.,*2023; WHO,2023, Yektl, *et al.,* 2022) [15, 16, 3, 17]. Hice, this finding is consistent with other studies.

The most affected class in this study is primary 1-2. This is not an obvious surprise considering that it falls within the study most affected age group. Besides, age at 6 is the recommended primary school entry year for pupils in Nigeria.

CONCLUSION

Visual impairment remained among primary school pupils in the study area remained a challenge and can be corrected since severe cases are rare, The major cause of the impairments is Hypermetropia. Age and class of study are both significant associating factors of visual impairments among study pupils. The most affected by visually impairment among primary school pupils were the 6-10 years and who are mostly in early primary classes. Visual impairment occurred more on boys than girls but no evidence of significant effect of gender was found. Since refractive error was the leading cause of visual impairment in this study, further studies the significant influence of refractive errors on visual impairments among primary school pupils need to be undertaken in order to establish the national burden and plan appropriate actions to address the problem.

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