

Oculo-visual assessment of children and adolescents with special needs in selected schools within Imo State, Nigeria

ABSTRACT

Aim: This was a cross-sectional study conducted to assess the oculo-visual status of children with special needs in three selected special schools in Imo State, Nigeria. Children with special needs are at a higher risk of visual impairment as compared to normal population. Interestingly, majority of the ocular disorders are treatable.

Methodology: The study was conducted on children ages 5-25years (mean 12.0 ± 3.2 years) and detailed ocular examination on 296 children using standard examination techniques was recorded.

Results: Results revealed that oculo-visual disorders were seen in 196 (66.2%) children. Oculo-visual disorders were found in 75.5% of children with hearing impairment, 83.3% in children with cerebral palsy, 75% in children with autism, 85.7% in children with down syndrome, 38.6% in children with speech disability, and 64% in children who are deaf and dumb. The most common ocular disorders seen in these children were refractive errors (30.5%), strabismus (12.7%), amblyopia (8.9%) and cataract (7.7%). Children requiring further evaluation were referred to base hospitals in Imo State, Nigeria.

Conclusion: Oculo-visual problem is highly prevalent among children with special needs in Imo State, most commonly, the problems were refractive errors, strabismus, amblyopia, cataract and cornea disorders. The prevalence was predominant among the female teenagers (15-19years). Government and stakeholders in the health care and humanitarian sectors should place more priority on the ocular-health status of children with special needs.

Keywords: Refractive errors, strabismus, amblyopia, cataract, cornea disorders, teenagers

1. INTRODUCTION

Ocular problems are common in children with disabilities. The eyes play an important role for sending visual signals to the brain, and a lot of information presented at school is presented visually. Its functions are vital to the acquisition of information and skills such as language, interpreting facial expressions, lip-reading and skills requiring hand-eye coordination like driving [1]. As such, vision is considered one of the most important senses for children especially those with disabilities because they greatly depend on visual inputs for communication and understanding; unfortunately, in such children, visual problems tend to be overlooked because the focus is largely on their primary disability [2,3]. According to the World Health Organization (2011) [4], the most common childhood eye diseases leading to blindness in sub-Saharan Africa are largely avoidable and treatable if sufficiently reported and due attention given. Children with disabilities constitute a critical part of the population. According to the World report on disability, estimated 25 million Nigerians have had at least

one disability, and about 1.3 million of these persons are children [5, 4]. Good ocular health is vital for optimal childhood development. It has been noted to play an integral role in the psychosocial development of special needs children as well as compensate for certain impaired functions [1], particularly in children with hearing impairment [6]. As a result of seeming neglect children with special needs are at a higher risk of ocular and visual problems than their peers [7]. Consequently, these children may not be able to express the presence of symptoms adequately [2]. Moreover, performing eye examinations on this population can be challenging and time-consuming, requiring more skills and a broader range of assessment instruments [8, [9]; most of them manifest sensory integration issues such as sensitivity to light, or aversion to new surroundings. Perhaps, these perceived difficulties and for reasons yet investigated, many of these children do not receive adequate assessment of visual function. Delay in the detection and management of these disorders compounds the already existing challenges in these children. Studies on the prevalence of ocular disorders among special need children have been done in Calabar [7], Northern Nigeria [10] and Southwest [11].

In view of the burden of visual impairment in children with special needs, this study was conducted to determine the oculo-visual status of children with special needs attending selected special education schools in Imo State, Nigeria.

2. MATERIAL AND METHODS

A cross-sectional study design with quantitative method of data collection involving diagnostic requirements for oculo-visual status of recruited subjects. All examinations were carried out between 9:00am and 1:00pm daily over a period of eight weeks.

2.1 Study Setting

The centers used for this study were Imo State Secondary School for the deaf, Ofekata, Mbaitoli, Cheshire home and Special education center both in Orlu. These are special school/rehabilitation centers that offer both formal and vocational education in Imo State, Nigeria. All examinations were performed at the school, in familiar surroundings, with the children's parent/guardian, nurse or teacher present in order to establish constant reassurance and to provide sign language interpretation as required.

2.1.2 Study Population

This was derived from children who had been clinically certified by medical doctors as special needs children and confined to special education schools in Imo State. A total of 600 recruited subjects made up of Imo State Secondary School for the deaf, Ofekata, Mbaitoli (250); Cheshire home, Orlu (200) and Special education center, Orlu (150) of which 310 subjects across the three centers consented thus forming the study population.

2.1.3 Sample Size and Sampling Technique

Stratified random sampling technique was adopted for this study while the sample size was determined using the Cochran's formula:

$$n = \frac{z^2 pq}{d^2}$$

Where; n = the desired sample size (when population >10,000)

z = standard error of the mean which corresponds to 95% confidence level (1.96)

p = prevalence of ocular disorders in children with special needs in Port Harcourt, River State, Nigeria (76.2%) [12].

q = 1 – p. d = Precision with which P is determined = 0.05

$$n = \frac{1.96^2 \times 0.762 \times (1-0.762)}{0.05^2}$$

$$n = \frac{3.8416 \times 0.762 \times 0.29}{0.0025} \approx 340$$

$$n = 340/1.565 \approx 217.$$

Allowing for 10% attrition, minimum sample size becomes 239. A total of 310 children with special needs between the ages of 5-25 years were however recruited for this study.

2.2 Inclusion Criteria

This was made up of children with disabilities attending the special education schools in Imo State and students whose parents consent to participate in the study. This also included the children consent and such that were able to co-operate with the clinical evaluation process.

2.2.1 Exclusion Criteria

This was made up of children whose parents did not give consent, children who were not able to cooperate with the clinical evaluation process and students who were absent from school for any reason on the days of eye examination.

2.3 Data Collection

All generated data were grouped as observation and clinical examination for the different disabilities; these include hearing impairment, cerebral palsy, speech disorders, autism and down syndrome. Consenting subjects were screened for both refractive and pathological anomalies using standard methods.

2.4 Clinical Examination Procedure

The staff of the centers rendered great assistance in terms of interpreting instructions to participants and also conveying participants' responses to the research team. The following parameters were measured - visual acuity (VA), pulse and blood pressure of all participants. Visual Acuity (VA) Testing was carried out according to the methods of [13] especially for autistic children [2] while Binocular Vision Assessment (BVA) was carried out on both right and left eyes in a well illuminated room and according to standard methods. For children whose unilateral test result was not reliable, corneal reflex test (Bruckner test) was used.

2.4.1 Ocular Health Assessment

Standardized external ocular examination was carried out and children who had difficulty responding to testing on the first visit were rescheduled for a follow up assessment as a test repeat.

2.4.2 Refraction

Subjects with visual acuity equal or less than 6/9 and improved with pinhole, refraction was conducted by cycloplegic retinoscopy and autorefractometry (where retinoscopy was not possible - especially children with autism and cerebral palsy), cycloplegia drug was used – this drug was chosen because of its safe, rapid effect (25 minutes) and short duration of action (3-5 hrs) [14,15]. One drop of drug was instilled into the conjunctival sac every 5 minutes ($\times 2$ doses) and allowed for 30 minutes before retinoscopy was done with refractive errors classified as myopia ≥ -0.5 DS, hyperopia $\geq +0.5$ DS, astigmatism $\geq +0.5$ DC. However, due to poor attention and concentration skills in this population, attention was motivated using fixation target where toys, clapping of hands and calling of their names initiated in order to enhance cooperation of the subjects. Those who required further investigations and treatment were referred to Federal medical center, Owerri, Imo State University Optometry clinic, Owerri, and Imo State University teaching hospital, Orlu.

2.5 Statistical Analysis

The data gathered from this study was recorded into a data collection form, entered and analyzed using the IBM SPSS software version 22. Summary statistics are presented using mean, standard deviation, frequency, bar chart and tables. Tests of association between categorical socio-demographic variables and utilization of eye care facilities were done using the Chi-square test and odd ratio. All hypotheses were tested at 5% level of significance.

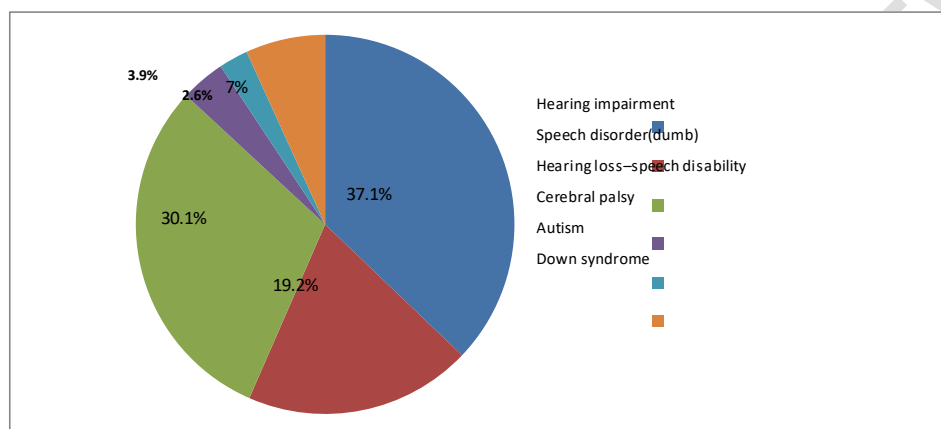
3. RESULTS AND DISCUSSION

3.1 Demographic features

According to our study, 34 (11.5%) subjects were aged 5-9years, 103 (34.8%) were aged 10-14years, and 130 (53.7%) were aged 15-19years. The mean age of the females was 13.5 ± 3 years and that of the males was 13.7 ± 3 years.

3.2 Distribution of Disabilities

From a total of 296 subjects, 207 (69.9%) had single disability and 89 (30.1%) had multiple disabilities. The most common category of disability encountered was hearing impairment, followed by speech disorder, down syndrome, cerebral palsy and autism respectively for those with single disability, while the rest (30.1%) accounted for the combination of the



multiple disabilities (hearing loss-speech disability) - Figure 1.

Figure 1: Disability Status of Participants

3.3 Vision classification

Table 1: Presenting distant visual acuity distribution in the better eye of participants

		Distant VA	No of students	Percentage
No *VI		$\geq 6/6$	120	42
Category of VI				
Mild VI	0	$<6/6-6/18$	73	25.5
Moderate VI	1	$<6/18-6/60$	45	15.7
Severe VI	2	$<6/60-3/60$	30	10.5
Blindness	3	$<3/60-PL$	18	6.3
Total			286	

Classification of VI based on International Classification of Diseases 11 (2018)

*VI = Visual impairment, VA = Visual acuity

Based on vision category per person, a total of 166 (58%) were visually impaired. Table 1 shows that 73 children (25.5%) had mild visual impairment, 45 children (15.7%) had moderate VI, 30 children (10.5%) had severe VI and 18 (6.3%) were blind. Ten subjects (≈3.4%) were not cooperative for visual acuity measurement. The prevalence of ocular abnormalities varied among the disability groups - Table 1.

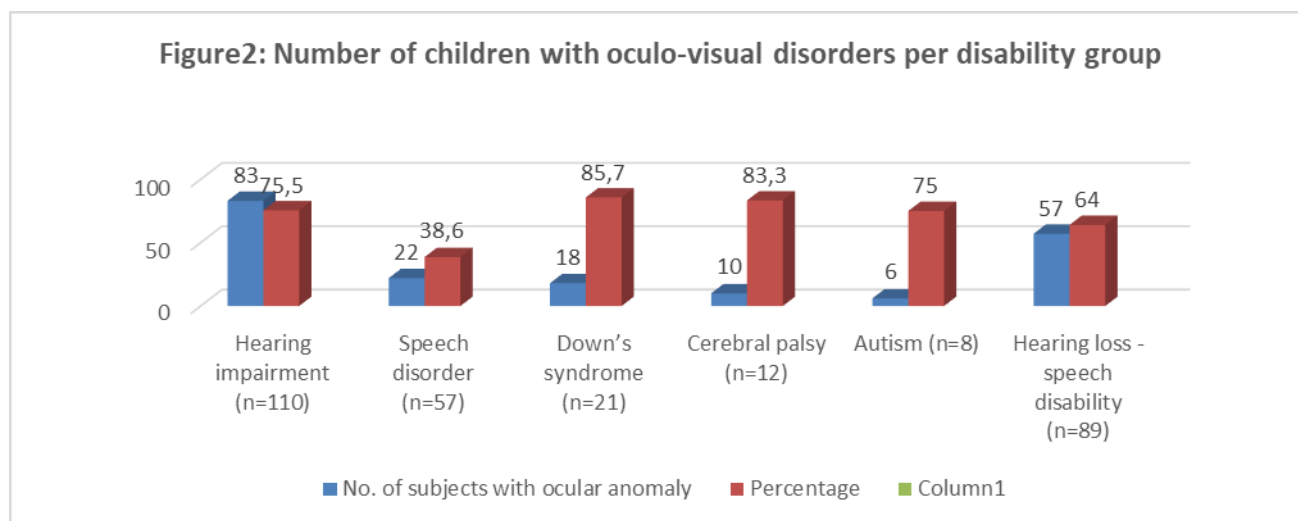


Fig. 2 The number of subjects with ocular disorder in each disability classification. Ocular disorders were found in 83 (75.5%) children with hearing impairment, 10 (83.3%) of the children with cerebral palsy, 6 (75%) of the children with autism, 85.7% of the children with Down's syndrome and 22 (38.6%) of children with disability. The number of children with multiple ocular abnormalities also varied among the groups. For instance, twenty-seven cases (10.4%) were found in children with Down syndrome. One hundred and nine cases (42.1%) were found in children with hearing impairment, 64 cases (24.7%) in children with hearing loss- speech disability, 21 cases (8.1%) in cerebral palsy, 10 (3.9%) cases in children with autism, and 28 cases (10.8%) in children with speech disability - Figure 2.

Majority of the subjects had at least one oculo-visual disorder. However, multiple visual disorders such as pupillary disorders, optic atrophy in the left eye with cataract in the right eye, and vice versa, lid abnormalities with pupillary disorders and in some other cases strabismus with pupillary disorders were also observed.

The prevalence of oculo-visual disorders in this study - hearing impairment (75.5%), cerebral palsy (83.3%), autism (75%), Down's syndrome (85.7%), speech disability (38.6%) and hearing loss-speech disability (64%) respectively appears to vary among the various categories of disabilities in the schools. Some other studies reported that vision problems were seen in 24% children with hearing impairment in a study carried out by Gogate *et al.*, (2009) [16], 57% children with autism in a study by Black *et al.*, (2013) [17], 57.8% children with down syndrome by Afifi *et al.*, (2011) [18], 45.3% children with learning difficulties in a study by Gogate *et al.*, (2011) [9], and 51.45% children with mental retardation in a study by Joshi *et al.*, (2013) [1]. It is also in line with Kaur *et al.*, (2016) [19] who reported visual impairment in special children in this order; mental retardation > hearing impairment > Down syndrome > cerebral palsy > ADHD > autism. These highlight the high level of unmet visual

need in these children. However, this difference in prevalence in this study could be accounted for by the fact study population did not include equal number of subjects per disability category. The high prevalence of VI in children with hearing impairment calls for great concern as these children depend greatly on lip-reading and written text for information.

Refractive errors, strabismus and amblyopia were the most common ocular disorders identified in our study. This agrees with other studies that refractive errors are the most common ocular findings in special children (Adedayo and Samuel, 2012) [12]. Also, most study had reported strabismus as the second most common ocular disorder in a studied population (Kaur *et al.*, 2016) [19]. Notably, these conditions are neurologically related thus may suggest the existence of a background neurologic malformation in the children.

Table 2: Age and gender distribution of subjects with visual disorders

Age Group (Years)	Gender (%)		Total (%)
	Male	Female	
5-9	9	12	21 (10.7)
10-14	30	31	61 (31.1)
15-19	51	63	114 (58.2)
Total	90 (45.9)	106 (54.1)	196 (100)

Age and gender distribution of subjects with ocular disorders. The prevalence of ocular disorders was found to increase fairly with age for both sexes. The prevalence for subjects aged 5-9 years was 10.7% (21 children), 31.1% (61 children) for subjects aged 10-14years old, and 58.2% (114 children) for subjects aged 15-19years. Also, a higher percentage of females were affected (54.1%) than males (45.9%) - *Table 2*.

The gender distribution of the children in our study is consistent with previous reports. On a general note, we found higher percentage of female subjects affected than males, except in deaf and dumb children where there was higher male preponderance (56.1% vs. 43.9%). The general preponderance of females in our study could be due to the fact that more females enrolled for the study.

Table 3: Spectrum of ocular findings among the various Age Groups

Ocular Disorder	5-9yrs	10-14yrs	15-19yrs
Eyelid disorders	9	7	3
Conjunctivitis	7	5	3
Arcus juvenilis	-	3	2
Pupillary defects	1	3	6
Corneal opacity	2	4	6
Cataract	2	7	11
Nystagmus	2	5	6
Strabismus	6	16	12
Optic atrophy	-	4	6
Glaucomatous	1	2	8
Cupping			
Maculopathy	-	1	2
Retinitis pigmentosa	-	2	3
CVI	1	2	-
Amblyopia	3	7	10
Refractive error	15	26	38
Myopia	6	18	30
Hyperopia	8	2	2

	1	6	6
Astigmatism			
Total	49	94	116

Ocular disorders were most common in subjects aged 15-19years (116 cases, 44.8%) followed by subjects aged 10-14 years (94 cases, 36.3%), and least among subjects aged 5-9years (49 cases, 18.9%). For the three age groups, refractive error was most common. For subjects aged 5-9years, eyelid and conjunctivitis were more common while glaucomatous cupping, CVI and pupillary defects were least common. Aside refractive errors, strabismus was most common among subjects aged 10-14years and 15-19years (16 cases and 12 cases respectively) - *Table 3*.

This study also found the prevalence of ocular disorders to be higher in children between 15 and 19 years. The fact that most of the subjects evaluated belong to this class may be responsible for this. This may also be due to changes in the refractive state of the eye as children grow as myopic shift is expected in older children. Similar report by Isawumi *et al.*, 2016 [20] found that older children constituted the larger proportion of children who presented to eye clinics with oculo-visual disorders. The detection of visual problems in older special children may be facilitated by the increased visual demands of reading and the difficulty with seeing the board from the back of the classrooms. On the other hand, it may suggest lack of detection of such problems by parents and teachers of younger children. In fact, the absence of routine screening programs for defective vision in these schools probably contributes to late detection in our climate. Unfortunately, late presentation for treatment has negative implications on the outcome of treatment particularly for children with high refractive errors. This is because older children are beyond the critical age of visual development and, thus, are at risk of poor outcome following amblyopia therapy.

Interestingly, while refractive errors and strabismus were most common amongst subjects aged 15 to 19years, fewest cases of eyelid disorders and conjunctivitis were noted among them. Conversely, eyelid disorders and conjunctivitis were most common among the younger subjects (5-9years). This could be attributed to possible awareness, better hygiene and treatment in their schools.

However conjunctival disorders and cornea opacity were more among the male children, the females appeared to suffer cataract and strabismus more. Refractive error was common among both genders. This is similar with studies conducted in Nigeria [21] where female preponderance has been observed, and the observation that the female gender is associated with a visual disorder especially higher refractive error burden [22].

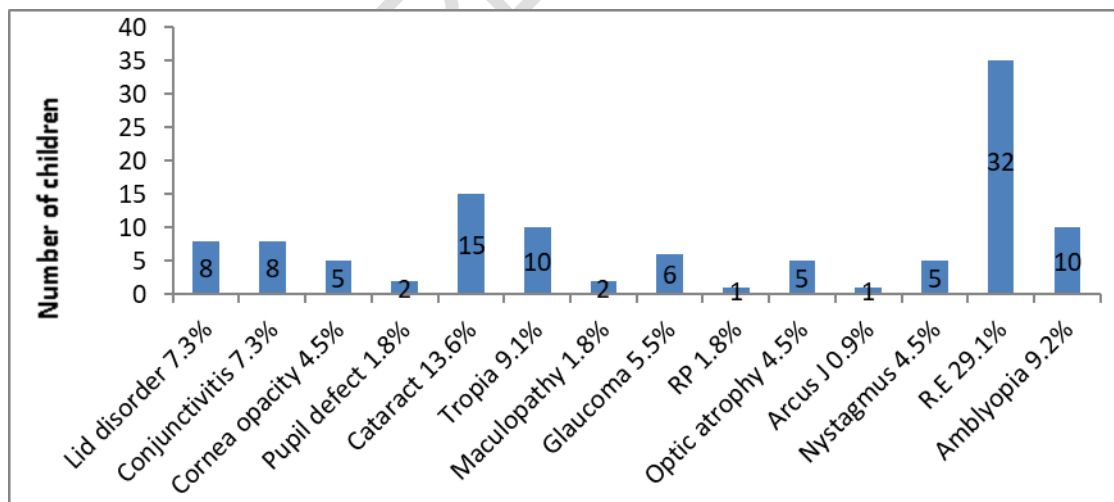
Table 4: Gender Distribution of Oculo-visual Disorders in the Study Population

Ocular Disorder	Male	Female
Eyelid disorders	8	11
Conjunctivitis	6	9
Arcus juvenelis	5	-
Corneal opacity	5	7
Pupillary defects	4	6
Cataract	13	10
Nystagmus	10	7
Strabismus	17	20
Optic atrophy	5	4
Glaucomatous Cupping	5	7
Maculopathy	2	-
Retinitis pigmentosa	2	2
CVI	2	3

Amblyopia	4	6
Refractive error	36	43
Myopia	27	30
Hyperopia	3	4
Astigmatism	6	9
Total (%)	124 (47.9)	135 (52.1)

Gender distribution of ocular disorders in the entire population studied. The table shows that a higher percentage of females (52.1%) were affected than males (47.9%). Five cases of arcus juvenilis was found among the male population, and none amongst the females. Also, two cases of maculopathy were recorded among the males but none among the females. Interestingly, the female subjects had higher prevalence in the three refractive errors recorded – *Table 4*.

Myopia was the most common type of refractive errors in the children followed by hyperopia and astigmatism. This agrees with the report by Olusanya *et al.*, (2019) [23] that reported myopia as the most prevalent. However, it is at variance with a report by Hanan *et al.*, (2011) [24] that found hyperopia as the preponderant refractive error. These variations may be partly due to differences in the operational definition for classification of refractive errors, partly due to geographical location where the studies were conducted, and partly from the age distribution of the study participants. Majekodunmi *et al.*, (2018) [25], reported that only 7.5% of their subjects with refractive errors had spectacles corrections which they got from clinics outside their school. This may likely be due to the fact that their parents may have been overwhelmed with the other challenges of their primary disability and had no clue to the possibility of ocular problems



*RE = Refractive errors. RP = Retinitis pigmentosa

Figure 3: Distributions of Ocular Disorders in Children with Hearing Impairment

The distribution of ocular disorders in children with hearing impairment. Out of the 110 children with hearing impairment examined, 83 (75.5%) of them were observed to have ocular disorders. Amongst these, 13 children (11.8%) had more than one ocular abnormality.

The most common ocular manifestation observed was refractive error, present in 32 subjects (29.1%). The distribution of refractive error in this population is shown in figure 4.5. Cataract was the second most common finding, accounting for 13.6% cases recorded followed by tropia in 9.1% cases. Eyelid abnormalities and conjunctivitis were seen 8 children (7.3%) each, while nystagmus, optic atrophy and cornea opacity were seen in 5 (4.5%) children each. Glaucoma was seen in 5.5% children. Pupillary defects and maculopathy were seen in 1.8% children each. One child presented with retinitis pigmentosa.

The prevalence of ocular disorders was found to increase fairly with age being 13.3% for subjects aged 5-9 years, 26.5% for subjects aged 10-14years old, and 60.2% for subjects aged 15-19years. Interestingly, the prevalence eyelid and conjunctival disorders decreased age (8.3% for children 5-19years, 3.7% for children 10-14years and 1.8% for children 15-19years while significant refractive errors ($> 0.50D$) increased dramatically with increasing age; 21.8% of refractive errors in children 15-19 years old compared to only 2.8% in children 5-9years old. A higher percentage of the females (55.4%) were affected than males (44.6%). The most common condition among the males was refractive error (15.6%) followed by conjunctivitis (5.5%) while the females had more of cataract (8.3%) and tropia (5.5%). The only case of arcus juvenilis was recorded among the males - *Figure 3*.

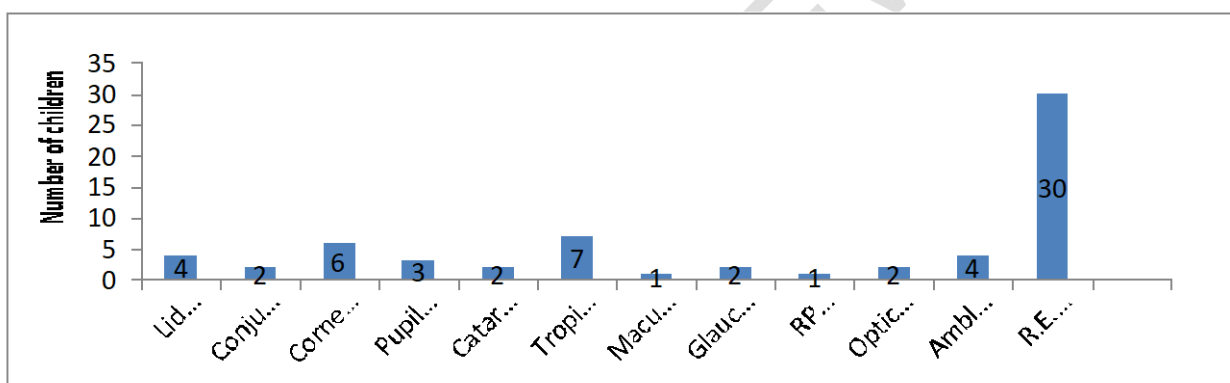
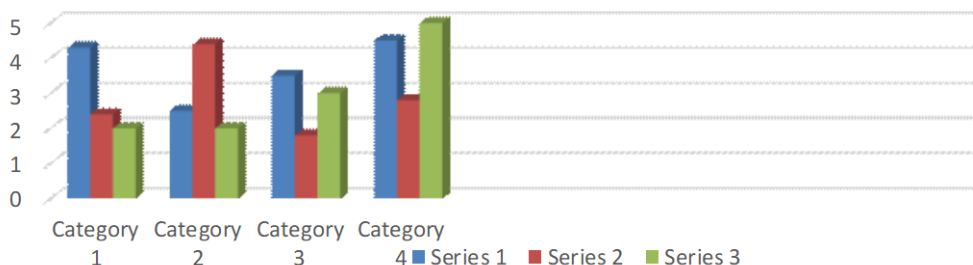


Figure 4: Distribution of ocular disorders in children who are deaf and dumb

This study revealed that a total of 64 cases of deaf and dumb were recorded. Many of them had more than one ocular disorder. Refractive error was the most common ocular condition found (30 cases). Seven children (7.9%) had tropia, 6 (6.7%) had cornea opacity, 6 had eyelid and conjunctival abnormalities, 3 had pupillary defects. Cataract, glaucoma and optic atrophy were found in 2 children each. There was 1 case each of retinitis pigmentosa and maculopathy – *Figure 4*.

Furthermore, oculo-visual problems were more common among the males (56.1%) compared with the females (43.9%). For both sexes, refractive error was most prevalent (17 and 13 cases respectively). Also, the prevalence of ocular disorders was found to increase with age for both sexes - 5.3% for subjects aged 5-9 years, 15.8% for subjects aged 10-14years, and 43.9% for subjects aged 15-19years. Whereas eyelid disorders were more common among children 5-9years, refractive error was more among children 15-19years old. Myopia accounted for 17cases (56.7%), hyperopia 9 cases (30%) and astigmatism

Figure 5: Spectrum of ocular findings in children with down syndrome



4cases (13.3%). Interestingly, the all cases of astigmatic error found were with-the-rule astigmatism – *Figure 4*.

Fig. 5 This study evaluated 21 children with Down's syndrome out of which 18 (85.7%) were found to have oculo-visual disorders and 15 (71.4%) had multiple oculo-visual disorders. Highest oculo-visual disorder observed was refractive errors 14 (66.7%) – *Figure 5*.

The most common type of refractive error was hyperopia in 20 eyes (71.4%), followed by astigmatism in 6 eyes (21.4%) and myopia in 2 eyes (7.1%). All cases of astigmatism found were with-the-rule astigmatism. Cataract was the second most common finding, seen in 8 children (38.1%) followed by strabismus seen in 7 children (33.3%; 28.6% esotropia, 4.7% exotropia) and nystagmus 5 cases (23.4%). Conjunctivitis and amblyopia were seen in 3 (14.3%) children each. Five children (23.8%) had eyelid abnormalities. Glaucoma was seen in 2 children. The prevalence of ocular disorders was highest among subjects aged 15-19years (44.8%) and least for subjects aged 5-9years (16.7%). The prevalence of ocular disorders was more among the female subjects (55.6%) compared with the males (44.4%). Cataract was most common ocular pathology among the males (10.6% of the cases) followed by tropia (6.4%). Among the females, tropia was most common (8.5% of the cases). Amblyopia, reduced vision in one eye relative to the other eye without a significant pathological reason, accounted for 6.4% of the cases – *Figure 5*.

Table 5: Distribution of ocular findings in children with cerebral palsy

Ocular Disorders	No of cases (n=12)	Prevalence (%)
Eyelid abnormalities	1	8.3
Pupillary defects	5	41.7
Strabismus	5	41.7
Esotropia	2	
Exotropia	3	
Nystagmus	2	16.7
Optic atrophy	2	16.7
Cortical Visual Impairment	3	25
Refractive errors	9	75
Myopia	2	
Hyperopia	6	
Astigmatism	1	

Of the 12 children with cerebral palsy, 10 (83.3%) were found to have multiple oculo-visual disorders – *Table 5*. The distribution of oculo-visual disorders among this group was male (40%) and female (60%). The prevalence of ocular disorders was highest among subjects aged 10 to 14years (60%) and least for subjects aged 15-19years (20%). Ten (46.8%) ocular disorders were found among the male population, and 11 cases (53.2%) among the females. For the male subjects, pupillary defects and tropia (3 cases each) were the most common ocular manifestations. However, for the females, there were 2 cases of tropia, optic atrophy, pupillary defects and CVI. However, no case of lid disorder or optic atrophy was recorded among the males.

3.4 Distribution of ocular disorders in children with autism

Oculo-visual disorders were found in 6 (75%) out of the 8 children examined. Strabismus was found in three (37.5%) subjects made up of esotropia in 2 (66.7%) and exotropia in 1

(33.3%) subject. Refractive errors accounted for joint highest ocular conditions 3 (37.5%) among this population. Amblyopia and nystagmus were noted in one child each (12.5%). These oculo-visual disorders were noted only among children aged 5-9years (16.7%) and 10-14 years (83.3%). Among the 6 children with ocular disorders 2 (33.3%) were males while 4 (66.7%) were females. A case of amblyopia was noted among the males while the females had a case of strabismus and nystagmus but no case of amblyopia.

The high preponderance of oculo-visual disorder among children with autism (75%) especially strabismus, nystagmus and refractive errors has been reported in earlier studies. From there retrospective chart review, Ikeda *et al.*, (2013) [26] reported ocular problems in 40% of patients with autism with 29% having significant refractive errors, 21% demonstrating strabismus, and 10% having amblyopia.

3.5 Ocular disorders in children with speech disability

From a total of 57 subjects falling into this group, oculo-visual disorders were found in 22 (38.6%).

Strabismus was the second most common finding, seen in 18.2% children followed by eyelid disorders and cataract in 13.6% of the children. Cornea opacity was seen in a child, while nystagmus and glaucoma were seen in 2 (9.1%) children each. Refractive error was recorded in 7 (31.8%) children. The most common type of refractive error was myopia 4 (7%) followed by astigmatism 2 (3.5%) and hyperopia 1 (1.8%). The prevalence of visual disorders was least among subjects aged 5-9years (2 cases; 9.1%) and highest among subjects aged 15-19years (16 cases; 72.7%). Refractive error was highest among subjects aged 15-19years and least among subjects aged 5-9years.

This study further noted high prevalence of oculo-visual disorders among the deaf children (75.5%). This differs from the results of other studies conducted in other States in Nigeria, viz., Lagos [27], Akure [11], Benin [6], and Kaduna [10] which showed a prevalence of 34%, 73.75%, 73.26%, and 20.9%, respectively. There was a low response rate of children with cerebral palsy in this study, as shown by only 6.1% responding to our call to present for ocular assessment. This could be related to the psychological challenge faced by parents as a result of their children's health condition. Majority (83.3%) of them had conditions causing visual impairment. This is in conformity with the reports of other researchers that there is a high rate of oculo-visual defects among children with cerebral palsy. Hyperopia accounted for 66.7% of all cases of the refractive error however disagrees with the findings of Sasmal *et al.*, 2011 [28]. For children with down syndrome, we found abnormal conditions in 85.7% of them. The most common oculo-visual disorder observed was refractive errors, present in (66.7%) of the children. Hyperopia was the most common refractive error. Cataract was the second most common finding (38.1%) in this study followed by strabismus (33.3%; 28.6% esotropia, 4.7% exotropia).

4. CONCLUSION

The prevalence of oculo-visual disorders in children with special needs in Imo State, Nigeria is high. The most common oculo-visual problems found among them are refractive errors, strabismus, amblyopia, cataract and cornea disorders. The preponderance to oculo-visual disorder vary among the disability groups, being highest among children with cerebral palsy and Down syndrome and least among children with speech disability. The prevalence of oculo-visual disorders is higher among the older children (15-19years), with a general preponderance among the females.

CONSENT

Informed consent was obtained from the student's parent/guardian through the selected schools' authority before enrolment into the study.

ETHICAL APPROVAL

These were obtained from the research ethical committee of Abia State University and the special education unit of the education support services of the ministry of education, Imo State, Nigeria with the following reference number ABSU/REC/OPT/004 and MOE/ADM/687/133 respectively.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

REFERENCES

- [1]. Joshi RS, Somani, AA. Ocular disorder in children with mental retardation. *Indian Journal of Psychiatry*. 2013; 55(2):170-2.
- [2]. Bodack MI. Eye and vision assessment of children with special needs in an interdisciplinary school setting. *Optometry and Vision Development*, 2011; 42(4): 220-6.
- [3]. Woodhouse JM, Davies N, McAvinchey A, Ryan B. Ocular and visual status among children in special schools in Wales: the burden of unrecognized visual impairment. *Archives of Disease in Childhood*, 2014; 99(6): 500–504.
- [4]. World Health Organization. World report on disability 2011. Pp 26. Geneva.
- [5]. World Health Organization. The Global Burden of Disease, 2004 update. Geneva. 2008.
- [6]. Osaiywu AB, Ebeigbe JA. Prevalence of visual disorders in deaf children in Benin City. *Journal of the Nigerian Optometric Association*. 2009; 15(1): 20-23.
- [7]. Ezeh EI, Ibanga AA, Duke RE. Visual status of special needs children in special education schools in Calabar, Cross River State, Nigeria. *Nigerian Postgraduate Medical Journal*, 2018; 25(3): 161-165.
- [8]. El-Hazmi MAF. Early recognition and intervention for prevention of disability and its complications. *Eastern Mediterranean Health Journal*, 1997; 3(1):154–161.
- [9]. Gogate P, Soneji, FR, Kharat J, Dulera H, Deshpande M, Gilbert C. Ocular disorders in children with learning disabilities in special education schools of Pune, India. *Indian Journal of Ophthalmology*, 2011; 59(3): 223–28.
- [10]. Abah ER, Oladigbolu KK, Samaila E, Merali H, Ahmed AO, Abubakar TH. Ophthalmologic abnormalities among deaf students in Kaduna, Northern Nigeria. *Annals of African Medicine*. 2011; 10(1): 29-33.

- [11]. Omolase CO, Komolafe, OO, Adeniji AO, Adetan O, Omolase BO, Akinwalere AK, Omolade EO. Ophthalmic disorders among students of School for the Deaf. *Otolaryngology Online Journal*. 2012; 2(3): 23–41.
- [12]. Adio AO, Wajuihian SO. Ophthalmic manifestations of children with Down syndrome in Port Harcourt, Nigeria. *Clin Ophthalmol*. 2012; 6: 1859–1864. Published online 2012 Nov 9. doi: 10.2147/OPTH.S36685
- [13]. McGraw PV, Winn B, Gray LS, Elliott DB. Improving the reliability of visual acuity measures in young children. *Ophthalmic and Physiological Optics*. 2000; 20(2): 173–184.
- [14]. Woodhouse JM, Pakeman, VH, Saunders KJ, Parker M, Fraser, WI, Lobo S, Sastry P. Visual acuity and accommodation in infants and young children with Down's syndrome. *Journal of Intellectual Disability Research*. 1996; 40(1): 49–55.
- [15]. Kyei S, Nketsiah AA, Asiedu K, Awuah A, Owusu-Ansah A. Onset and duration of cycloplegic action of 1% cyclopentolate - 1% tropicamide combination. *African health sciences*. 2017; 17(3): 923–932. <https://doi.org/10.4314/ahs.v17i3.36>.
- [16]. Gogate P, Rishikeshi N, Mehata R, Ranade S, Kharat J, Deshpande M. Visual impairment in the hearing-impaired students. *Indian Journal of Ophthalmology*. 2009; 57(6): 451–453.
- [17]. Black K, McCarus C, Collins M, Jensen A. Ocular Manifestations of Autism in Ophthalmology. *Strabismus*. 2013; 21(1): 98–102
- [18]. Afifi HH, Azeem AAA, El-Bassyouni HT, Gheith ME, Rizk A. Ocular findings and management in Egyptian children with Down Syndrome. *J Am Sci*. 2011;7(4):782–88. [\[Google Scholar\]](#).
- [19]. Kaur G, Thomas S, Jindal M, Bhatti SM. Visual Function and Ocular Status in Children with Disabilities in Special Schools of Northern India. *Journal of Clinical and Diagnostic Research*. 2016;10(10): NC01–NC04. doi: 10.7860/JCDR/2016/23615.8742
- [20]. Gurvinder et al., 2016.
- [20]. Isawumi M, Akinsola F. Ocular Health Status and Causes of Enrolment into Special Schools in Osun State, Nigeria, *Zahedan Journal of Research in Medical Sciences*. 2016; 18(12): 4960.
- [21]. Opubiri I, Pedro-Egbe C. Screening for refractive error among primary school children in Bayelsa State, Nigeria. *Pan African Medical Journal*. 2013;14:74. [doi: [10.11604/pamj.2013.14.74.1345](https://doi.org/10.11604/pamj.2013.14.74.1345)]
- [22]. Lou L, Yao C, Jin Y, Perez V, Ye J. Global Patterns in Health Burden of Uncorrected Refractive Error. *Investigative Ophthalmology & Visual Science*. November 2016; 57: 6271–6277. doi:<https://doi.org/10.1167/iovs.16-20242>
- [23]. Olusanya BO, Okolo AA, Ijaduola GT. The hearing profile of Nigerian school children. *International Journal of Pediatric Otorhinolaryngology*. 2000; 55(3): 173–9.
- [24]. Hanan H, Amira A, Azeem A, El-Bassyouni HT, Gheith ME, Rizk A. Ocular findings and management in Egyptian children with Down syndrome. *Journal of American Science*. 2011; 7(4): 782–788.

- [25]. Majekodunmi OI, Olusanya BA, Oluleye TS. Utilization of eye care services among students attending schools for the hearing impaired in Oyo State, South-west Nigeria. *Annals of Ibadan Postgraduate Medicine*. 2019; 17(2): 181-186.
- [26]. Ikeda J, Davitt BV, Ultmann M, Maxim R, Cruz OA. Incidence of ophthalmic disorders in children with autism. *Journal of Autism and Developmental Disorder*. 2013; 43(6): 1447–51.
- [27]. Onakpoya OH, Omotoye OJ. Screening for ophthalmic disorders and visual impairment in a Nigerian school for the deaf. *European Journal of Ophthalmology*. 2010; 20(3): 596–600.
- [28]. Sasmal, N.K., Maiti, P., Mandal, R., Das, D., Sarkar, S., Chatterjee, S. (2011). Ocular manifestations in children with cerebral palsy. *Journal of Indian Medical Association*. 2011; 109(5): 318, 323.