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Screening for Ophthalmic Disorders among Deaf School Children in Nigeria- A Neglected Population

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Authors' contributions

This work was carried out in collaboration between all authors. Author IOC designed the study, wrote the protocol and the first draft of the manuscript. Author AOA wrote the final draft of the manuscript while author NEC did the literature searches. All authors were involved in data collection and all read and approved the final manuscript.

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ABSTRACT

Background: The visual and auditory systems are vital for the optimal development of a child. However recent studies have shown that the incidence of visual problems in the deaf is higher than in their hearing counterparts. This study is aimed to find out if this is so in our locality.
Aim: To screen for ocular abnormalities among students in a deaf school in Nigeria.
Materials and Methods: A cross sectional survey of students in a school for the deaf was carried out. Demographics as well as visual acuity, penlight eye examination, intraocular pressure, dilated fundoscopy and refraction of consenting respondents were documented where applicable.
Results: A total of 114 deaf students were seen comprising 48(42.1%) males and 66(57.9%) females. Mean age was 15.14±3.91 .A total of 110 (96.5%) subjects had vision ≥6/18 while the rest (n=4; i.e.3.5%) had low vision between < 6/18 and 6/60. Significant causes of low vision include optic atrophy of unknown cause, cupped discs from untreated chronic glaucoma and macular scarring.
Conclusion: There should be routine eye evaluation for all hearing-impaired and deaf persons so

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that timely treatment can be offered for treatable conditions in order to avoid loss of vision, which is the sense heavily relied upon in this group of individuals. No significant plans are in place to address this at the moment. It is encouraged that policy makers should please seek prompt and adequate delivery of these services to this population.

Keywords: Auditory; ocular; sensori-neural; visual impairment.

1. INTRODUCTION

Approximately 1 in every 1000 infants is born deaf [1] and many more children acquire various degrees of hearing impairment within the first 2 years of life [2]. It is well documented that the incidence of visual problems is higher among the deaf than in a corresponding population of hearing individuals [3-6]. That deaf children depend more heavily on vision is obvious; therefore the documented higher incidence of visual problems in this population [2] is expected to be more debilitating and communication much more difficult with such multiply disabled individuals particularly in an underserved community. Because visual and auditory channels together are responsible for more than 95% of information acquisition7 (tactile, kinesthetic, and olfactory senses playing minor roles), it is crucial to optimize visual function in all hearing-impaired and deaf persons where it is not optimal. The situation is further complicated by the fact that it may be more difficult for deaf persons to obtain routine professional services from vision care specialists because of communication problems [7]. In a study on visual function in children with congenital sensori-neural deafness [2], it was observed that visual abnormalities occurred in 60.6% of the patients; the commonest being uncorrected refractive errors which constituted 44.4%, with hyperopia being the commonest error (31.5%). Other important findings were strabismus (3.6%), cataract (1.8%), Axenfeld anomaly (1.8%), rubella retinopathy (1.8%) and retinitis pigmentosa (1.8%); thus other posterior segment lesions constituted 3.6%.

It has been discovered also that the incidence of autism spectrum disorder in them is higher than in the average population without hearing loss if visual abnormalities are also found in them [8].

In a similar study [9] on screening for ophthalmic disorders and visual impairment in Nigeria by Onakpoya et al. [9], it was shown that 70.5% of the subjects had not had prior eye examination, 1.3% were blind, while 3.2% had visual impairment. In that study important causes of blindness were bilateral pigmented macular scars and Usher syndrome which is a major cause of genetic deafness and blindness [10]. CHARGE syndrome (an acronym for coloboma, heart defect, atresia choanae, retarded growth and development, genital abnormality and ear abnormality) is another important cause of dual sensory impairment [11]. Waardenburg syndrome a rare genetic disorder however hardly cause visual impairment but features such cosmetic blemishes like white forelock, heterochromia irides and ptosis (which may or may not be Marcus-Gunn type) apart from moderate to severe sensorineural deafness [12].

No known published effort has been made to find out the prevalence of these conditions in our environment among the less privileged deaf and hearing impaired in our community. Early detection of these conditions particularly the genetic ones have been shown to have important implications in terms of educational planning and treatment [10].

This study is aimed at finding out the different types of ocular abnormalities prevalent in a population of deaf students in our locality so that suitable recommendations can be proposed to policy making organizations and the government.

2. MATERIALS AND METHODS

A cross sectional survey of all the students in a government-owned school for the deaf in Port Harcourt was carried out between April 1st and 15th of 2010. Ethical clearance was obtained from the University of Port Harcourt ethical committee and the methods used adhered to the tenets of the declaration of Helsinki. Communication with the students was made possible through sign language by one of the special educators in the establishment.

Group written consent was obtained from the parent teachers association and the principal of the school. All students with diagnosed sensorineural deafness were included in the study while those with grossly normal hearing were excluded. Demographic details were

documented following which visual acuity of the subjects was assessed using the illiterate 'E' Snellen's chart placed at the standard 6m from the subject in a well-illuminated area of the school courtyard. The two eyes were tested separately and then together. Subjects with visual acuity (VA) worse than 6/6 had retested with a pin hole. Ocular external examination was done with bright penlights while intraocular pressure was measured with the Perkins ^{R} tonometer with the aid of 1% tetracaine eyedrops and 2% fluorescein strip. Dilated fundoscopy, objective and subjective refraction was also carried out where indicated. Simple topical eye medications like anti-allergy and antibiotics drops were given on the spot to those who required them while all other subjects with pathological findings were referred to the local teaching hospital eye clinic for further detailed investigations and possible treatment.

Data was entered into the WHO/PBL eye examination record (version III) according to the WHO definition of visual acuity categories incorporated in the International classification of disease(ICD-10) of 1975 [13].

Data was analysed using EPI-INFO version 11 with the aid of a biostatistician and results explained with frequency distribution and summary statistics. A p-value of <0.05 was taken as significant.

3. RESULTS

A total of 114 co-educating deaf students in a deaf school in Port Harcourt were seen comprising 48(42.1%) males and 66(57.9%) females. The mean age of the students was 15.14 years with Standard Deviation (SD)(±3.91).

Three of all the subjects had a white forelock indicating presumed Waardenburg syndrome (2.6% of 110 subjects) [See Fig. 1] while none were noted to have Usher,s or CHARGE syndrome. None of the subjects had ever been evaluated for nor used a hearing aid.

Fig. 1. Visual acuity testing of a deaf student at 6 m with the assistance of a special education instructor

3.1 Ocular Findings

A total of 228 eyes of 114 African students were examined. The remaining students were not present at school during the period of collation of data.

Two hundred of the 228 eyes were normal. Table 1. There were 98 right (86%) and 102 left eyes (89.5%) eyes examined with 28 eyes of 14 persons exhibiting ophthalmic abnormalities.

Visual acuity was better than 6/18 in 220 eyes. Table 1. Vision was between 6/18 and 6/60 in 8 eyes. Of these 8 eyes, 3 eyes had refractive error (37.5%).

3.2 Abnormalities Detected

Moderate ptosis was seen in 4 eyes of 2 patients while nystagmus and pterygium were respectively seen in both eyes of two different patients. Large angle sensory exotropia was observed in one eye.

Iris hypochromia was observed in four eyes while ectopia papillae and bacterial conjunctivitis were seen in one eye each of two different subjects.

Table 1. Visual acuity in both eyes in respondents in deaf school

Visual acuity	Right eye	%	Left eye	%
6/5 to 6/6	100	87.7	93	81.6
6/9 to 6/12	4	3.5	10	8.8
6/18 to 6/24	8	7.0	8	7.0
6/36 to 6/60	2	1.8	None	-
3/60 to HM	None	-	1	0.9
NLP	None	-	2	1.7
Total	114	100%	114	100%

Nine eyes had disc pathology (pale cupped discs and disc atrophy) while one eye had a dull fovular reflex and large macular scars.

In the right eye 5(4.3%) had pale cupped discs while 3(2.6%) eyes had iris hypochromia, 2 subjects (1.8%) had mild ptosis. One (0.9%) subject each had nystagmus, bacterial conjunctivitis, pterygium, acquired ectopia papillae, dull foveal reflex and optic atrophy in that eye (Table 2).

The left eye of 102(89.5%) subjects was normal. Three (2.6%) had pale cupped discs while 2(1.8%) subjects had mild ptosis. Furthermore 1 subject (0.9%) each had pterygium, hypochromia iridis, large macular scar, temporal disc pallor, nystagmus, exotropia and generalised optic atrophy in that eye (Table 2).

3.3 Cup Disc Ratios in the Subjects

The vertical cup disc ratio in the right eye showed that 87(76%) were ≤0.4, 19 (17%) were between 0.5 and 0.7 while 3(2.6%) had 0.8.For the left eye 93(81.5%) were normal (≤0.4), 14(12%) were between 0.5 and 0.7 while 2(1.8%) had above 0.7. The intraocular pressure was greater than 21 mmHg in four right eyes and five left eyes(9 eyes) and this involved those subjects with their cup disc ratios greater than 0.5.

4. DISCUSSION

Examination of individuals who have both hearing and visual impairment is a daunting task as has been shown by several workers [14]. [See Fig. 2 showing sign language being used to explain visual acuity to the deaf student].

Many more questions and observations are required in order to be able to properly evaluate such patients. As these children depend heavily on their vision to complement their poor auditory function, early detection is important. This will allow development of efficient communication skills. A review of about a thousand papers on this topic showed that these ocular conditions when identified and treated in these children enables them optimize the sign and spoken language and help to develop social cognition [15].

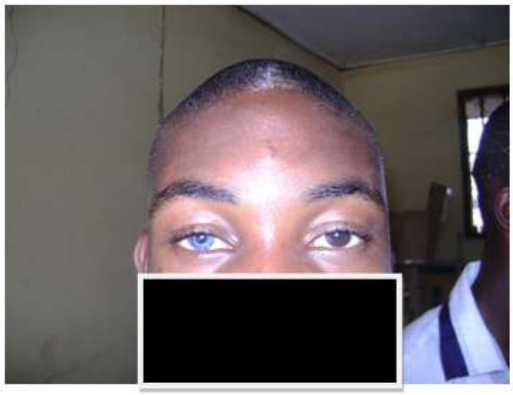

Fig. 2. Deaf student with a white forelock and right iris hypochromia

In this study, only 3.5% of the subjects had visual impairment. This is close to the findings in a similar study among deaf school children in Nigeria by Onakpoya et al. [9] whereby 3.5% of

Table 2. Ocular findings in 114 deaf students

Disease	Frequency	
	Right eye	Left eye
Pale cupped disc	5(4.3%)	3(2.6%)
Ectopia pupillae(post bottle injury)	1(0.9%	-
Incipient pterygia	1(0.9%)	1(0.9%)
Iris hypochromia	3(2.6%)	1(0.9%)
Mild ptosis	2(1.8%)	2(1.8%)
Nystagmus	1(0.9%)	1(0.9%)
Bacterial conjunctivitis	1(0.9%)	-
Optic atrophy	1(0.9%)	1(0.9%)
Dull foveal reflex	1(0.9%)	1(0.9%)
Large macular scar	-	1(0.9%)
Temporal disc pallor	-	1(0.9%)
Exotropia	-	1(0.9%)
Normal	98(86.0%)	102(89.5%)
Total	114(100%)	114(100%)

the subjects had visual impairment. This could be due to the fact that the students were in a similar age bracket. This was however much lower than the findings in another study in the northern part of Nigeria looking at ophthalmologic abnormalities in a similar population where up to 20.9% suffered from this [6].

Another study by Michael et al. [2] showed out that about 60.6% of the subjects had visual problems. However in this study, the subjects had congenital sensori-neural anomalies with a high risk of having other developmental anomalies unlike in our study involving school children some of whom may have had acquired auditory conditions. Our study however presumed deafness from history and inability to hear the spoken word alone as we could not carry out a detailed evaluation of the auditory status of these subjects and only examined the visual status at that point in time.

The causes of visual impairment in this study included pale cupped discs (indicating possible glaucomatous origin) in addition to optic atrophy (which may be of genetic or nutritional origin) and macular scars (which may be of traumatic or parasitic origin). Macular scars were also seen in a Nigerian study but were not found to be a significant cause of visual impairment a Miami study by Michael et al. [2]. There were however no cases of retinitis pigmentosa or Usher,s syndrome, Rubella, Axenfield anomaly and Cataract as found in the Miami study. Other studies have however shown refractive errors to be a major cause of visual impairment in up to (7.9%) [6], (75%) [9], (18.5%) [15], (81%) [16] and (48.%) [17]. This was also corroborated in a 2006 evidenced based systematic review which summarized that ophthalmic problems are very prevalent in this group of people and can be very high (up to 40-60%) and can remain undetected for many years unless sought for and this can have a serious impact on the acquisition of communication skills if not addressed [18].

If this study were not carried out, there would be no information about the ocular challenges faced by this group of people in this locality and because of their peculiar communication challenges, these ocular challenges tend to run their course until visual impairment or blindness results.

Limitations of this study include dependence on a sign language interpreter to give instructions and pass on information especially when contact tests like IOP check with applanation tonometry was being carried out.

5. CONCLUSION

This study has shown significant ocular abnormalities may be present among deaf school children. However, there are obviously no systems in place to screen or ensure that adequate eye care delivery reaches this group of individuals mostly due to issues with communication. Neglect of associated visual impairment could aggravate the existing educational and social disability.

To take care of this, Institutions for deaf children should be made aware of the relatively high prevalence of ophthalmic disorders and its impact on vision development. All deaf children should as a result be given periodic complete eye examination in addition to provision of durable affordable hearing aids will improve communication.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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