



Ophthalmologic abnormalities among deaf students in Kaduna, Northern Nigeria

E. R. Abah, K. K. Oladigbolu, E. Samaila, H. Merali¹, A. O. Ahmed², T. H. Abubakar³

Department of Ophthalmology, Ahmadu Bello University Teaching Hospital, Shika-Zaria, ²Department of E.N.T, Aminu Kano Teaching Hospital, Kano, ³Kaduna State Special Education School, Kaduna, Nigeria, ¹College of Medicine, Harvard University, U.S.A.

Correspondence to: Dr. E. R. Abah, Department of Ophthalmology, Ahmadu Bello University Teaching Hospital, Shika-Zaria. E-mail: emmanabah@yahoo.com

Abstract

Background: The association between deafness and ocular problems is well established; however the nature and prevalence of these problems are diverse across the globe.

Objective: The aim of this study is to determine the nature and prevalence of ophthalmologic abnormalities in deaf students and offer treatment to those with remediable conditions.

Method: Six hundred and twenty deaf students aged between 5 and 38 years were examined in a school for the deaf.

Results: One hundred and thirty (20.9%) had some form of ophthalmologic abnormality. Some had anterior segment abnormalities such as corneal opacities (0.5%) and allergic conjunctivitis (3.4%) while others had posterior segment abnormalities like optic atrophy (0.3%), Waardenburg syndrome (0.6%) and Ushers syndrome (0.6%). Refractive error was the most common (7.9%).

Conclusion: Since these deaf students use their sight to compensate for the deafness, routine ophthalmologic examination should be carried out on them so that ophthalmologic abnormalities are detected early and treatment offered for remediable diseases.

Keywords: Deafness, ophthalmologic abnormalities, visual screening

Résumé

Fond: L'association entre les problèmes oculaires et de surdit  est bien  tabli, mais la nature et la pr valence de ces probl mes sont diverses partout dans le monde. L'objectif de cette  tude est de d terminer la nature et de la pr valence des anomalies ophtalmologiques  tudiants Sourds et d'offrir des traitements aux conditions r parable.

M thode: Six cent vingt  tudiants sourds entre 5 et 38 ans ont  t  examin s dans une  cole pour les sourds.

R sultats: Cent trente (20,9%) avait une forme quelconque d'anomalie ophtalmologique. Certains avaient d'anomalies de segment ant rieur comme les opacit s corn ennes (0,5%) et la conjonctivite allergique (3,4%) alors que d'autres anomalies de segment post rieur comme une atrophie optique (0,3%), le syndrome de Waardenburg (0,6%) et le syndrome de huissiers (0,6%). Erreur de r fraction a  t  le plus commun (7,9%).

Conclusion:  tant donn  que ces  l ves sourds utilisent leur vue pour compenser la surdit , examen ophtalmologique routine doit  tre effectu  sur eux afin que les anomalies ophtalmologiques sont d tect es t t et traitement offert pour maladies r parable.

Mots cl s: Surdit , anomalies ophtalmologiques, d pistage visuel

Introduction

A strong link has been established between the

functions of the various organs of sensation, particularly between the eyes and ears. This is not uncommon since the retina and the cochlea develop

from the same embryonic layers during the 6th and 7th week of gestation. Many researchers in the past also presented specific links between these sensory modalities and dysfunctions, particularly between deafness and ophthalmologic problems.

The prevalence of ocular abnormalities among deaf children has been reported to vary from 33 to 60%.^[1-5] Globally, these range between 23% (in Nepal);^[6] 33% (in Perth),^[7] 40.4% (in Turkey),^[11] and 48% (in USA).^[8] In Nigeria, a prevalence of 22.2% was found in a conventional school population in Western Nigeria.^[9] Many researchers have also reported high incidence of ophthalmologic abnormalities among deaf students, compared with hearing population of the same age (44–45% and 17–30%), respectively.^[2] In other related studies, it is established that ocular problems are generally more common in children with hearing problems than in normally hearing^[1] children.^[10] In West Africa, deafness is a common health problem often associated with three major preventable infectious conditions; namely measles, meningitis and rubella.^[11]

Sight is the main sense used to compensate for deafness even though some knowledge is acquired via tactile and olfactory senses.^[1] Therefore, visual screening is very critical for those with irreversible deafness to facilitate early detection and treatment of ocular problems. These are the best assurances for the maximum possible social and professional adjustments for the deaf.^[2] Those with non-correctable and non-treatable visual disorders also require multiple environmental adaptations and appropriate support services.^[2] Routine ophthalmologic screening of the deaf school (as in this study) is necessary to reduce the needless deaf-blind population. This study is therefore undertaken to determine the ophthalmologic abnormalities in deaf students in Kaduna with a view to providing appropriate solutions to treatable abnormalities, and to manage those that are not immediately curable.

Materials and Methods

A cross-sectional study of 620 deaf students of Kaduna State Special Education School ranging from nursery to senior secondary school.

All the deaf students attending the Special School for both deaf and blind^[2] were included in the study. Those students who were absent at the time of the study were excluded.

Clearance to conduct the study was obtained from the Kaduna State Ministry of Education through the school principal and the cooperation of the teachers was sought and some were trained in vision

screening. Consent was given by the students. The teachers also helped in explaining the questionnaire to the students.

The study team consisted of three ophthalmologists, one otorhinolaryngologist, a student from College of Medicine, Harvard University USA, and a sign language expert from the Special School.

The students were assessed within the school premises, with their school teachers near them, using a modified screening protocol for visual impairments in children who are Deaf/Hard of Hearing (developed by the Georgia Deaf-Blind Project^[3] USA). They were examined with a teacher nearby and they responded by sign language, which was interpreted by the teachers, or by sign and oral communication in a few.

All the students had systemic examination. The ophthalmic assessment included acuity checks for distance (6 m) and near (33 cm) using the illiterate E-chart, a form of Snellen's line test for distance, and reduced Snellen's illiterate chart for near, respectively. Anterior^[6] and posterior segments of the eye were examined by one^[7] of the three ophthalmologists. They had their intraocular pressures measured using a hand-held applanation tonometer (Perkins) where indicated.

Students with poor/subnormal night vision had dark adaptation test. This was conducted by the teacher using sign language in bright illumination and then repeating same after 30 minutes in the dark taking note of misinterpretations.^[8] Those who failed the dark adaptation test and those with abnormalities requiring further examination of the posterior segment all had a dilated fundoscopy.^[9]

Colour vision testing (Using Ishihara Chart) was conducted on all the students.

Refraction was done for those with visual impairment that improve with the use of pinhole.^[10] Difficult refractions especially in the younger age group were referred to a tertiary health facility for further management.

All the children had comprehensive ear examination conducted by an Otorhinolaryngologist and drugs were administered to those with treatable eye disease.

Results

A total of 620 deaf students were examined. Their age range was 5–38 years with mean age of 15.7 years + 3.9 (SD). There were 373 males

and 235 females, 61.3 and 38.7%, respectively (M : F=1 : 0.6) [Figure 1].

Those who had no visual impairment for distance in the better eye accounted for 97.8% [Table 1]; none of the children had impairment of near vision.^[11]

The prevalence of ocular abnormalities in this study population was 20.9%. Table 2 shows the ophthalmologic abnormalities. The frequency of refractive errors (7.9%) was higher than other abnormalities.

Hypermetropia was the leading refractive abnormality. Conjunctivitis was also common and predominantly allergic. Some children had color vision deficiency most of which were Blue–Green color defects. Five children had congenital ptosis. Two had optic atrophy secondary to trauma out of which one had exotropia. Five others had squint out of which four were congenital but one due to hypermetropia (convergent squint).

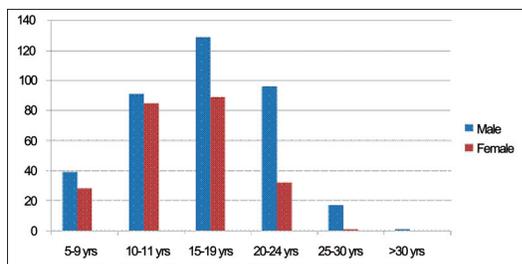


Figure 1: Students Age and Gender Distribution (bar chart)

Table 1: Visual Impairment/WHO Classification

WHO Classification of visual impairment	
6/6–6/18	No impairment
<6/18–6/60	visual impairment
<6/60 –3/60	severe visual impairment
<3/60	Blind

Table 2: Ocular Abnormalities

Types of abnormality	Frequency	Percent
Allergic conjunctivitis	21	3.4
Bacterial conjunctivitis	9	1.5
Colour vision deficiency	15	2.4
Refractive error	49	7.9
Ptosis	5	0.8
Optic atrophy	2	0.3
Squint	6	1.0
Corneal opacities	3	0.5
Iris heterochromia (blue irides) with white forelock hair (presumed Waardenburg syndrome)	4	0.6
Retinitis pigmentosa (presumed Usher syndrome)	4	0.6
Glaucoma (suspect)	12	1.9
Total	130	20.9

Three students (0.5%) had corneal opacities out of which two followed childhood measles complication while one was due to injury. Four (0.6%) students had iris heterochromia, threebilateral and one unilateral. They also had white forelock hair and together with the deafness were presumed to have Waardenburg syndrome. [Figure 2-5]

Similarly, 4 students were part of the 35 (5.6%) of the students that failed the dark adaptation test. They were presumed to have Usher’s syndrome. Twelve children had vertical cupdisc ratio >0.5 out of which 5 had IOP >20 mmHg. These were Glaucoma suspects.

No students^[12] had the typical salt and pepper fundus of congenital rubella. Majority of the students (74.8%) had sensorineural hearing loss. The interventions included the provision of spectacle correction for 18 students out of the 49 that had refractive errors, 30 students were given drugs for both bacterial and allergic conjunctivitis and 32 were referred for tertiary ophthalmic care [Table 3].

Discussion

The prevalence of ocular abnormalities in this study population was relatively low^[13] (20.9%) among deaf school students in Northern Nigeria compared to previous studies reported to vary from 33 to 60%.^[11-5] The prevalence of ocular abnormalities among deaf children in studies around the globe included the Turkish School for the deaf, 40.4%;^[11] Deaf School, Kathmandu, Nepal, 23%;^[6] Oregon School for the deaf (USA), 48%;^[8] and Princess Margaret Children Hospital Perth, 33%.^[7] This is close to the Kathmandu deaf school study and comparable to what was found in conventional school population of Western Nigeria.^[9] Findings in the developed countries are higher. The relatively high finding in the Western world is most likely attributable to the investigative procedure employed (for example, all the children in the Oregon deaf school study had electroretinogram). This means that even more subtle abnormalities were detected, hence the higher incidence.

The most common ocular abnormality in this study was refractive error (7.9%). Among these, hypermetropia was the commonest (1.9%) while myopia and astigmatism were 1.1 and 0.9%, respectively. In a review of 49% patients with^[14] sensorineural hearing loss in tertiary care, University California, San Francisco, USA, found hypermetropia to be the most common abnormality,^[12] similar to the findings of this study.



Figure 2: Waardenburg syndrome



Figure 3: Waardenburg syndrome

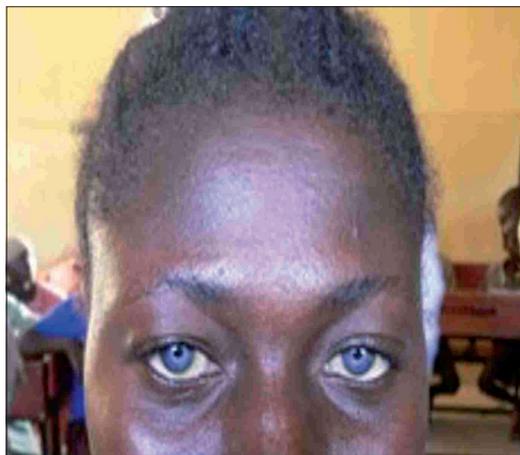


Figure 4: Waardenburg syndrome



Figure 5: Waardenburg syndrome - unilateral heterochromia

However, a conventional school screening in India found myopia to be the commonest, followed by hypermetropia.^[13] These eye screenings in both conventional and deaf schools have found refractive error to be a very common cause of ocular morbidity,^[15] which can be readily managed with spectacle correction. The need for routine school eye screening in both conventional and special schools was thus re-emphasized. Moreso^[16] says that the deaf child requires visual compensation for the deafness to prevent a needless deaf-blind^[17] situation.

Sensorineural hearing loss was found to be the commonest in this study and this can be related

Table 3: Interventions

Types of intervention	Frequency	Percent
Spectacle correction	18	2.9
Drugs	30	4.8
Referral for tertiary	32	5.2
Ophthalmic care		
Total	80	12.9

to the neuro-embryonic origin for both hearing and sight.^[14] It is also for similar reason that ocular auditory syndrome^[15] that have been defined in other reports were also found in this study. They include Usher syndrome type I (congenital deafness, balance difficulties, late walking and retinitis pigmentosa) and Waardenburg syndrome (abnormal pigmentation of skin and hair, dystopia cantorum and ectopic lacrimal punctum).

Although rubella retinopathy was the most common retinal finding in previous reports,^[16] none was detected in this study. This is probably as a result of limited number of students who had dilated funduscopy, although the incidence of congenital rubella syndrome in Nigeria is remarkably low (54/100,000 live births).^[17] Other ocular abnormalities found were allergic conjunctivitis (3.4%), glaucoma suspect (1.9%), bacterial conjunctivitis (1.5%), Ptosis (0.8%), optic atrophy (0.3%), squint (1.0%) and corneal opacities (0.5%). Similar findings were found elsewhere.^[1-5]

Conclusion

Visual abnormalities in deaf students are remarkable in Northern Nigeria (20.9%). Their association with other neurologic/sensory deficits such as deafness appears well established.^[15] The situation in a developing country like Nigeria continues to challenge the country's socio-economic framework. It calls for an urgent need for improvements in general health services, particularly routine early screening by teachers for the blind who should be trained for continuous screening exercise. This will facilitate early detection of eye/other neurologic diseases. This is to ensure there is none that is needlessly deaf-blind, and to enhance visual compensation for the hearing loss.

References

- Hanioğlu-Kargı S, Köksal M, Tomaç S, Uğurba SH, Alpay A. Ophthalmologic abnormalities in children from a Turkish school for the deaf. *Turk J Pediatr* 2003;45:39-42.
- Nikolopoulos TP, Lioumi D, Stamataki S, O'Donoghue GM, Guest M, Hall A. Evidence-based overview of ophthalmic disorders in deaf children, A literature update. *Otol Neurotol* 2006;27:1-24.
- Stockwell E. Visual defects in deaf child. *Arch Ophthalmol* 1952;48:428-32.
- Leguire LE, Fillman RD, Fishman DR, Bremor DL, Rogers GL. A prospective study of ocular abnormalities in hearing impaired and deaf students. *Ear Nose Throat J* 1992;71:643-6.
- Rogenbogen L, Godel V. Ocular deficiencies in deaf children. *J Pediatr Ophthalmol Strabismus* 1985;22:231-3.
- Sapkota K. Visual status of deaf school students in Kathmandu, Nepal. *Community Eye Health* 2005;18:129.
- Nicoll AM, House P. Ocular abnormalities in deaf children; A discussion of deafness and retinal pigment changes. *Aust N Z J Ophthalmol* 2007;16:205-8.
- Brinks MV, Murphey WH, Cardwell W, Otos M, Weleber RG. Ophthalmic screening of deaf students in Oregon. *J Pediatr Ophthalmol Strabismus* 2001;38:11-5.
- Derek DM, Stemen DP, Craig H, Anil KL. Ocular findings in children with congenital sensorineural hearing loss. *Arch Otolaryngol Head Neck Surg* 2002;128:1303-6.
- Gogate P, Rishikeshi N, Mehata R, Ranade S, Kharat J, Deshpande M. Visual impairment in hearing-impaired students. *Indian J Ophthalmol* 2009;57:451-3.
- Holborow C, Martinson F, Anger N. A study of deafness in West Africa. *Int J Pediatr Otorhinolaryngol* 1982;2:115-35.
- Adegbehingbe BO, Olodehinde MK, Majemgbasan TO, Onakpoya HO, Osagiede EO. Ocular morbidity in secondary school students in Ile-Ife, Osun State, Nigeria. *Niger J Ophthalmol* 2006;14:60-4.
- Hans L, Kansara HT, Sandra S. Results of school eye screening of 5.4 million children in India a five year follow-up study. *Acta Ophthalmol Scand* 1999;77:310-4.
- Chan KH. Sensorineural hearing loss in children; classification and evaluation. *Otolaryngol Chin North Am* 1994;27:473-86.
- Mets MB, Young NM, Pass A, Lasky JB. Early diagnosis of Usher's syndrome in children. *Trans Am Ophthalmol Soc* 2000;98:237-45.
- Elango S, Krishna RT, Shriwas SR. Ocular abnormalities in children from Malaysian school for the deaf. *Ann Trop Pediatr* 1994;14:149-52.
- Cutts FT, Vynnycky E. Modelling the incidence of congenital rubella in developing countries. *Int J Epidemiol* 1992;28:1176-84.

Source of Support: Nil, **Conflict of Interest:** None declared.

Author Help: Reference checking facility

The manuscript system (www.journalonweb.com) allows the authors to check and verify the accuracy and style of references. The tool checks the references with PubMed as per a predefined style. Authors are encouraged to use this facility before submitting articles to the journal.

- The style as well as bibliographic elements should be 100% accurate to get the references verified from the system. A single spelling error or addition of issue number / month of publication will lead to error to verifying the reference.
- Example of a correct style
Sheahan P, O'leary G, Lee G, Fitzgibbon J. Cystic cervical metastases: Incidence and diagnosis using fine needle aspiration biopsy. *Otolaryngol Head Neck Surg* 2002;127:294-8.
- Only the references from journals indexed in PubMed would be checked.
- Enter each reference in new line, without a serial number.
- Add up to a maximum 15 reference at time.
- If the reference is correct for its bibliographic elements and punctuations, it will be shown as CORRECT and a link to the correct article in PubMed will be given.
- If any of the bibliographic elements are missing, incorrect or extra (such as issue number), it will be shown as INCORRECT and link to possible articles in PubMed will be given.