



Visual Status among People Living with Hearing Loss in Tudun Maliki School for the Deaf and Blind, Kano, Nigeria.

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Abstract

Background: Research has shown that the prevalence of ocular abnormalities among people living with hearing loss is higher than the overall population of similar age categories.

Aim: The study was carried out to probe the visual status involving people living with hearing loss in school for the deaf and blind, Kano, Nigeria.

Methods: A cross-sectional descriptive design study, conducted in Tudun Maliki, which is the only established special need school for people living with hearing loss in Kano. The participants were already diagnosed with hearing loss or impairment and met the inclusion criteria. Eighty-one participants had a thorough eye examination in the school after both ethical clearance and approval from the ministry of health and the school board respectively, were obtained.

Results: The participants were between the ages of 7 and 27 years, with a mean age of 14.72 ± 3.92 years. Fifteen participants (18.5%) had moderate visual impairment. The Prevalence of refractive error was 77.7%, with astigmatism 31 (38.3%) as the highest type of refractive error. Thirty one (68.8%) participants had anterior segment abnormalities, while 14 (31.1%) had posterior segment abnormalities. The prevalence of visual impairment was 19.7% among participants.

Conclusion: There are high proportions of poor visual status among students attending special need schools for the deaf in Tudun Maliki in Kano, consequently recommending for thorough eye examination for every young child diagnosed with hearing loss.

Keywords: visual status, hearing loss, visual impairment, refractive error, ocular disorder.

Introduction

Visual status of the eye is the evaluation of the visual acuity (VA) [1], amplitude of accommodation, binocularity of the eyes in an uncorrected condition, and the best corrected visual acuity (BCVA) realisable using contact lens or spectacle prescription. A person with a hearing thresholds of 20dB or better in both ears is regarded to have a hearing loss [2]. It can be mild (they do not hear soft sounds), severe (at the normal level they hear nearly nothing when they are talk to) or profound (do not hear any speech, except very loud sounds) [2]. In 2018, World Health Organization (WHO) estimated the people living with disabling hearing impairment to be 466 million [3]. Researchers has reported the prevalence of Hearing disorder globally, from 1.4% in children aged 5–14 years to 9.8% in those who are 14 years or older [4]. The most common causes of hearing impairment among school children in Africa were cryptogenic deafness, convulsions, ototoxicity, neonatal jaundice, and infectious causes [5,6]. The link between the roles of the many organs of sensation has been established, especially between the ears and eyes. The retina and cochlea are formed in the 6th and 7th week of gestation from the same embryonic layers [7].

Vision, plays a very important role in skills possession like, facial expressions interpretation, language and those that needed hand–eye collaborations.⁸ The eyes plays a great role in the growth and the child's functioning [8]. In the case of Special needs children, vision played a fundamental role in the psychosocial growth among them and account for impaired functions, mostly in children living with hearing lost [9].

A lot of knowledge and skills in children are acquired through the eyes and ear [10]. When either the eye or ear is greatly impaired, the functioning one will compensate for the other (making it more significant

as the impairment worsened).⁸ Oculo-visual abnormality in children with special needs that is concealed and untreated, could negatively influence their psychosocial behavior, learning potentials and development, hence increase socioeconomic burden of the family [11]. Furthermore, the perseverance of an untreated oculo-visual abnormality would complicate the effect of other forms of disability.¹² When a child is above the age of 10–12 years, with uncorrected visual deficiency, the flexibility of the visual system is lost, and the recuperation of vision can be restricted [8]. There is need for a comprehensive and timely oculo-visual evaluation among those at risk [8]. Special needs Children are at a greater risk of ocular and visual complications than their associates [9]. Nonetheless, on many occasions cannot adequately communicate symptoms [13].

Research studies have showed that the deaf and hearing impaired has a higher prevalence of ocular abnormalities than the general population of similar age group [14].

Poor visual status with hearing loss is a devastating and poorly tolerating condition to one's life and socio-economic impact but little attention has been given to it. This research work was conducted to determine the visual status of patients with hearing loss in order to bridge the gap in their care service.

Presently, there is no documented study on visual status of patients with hearing loss in Kano State (considering the peculiarity of the state), Nigeria. This study will serve to provide new information about vision and hearing loss and also serve as a guide for further research. It will help the otolaryngologist (under non-governmental organizations) that visit the school to consider routine eye checkups and eye examinations for patients presenting with hearing loss in the clinic.

Materials and Methods

This research is a cross-sectional descriptive prospective study carried out at Tudun Maliki School for the deaf and blind. The school is located at Tudun Maliki quarter of Kumbotso Local Government Area Kano, Kano State, Nigeria. The study population consists of 81 out of 250 registered pupils and students living with hearing loss attending Tudun Maliki School for the Deaf and Blind from February to April 2023. The judgmental sampling technique was used in this research in order to be sure only those with hearing loss without any form of systemic condition or disability were included in the study.

The sample size was calculated using a study carried out in Ibadan, Nigeria [15].

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

n = desired sample size;

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

p = visual impairment and ocular findings among deaf and hearing impaired in school children in Ghana. (6.4%) [15].

$$q = 1 - p$$

d = precision with which P is determined 0.05

$$n = \frac{1.96^2 \times 0.064 \times (1 - 0.064)}{0.05^2}$$

$$n = \frac{3.8416 \times 0.064 \times 0.059904}{0.0025}$$

n = 92. Allowing for 10% attrition, the minimum sample size becomes 9

$$92+9 = 101$$

Only pupils and students with hearing loss without any further disability attending Tudun Maliki special school for the deaf and blind, who gave their consent or

returned their assent forms, were included in the study. Those students who were absent, non-consenting notwithstanding their assent form being returned, were excluded.

The data collection form comprises six parts/sections, namely, the socio-demographic data (personal information), visual acuity, preliminary examination, anterior segment assessment, near point of convergence (NPC), funduscopy, objective and subjective refraction. Tumbling illiterate E Snellen's chart, Trial Lens Box (TLB), Ophthalmoscope (Heine), Streak Retinoscope (Welch Allyn, YZ24), Meter Rule, Occluder, pen torch, and writing materials were materials used for the study.

A designated teacher from the school who helped in interpretations and coordinating the students was assigned by the school authorities for the study. An assent forms were given to the pupils/students <18 years for their parents/guardians to sign while consent forms were issued to the students (≥ 18 year), and it was explained to them by their sign expert/teacher. All examinations were carried out by qualified and registered optometrists in a designated room conducive to the study. A distance illuminated visual acuity chart (E-CHART) was placed at a distance of 6 m from the patient to find out their level of visual acuity, and the test was performed monocularly with the right eye first before the left eye. Acuity values were recorded in the data sheet. A cover test was performed at 40 cm using an Occluder, and this was done monocularly in the cover-uncover test and alternatively in alternative cover tests. Deviations seen are recorded (based on the eye movement during cover and uncover tests) as either esodeviation or exodeviation in both phoria tests and tropia. Direct ophthalmoscopy was performed to rule out posterior segment of the eye abnormalities while those with suspicious disc were referred to the clinic for IOP

measurements (with Keeler air puff machine). The external examinations were done using a pen torch for any physically obvious abnormalities. A non-cycloplegic objective examination was performed in dim illumination in one of the classes using a streak retinoscope. Cycloplegic refraction was not done due to the same ethical considerations as using certain medications in a vulnerable population. Subjective refraction was conducted at 6 meters and was recorded.

Visual impairment (VI) was categorized with the ICD-10 classification: Category 0 (mild or no visual impairment) is better than 6/18, Category 1 (moderate VI) = 6/18, Category 2 (severe VI) = 6/60, Category 3 (blindness) = 3/60 and Category 4 (blindness) = 1/60 using the best seeing eye. Refractive error was defined as follows: astigmatism as a cylindrical power of $\geq -0.50D$, hyperopia and myopia as spherical powers of $\geq +2.00D$ and $\geq -0.50D$, respectively, and emmetropia as a spherical correction of $< -0.50D$.

Data was analysed using Statistical Package for Social Sciences (SPSS 17) (IBM Boston, USA). Fisher's exact test was used to assess associations between variables. $P < 0.05$ was used for evaluating statistical significance at 95% confidence interval. Frequencies, standard deviation and percentage proportion were computed. Ethical approval to conduct this study was obtained from the Health Research Committee in the Kano State Ministry of Health, Kano, Nigeria (SHREC/2022/3120) after an introductory letter was obtained from the department of optometry, Bayero University Kano.

Results

The school had in their register 250 (pupils and students) of those living with hearing loss, in the hearing-lost section of the school; only 81 of them

participated in this study, comprising 16 (19.80%) females while the males were 65 (80.20%). The mean age and standard deviation of the participants were 14.72 ± 3.92 years. The age distribution was between 7 years and 27 years. The senior secondary school has the highest number of participants 33 (40.74%) (Tables 1 and 2).

Table 1: Social demographic data of the participants.

	N = 81	%
Sex		
Male	65	80.20
Female	16	19.80
Total	81	100
Academic Levels		
Primary School	23	29.63
Junior Secondary School	25	30.86
Senior Secondary School	33	40.74
Total	81	100

Table 2: Age Distribution of Participants

Age groups	Male n (%)	Female n (%)	Total n (%)
6 – 10	7(8.64)	2 (2.47)	9 (11.11)
11 – 15	34(41.98)	-	42 (51.85)
16 – 20	17(20.99)	6 (7.41)	23 (28.40)
21 – 25	(7.41)	0 (0.00)	6 (7.41)
26 – 30	1(1.23)	0 (0.00)	1 (1.23)

Most of the participants had normal vision using the International classification (ICD) of disease and related health problems, tenth version (ICD-10). Moderate visual impairment was seen in 11 (16.9%) and 4 (25%) male and female, respectively (Table 3). Participants with astigmatism had the highest refractive error 31 (38.3%) (Table 4). Prevalence of

ocular deviations was 20.99%, exophoria 7 (8.64%) had the highest occurrence (Table 5).

Table 3: ICD-10 Classification of VA across Gender

ICD-10 Classification	Gender	
	M (%)	F (%)
6/6 to > 6/18 (Normal to Mild)	54 (83.00)	11 (68.70)
<6/18 to 6/60 (Moderate Visual Impairment)	11 (16.90)	4 (25.00)
<6/60 to 3/60 (Severe Visual Impairment)	0 (0.00)	1 (6.25)
Total	65	16

Table 4: Refractive Status and Gender

Refractive Status	Gender		Total	%
	M	F		
Astigmatism	24	8	32	39.5
Emmetropia	17	1	18	22.2
Hyperopia	18	5	23	28.4
Myopia	6	2	8	9.9

Discussion

This study assessed the visual status of students living with hearing loss in a special need school in Kano. In this study, participant's responses were an optimum of 80.2% with a male population different, from a study conducted in Benin, Nigeria [10] were more females were seen. However, it is similar to the study conducted in Ghana [16], where there were more males. The presence of more males in this study may be as a result of the socio-cultural dynamics of Kano and Northern Nigeria at large, where more males are empowered, and this may not be different from the special needs children. The average age of participants in our research was 14.72±3.92 years, with the age limit of 7 and 27. It was slightly higher than that

Table 5: Ocular Deviation among the Participants

Phoria	n (%)	Tropia	n (%)
Exophoria	7 (8.64)	Exotropia	0 (0.00)
Esophoria	6 (7.41)	Esotropia	4 (4.94)

conducted in Calabar, Nigeria [8], but less than 15.7±3.9 years from another work in northern Nigeria among deaf children [7]. The higher school age may be as a result of delay in the enrollment of these children into school [17]. The senior secondary school student has the highest number of participants followed by the junior secondary school and primary school in the study, and this may also be as a result of the late entry into school as only a few will want to stay in the lower class at their age.

The visual impairment prevalence was 19.7% in our work, and this is similar to 19% found in Lagos, Nigeria [18], yet higher than 10.3% in Ghana [16]. This may be as a result of the classification of visual impairment used by the authors. In this study, 1.2% and 18.5% of the students were found to have severe and moderate visual impairment, respectively. However, one (female) of the students was found to have severe visual impairment, and moderate visual impairment was seen more among the male students. About 64% of global blindness is women as a result of these different perspectives: risk factors, life expectancy, and access to services [19]. These may be broken down further into social, economic, cultural, and biological (hormonal) differences that exist between men and women. Uncorrected refractive error accounts for 77.7% of the prevalence of visual impairment among the participants examined in our work; indicating that people living with hearing loss struggle or have challenges with learning and communication since they rely on visual cues. The prevalence of refractive error

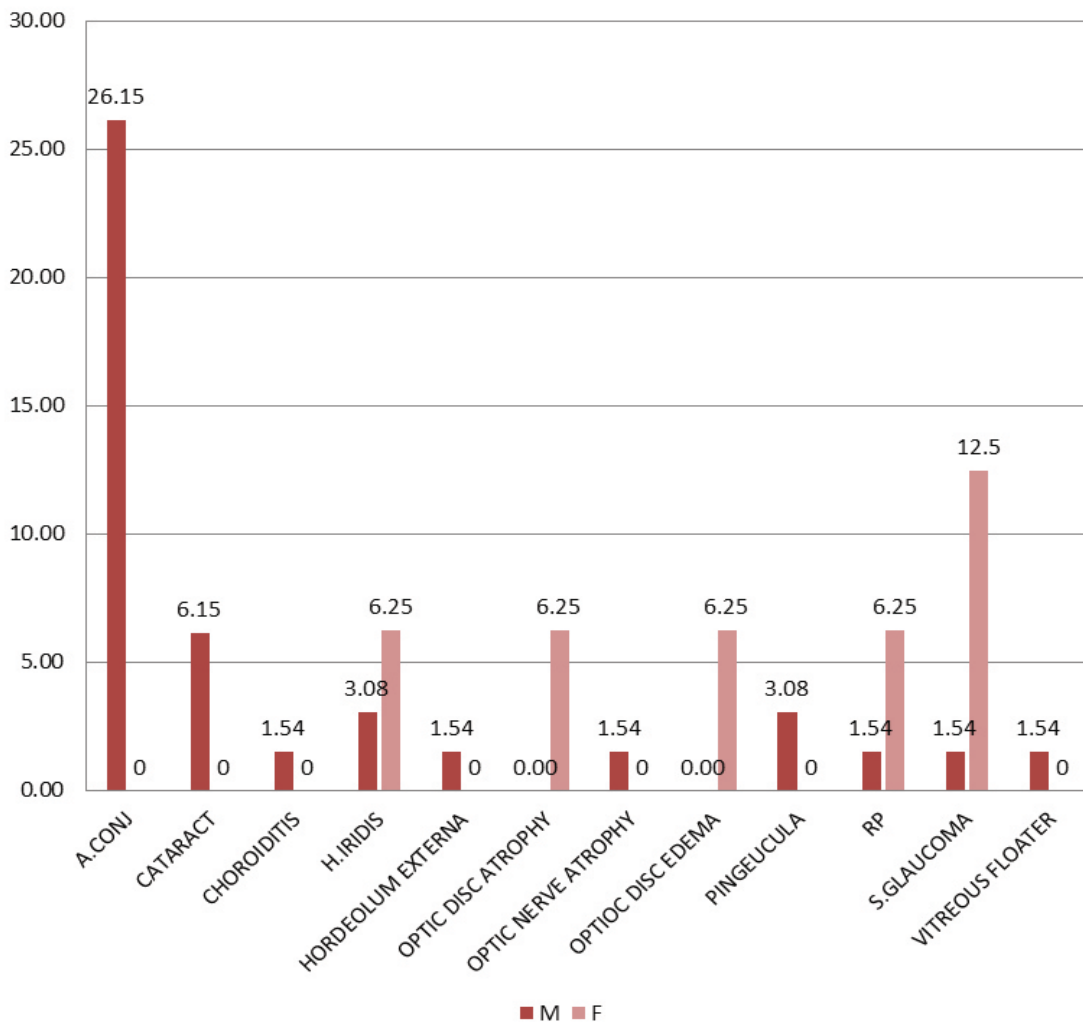


Figure 1: Prevalence of Ocular Disorders across Gender

found in our work was similar to the result of 73.26% recorded in sub-Saharan Africa [20] and in Benin City, Nigeria [10]. The commonest refractive error in the work was astigmatism, which was in contrast to another work in Nigeria [7] which had hyperopia as the highest refractive error and myopia in the work in India [21]. However, it was similar to a research conducted in Ghana [16]. The differences in environmental conditions as well as genetic reasons and residential status of the participants may have contributed to astigmatism being the most prevalent refractive error in this work [19]. The prevalence of ocular deviations was 20.99% and it was similar to the

study conducted in Ghana [16] where exophoria has the highest occurrence.

The association linking gender and refractive error distribution in the work was not significant ($P > 0.05$). While this work is in agreement with the research carried out in Dow University, Karachi, and Pakistan [22]. The prevalence of ocular disorder in this study was found to be 44.4%, which was similar to 40.4% found in the study conducted in Turkish [23]. This also agreed with other studies in Nigeria, that the occurrence of visual disorders among the people living with hearing loss is between the range of 20.9 – 73.3% [7,10]. The frequency of ocular disorders evaluated in the work could have been underreported taking into

consideration that eye examinations were carried out with direct ophthalmoscope, which could have limited the discovery of other disorders. There was a statistical association ($P < 0.05$) linking gender and ocular disorders. This could also be as a result of these three perspectives: risk factors, life expectancy and access to service.

Limitation of Study

The major limitation faced during the research was absenteeism among the school children leading to prolongation of the period of data collection; this led to the response rate recorded in this study.

Conclusion

There are high proportions of poor visual status among students attending special needs schools for the deaf in Tudun Maliki in Kano. However, little or no frequency of ophthalmic evaluation is conducted among these students attending the special need school for the deaf and blind, as there was no record of that by the school authority. There is a need for greater attention to these disorders, which poses serious educational and social problems for these children. Since deaf and hearing-impaired children have difficulty conveying their vision problems and need to compensate for their poor hearing with an enhanced sense of sight, eye screening examinations are paramount in these children at the point of admission into the school.

Conflict Interests

The authors declare that they have no conflict interests.

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Nil.

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