



Prevalence of Visual Impairment among Deaf and Mute Schools Children

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Authors' contributions

This work was carried out in collaboration between all authors. Author AMR designed the study, wrote the protocol, and wrote the draft of the manuscript. Authors AFE and AMR managed the literature searches, analyses of the study. Authors AFE, AEES and HGE supervised the study. All authors read and approved the final manuscript.

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ABSTRACT

Background: Particular attention must be paid to ocular abnormalities in deaf children, as their early detection and proper treatment will greatly affect their social and professional performance.

Aims: To determine the prevalence and causes of visual impairment in deaf and mute children.

Place and Duration of Study: The study was done from December 2011 to April 2012 in Shebin El-Kom and Menoufcities, Menoufia governorate, Egypt.

Methods: This is a cross section study done including two schools for deaf and mute children (435 students from 6 to 18 years old) in order to evaluate the prevalence of visual impairment among them. A screening test using Landolt broken ring chart was done to measure the visual acuity of each child. Children with visual acuity 6/12 or less in one or both eyes were referred to Menoufia University Hospital for detailed ophthalmic examination.

Results: The study revealed 39 students (9%) had visual acuity $\leq 6/12$ in one or both eyes. 19 children had astigmatism (4.4%), 4 were myopic (0.9%) and 9 were hypermetropic (2.1%). Strabismus found in 2 children (0.5%) while other 2 were

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amblyopic (0.5%). 3 children suffer from retinitis pigmentosa and associated disorders.
Conclusions: The prevalence of visual impairment recorded in two schools for deaf and mute children (aged from 6 to 18 years) was 9%.

Keywords: Astigmatism; amblyopic; deaf and mute children; hypermetropic; myopic; retinitis pigmentosa; strabismus; visual acuity.

1. INTRODUCTION

Available evidence suggests that ophthalmologic screening and detection of visual problems in deaf children is important because the vast majority of knowledge is obtained through the senses of sight and hearing, some through the tactile and olfactory senses. When one of these is seriously impaired, the other is used to compensate the disability, so the deaf population may compensate by making greater use of visual-perceptual cues than their normal hearing peers, and thus even a mild refractive error may reduce the visual cues available to the deaf mute person [1].

This study aims to stand on the causes of visual impairment and its prevalence among hearing impaired children. It included 2 schools for deaf and mute children in 2 cities (Shebin El-Kom and Menouf) in Menoufiya governorate, Egypt.

2. METHOD

This is a cross section study done from December 2011 to April 2012. It included two schools for deaf and mute children in Shebin El-Kom and Menoufcities in Menoufia governorate, Egypt. The total number of students in the two schools is 435. Their ages range from 6 to 18 years.

Inclusion criteria

- The study included all the students who attended during days of screening.

Exclusion criteria

- 20 students were excluded because of persistent absence.
- 6 students did not accept the examination while two students were uncooperative.
- A screening test using Landolt's broken ring chart at 6 meters was done to evaluate the visual acuity (VA) of each child.
- Children with VA 6/12 or less in one or both eyes were referred to Menoufiya University Hospital – Ophthalmology department for detailed ophthalmic examination.

The examination included:

- VA measurements (uncorrected and best corrected) were done at 3 meters using Decimal Notation E chart.
- Slit lamp biomicroscopy of the anterior segment of the eye and adnexa was done using both direct illumination and retroillumination methods.

- Ocular motility was evaluated using cover uncover test, ocular motility test and Hirschberg test.
- Fundus examination after pupil dilatation was done using indirect slit-lamp bio microscopy (using Volk auxiliary lens) and direct ophthalmoscope.
- The refraction was taken by auto refractometer under the effect of cyclopentolate eye drop.

Statistical analysis:

- The collected data were analysed using SPSS, statistical package.

3. RESULT

There are 435 students (247 males 56.8% and 188 females 43.2%) in the two schools aged from 6 to 18 years who were included in the study. 20 students recorded persistent absence, 6 students refused to participate in the study and 2 students were uncooperative.

The study revealed 39 students (9%) had visual acuity $\leq 6/12$ in one or both eyes; 10 males (25.6%) and 29 females (74.4%).

Astigmatism was the most common refractive error found in 19 cases (4.4%); 5 males and 14 females. Hypermetropia found in 9 cases (2.1%); 8 females and 1 male. Myopia was found in 4 cases (0.9%); 3 females and 1 male. 2 cases had amblyopia (0.5%); 1 male and 1 female while 2 had strabismus (0.5%); 1 male and 1 female. 3 cases suffer from retinitis pigmentosa and associated disorders; one case without associated disorder (0.2%), the second case associated with keratoconus (0.2%) and the third associated with high myopia (0.2%) Table 1.

Table 1. Distribution of the final diagnosis among cases with visual impairment (n=39) and among the whole group (n=435)

	Among cases (n=39)		Among the whole group (n=435)
	No.	%	in %
Amblyopia	2	5.1	0.5
Astigmatism:	19	48.7	4.4
Myopia:	4	10.2	0.9
Hyperopia:	9	23.1	2.1
Strabismus:	2	5.1	0.5
Retinitis pigmentosa (RP)	1	2.6	0.2
Keratoconus with RP:	1	2.6	0.2
Myopia with RP:	1	2.6	0.2

4. DISCUSSION

Hearing-impaired children rely almost entirely on their visual senses to learn about their environment. If a visual handicap added to the auditory handicap, it would affect such a child more than a normal child. Refractive errors and amblyopia are easily treatable and it would be a shame if such a hearing-impaired child does not get proper eye attention [2].

In India, a study involved 901 hearing-impaired students. A quarter of them (216/901,24%) had ocular problems. Refractive errors were the most common morbidity 167(18.5%). Other common conditions included strabismus in 12 (1.3%) children, and retinal pigmentary dystrophy in five (0.6%) children [2].

The present study was done in two schools for deaf and mute children including 435 students revealed that 39 students (9%) had visual acuity $\leq 6/12$. 19 cases had astigmatism (4.4%), 9 had hypermetropia (2.1%), while 4 had myopia (0.9%). 3 cases suffer from retinitis pigmentosa and associated disorders, 2 students had strabismus (0.5%) while other 2 had amblyopia (0.5%).

In the UK, one hundred and twenty-two children were seen at the Child Development Centre for an holistic assessment, and 110 of these children have had an ophthalmic assessment, of whom 48 (43.6%) were found to have ophthalmic abnormalities. These included 43 children (39.1%) with refractive errors. The prevalence of ophthalmic problems was higher than the prevalence in hearing school children in the literature and in local pre-school children. There were six cases of Usher syndrome [3].

In China, another study examined 279 students in a low hearing school. 100 persons (35.8%) were found to have ocular defects in one or both eyes. Among the ocular abnormalities, fundus defects occupied 28.6% and error of refraction represented 17.9%. Cases of hereditary syndromes were found: Usher syndrome, 2 cases; Goldenhar syndromes, 2 cases (brother and sister); Waardenburg syndrome, 1 case; von Recklinghausen's syndrome, 1 case. [4].

In a survey of 78 hearing impaired children in Australia, 33% were found to have ocular abnormalities. The abnormalities were relatively minor [5].

In Malaysia, the prevalence of ocular abnormalities was studied in 165 children from a Malaysian school for the deaf. Ninety-five children (57.6%) had one or more ocular abnormalities. Rubella retinopathy was the commonest form of ocular abnormality (35.2%). Refractive errors were found in 23 children (13.9%). Thirteen children had congenital anomalies causing significantly impaired vision [6].

In a Turkish study, complete ophthalmologic examinations were performed on 104 children aged 7 to 20 years from a school for the deaf. Of 104 children, 42 children (40.4%) had some form of ophthalmologic abnormality, with the vast majority (31 patients, 29.8%) being refractive errors. Of 104 children, 19 (18.2%) had ocular motility disturbances and one had external adnexal anomaly. Two (1.8%) children had anterior segment and nine (8.6%) children had posterior segment pathologies [7].

In USA, a study was done to determine the nature and prevalence of ophthalmologic abnormalities in children with congenital or prelinguistic sensorineural deafness, complete ophthalmologic examinations were performed on 54 children aged 2 to 14 years from the University of Miami Ear Institute's Cochlear Implant Program. Of 54 children, 33 (61.1%) had some form of ophthalmologic abnormality, with the majority (24 patients; 44.4%) being refractive errors. Of 54 patients, two (3.7%) had strabismus and two (3.7%) had external adnexal anomalies. One child (1.8%) had cataracts [8].

Results from these studies are shown in Table 2.

In the present study, the prevalence of visual impairment (9%) is less than the other studies. This may be because these studies included other ocular abnormalities not affecting the visual acuity or performed on children with severe hearing loss and perhaps additional handicap.

On the other hand, there are a lot of studies included normal hearing children that show different results.

In Malaysia, a study including normal hearing primary school children mentioned that the prevalence of visual impairment was 7.7%. The main cause was refractive error which represented 90.7% of cases and 7% of the whole group [9].

In Egypt, a study showed that the prevalence of refractive error (visual acuity $\leq 6/12$) among normal hearing children was high 22.1% and the prevalence of low vision (visual acuity $\leq 6/18$) was 12.5% [10].

In comparison with normal hearing children, the present study gives higher prevalence rates than the Malaysian study where as it gives lower rates than the Egyptian study.

Less prevalence rates do not exclude that hearing-impaired children are at a higher risk of ocular abnormalities than normal hearing children. During our study, we noticed that a lot of hearing-impaired children can hardly read and write. This may be because they are less interested in learning or a defect in the learning way. This may result in the lower rates of refractive error in comparison with the rates of the Egyptian study.

It is recommended for those children to receive:

- 1- Regular screening programs for their vision.
- 2- Detailed ocular examination for those with visual impairment.
- 3- Regular follow up, at least annually, for the visually impaired children.
- 4- Rehabilitation programs to the children with poor visual prognosis.
- 5- Low vision aids for those in need.
- 6- Social care concerning their vision. Awareness of school teachers and family members to the importance of observing any vision problem in the child and not to neglect it.

Table 2. Comparison of ocular problems in hearing-impaired children [3]

Name of study	Country	Year	Children examined	Ocular Problem	Refractive Error	Usher's	Fundus disorders	Motility problems
Guy et al. [3]	United Kingdom	2003	122	48/122 (43.6%)	43(39.1%)	6/122 (4.9%)	-	-
Hanioğlu-Kargi Se [4]	Turkey	2003	104	42/104 (40.4%)	31/104 (29.8%)	-	9/104 (8.6%)	19/104 (18.2%)
Elango et al. [5]	Malaysia	1994	165	95/165 (57.6%)	23(13.9%)	-	(35.2%) Rubella	-
Siatkowski et al. [6]	USA	1994	54	33/54 (61.1%)	24/54 (44.4%)	-	3/54 (5.5%)	2/54 (3.7%)
Ma et al. [7]	China	1989	279	100/279 (35.8%)	50/279 (17.9%)	2/279 (0.7%)	80/279 (28.6%)	-
Nicol et al. [8]	Australia	1988	78	26/78 (33%)	-	-	-	-
Regenbogen et al. [11]		1985	150	68 (45.3%)	-	-	-	12 (1.3%)
Gogate et al. [2]	India	2008	901	216/901 (24%)	167/901 (18.5%)	5/901 (0.6%)	10/901 (1.1%)	12/901 (1.3%)

5. CONCLUSION

Ocular problems are common in hearing-impaired children. Screening for ocular problems should be made mandatory for those children, as they use their visual sense to compensate the poor auditory sense.

CONSENT

Not applicable.

ETHICAL APPROVAL

Not applicable.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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