Available online at www.sciencedirect.com

ScienceDirect

Journal of Current Ophthalmology 27 (2015) 56–59

http://www.journals.elsevier.com/journal-of-current-ophthalmology

Eye problems in children with hearing impairment

Hadi Ostadimoghaddam[a,b], Hanieh Mirhajian[b], AbbasAli Yekta[b,c,*], Davood Sobhani Rad[d], Javad Heravian[a,b], Azam Malekifar[c], Mehdi Khabazkhoob[e]

[a]*Refractive Errors Research Center, School of Paramedical Sciences, Mashhad University of Medical Sciences, Mashhad, Iran*
[b]*Department of Optometry, School of Paramedical Sciences, Mashhad University of Medical Sciences, Mashhad, Iran*
[c]*Noor Research Center for Ophthalmic Epidemiology, Noor Eye Hospital, Tehran, Iran*
[d]*Department of Speech Therapy, School of Rehabilitation, Tehran University of Medical Sciences, Tehran, Iran*
[e]*Department of Epidemiology, Faculty of Public Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran*

Available online 18 November 2015

Abstract

Purpose: To compare the prevalence of refractive errors, amblyopia, and strabismus between hearing-impaired and normal children (7–22 years old) in Mashhad.

Methods: In this cross-sectional study, cases were selected from hearing-impaired children in Mashhad. The control group consisted of children with no hearing problem. The sampling was done utilizing the cluster sampling method. All of the samples underwent refraction, cover test, and visual examinations.

Results: 254 children in the hearing-impaired group (case) and 506 children in the control group were assessed. The mean spherical equivalent was 1.7 $\pm$ 1.9 D in the case group, which was significantly different from the control group (0.2 $\pm$ 1.5) ($P < 0.001$). The prevalence of hyperopia was 57.15% and 21.5% in deaf and normal children, respectively, but myopia was mostly seen in the control group (5.5% versus 11.9%, $P = 0.007$). The mean cylinder was 0.65 $\pm$ 1.3 D and 0.43 $\pm$ 0.62 D in deaf and normal subjects, respectively ($P = 0.002$). 12.2% of deaf subjects and 1.2% of normal subjects were amblyopic ($P < 0.001$), and the prevalence of strabismus was 3.1% in the case group and 2.6% in the control group ($P = 0.645$).

Conclusion: In a comparison of children of the same ages, hearing-impaired children have significantly more eye problems; therefore, a possible relation between deafness and eye problems must exist. Paying attention to eye health assessment in hearing-impaired children may help prevent adding eye problems to hearing difficulties.

Keywords: Deafness; Ocular disorders; Myopia; Hyperopia; Amblyopia

Introduction

Hearing disorder is one of the important health issues which significantly affect the quality of life.[1,2] The prevalence of this problem has been reported from 1.4% in children aged 5–14 years to 9.8% in those who are 14 years or older.[3] In severe hearing loss, the remaining senses are more important.[4] Vision is one of the important senses which has more value for communication in deaf people compared to ordinary people, and it has been shown that a coincidence of visual disorders with hearing impairment, especially in the early years of life, can negatively impact development of communication and cognitive skills.[4,5] Several studies reported that some visual disorders are more prevalent in the deaf population, which has been reported up to 60%.[5–8] Refractive errors, stereopsis problems, amblyopia, strabismus, and reduced vision are among the most important visual disorders in the deaf. Some of these studies have shown that refractive errors are more prevalent in deaf subjects compared to other visual disorders.[4,7,9,10] Nevertheless, the condition of refractive errors in this population compared to the normal population cannot be judged because the majority of studies were descriptive and did not have a control group.[6,11] Previous studies confirm that

*Corresponding author. Noor Research Center for Ophthalmic Epidemiology, Noor Eye Hospital, Tehran, Iran.
E-mail address: yektaa@mums.ac.ir (A. Yekta).
Peer review under responsibility of the Iranian Society of Ophthalmology.

http://dx.doi.org/10.1016/j.joco.2015.10.001

refractive errors are the most prevalent visual disorder in not only deaf children but also the older deaf population.[6,11]

Since analytical studies are more valid to test different hypotheses, such studies with a proper methodology should be performed to assess the link between high refractive error and deafness. Few studies have evaluated visual disorders in deaf students in Iran so far.[6,11] Thus, we conducted a study to compare selected visual disorders including refractive error, strabismus, and amblyopia in deaf and normal students.

Methods

This study was a cross-sectional analysis of the two groups of deaf and non-deaf subjects who were compared in terms of refractive errors, amblyopia, and strabismus. The deaf group in this study was selected by cluster sampling from deaf students in Mashhad.

Subjects were selected from four primary and junior high schools for the deaf using the random cluster sampling method. The total number of deaf students was 420, of whom 280 were selected. Taking the inclusion and exclusion criteria into account, 254 subjects participated in the study.

The control group consisted of subjects with no hearing disorders from all corresponding educational grades from 12 schools in Mashhad and was selected using cluster sampling. Age and sex are two confounding factors for refractive errors. Consequently, these two variables have been adjusted for selecting the control group. Considering similar age and sex distribution to deaf subjects, 560 students were selected.

Subjects with auditory problems based on the interview and medical history were excluded from the study.

Written informed consent was obtained from parents.

In this study, the deaf group was examined first. All examinations were performed in a school room with proper lighting. The examinations included visual acuity assessment with Snellen chart for 6 m and 40 cm, cycloplegic refraction for 7- to 14-year-old subjects and non-cycloplegic refraction for subjects 15 and older.

Refraction was measured using autorefractometer TOPCON RM8800 (Topcon Corporation, Tokyo, Japan) by only one optometrist for all participants, and results were rechecked by retinoscope (HEINE BETA 200 Optotechnic Germany). When results of autorefraction and retinoscopic refraction were different, the latter was registered. If the uncorrected visual acuity was less than 20/20, best corrected visual acuity was registered following subjective refraction.

Cover test was performed in 6 m and 40 cm with an accommodative target. For subjects whose uncorrected visual acuity was less than 20/20, cover test was performed with best correction. Other examinations included measurement of stereopsis by Titmus circles test (Stereo Optical, Chicago, IL) and fundus examination (direct ophthalmoscopy and assessment of foveal reflex). Severity of hearing loss was registered based on the hearing threshold of the last available audiogram as follows: mild (26–40 db), moderate (41–70 db), severe (71–90 db), or profound (>90 db).[12] Considering medical records, the etiology of hearing impairment was categorized as congenital (positive family history of deafness, positive history of drug use during pregnancy, acquisition of diseases such as rubella during pregnancy) or acquired (premature birth or low birth weight, postnatal complications such as high fever and convulsion, ear infection, and trauma). Inclusion criteria were parent willingness, an intelligence quotient greater than 70, and absence of disabilities aside from hearing impairment. For the case group, all the examinations were performed in their school and included tests of uncorrected visual acuity, corrected visual acuity, cycloplegic refraction (for 7- to 14-year-old subjects) and non-cycloplegic refraction (for subjects 15 and older), cover test, and fundus examination. Equipments of examinations and examiners were similar in both groups.

Spherical equivalent (SE) was used for calculations of refractive error. Refractive errors were compared separately for the two age groups. Previous studies have shown no difference in astigmatism between cycloplegic and non-cycloplegic refraction.[13] Hence, non-cycloplegic astigmatism was used for comparison. Myopia was defined as an SE of -0.50 diopter (D) or less and hyperopia as an SE of $+2.00$ D or more (for 7- to 14-year-old subjects) and more than $+0.50$ D (for subjects 15 and older). Astigmatism was defined as cylinder refraction more than 0.50 D. Amblyopia was defined as BCVA 20/30 or less or 2-line interocular optotype acuity differences with no intraocular anatomical pathology. Stereoacuity of 100 s of arc or less was considered normal.

Exclusion criteria

Parent unwillingness, lack of test cooperation, and audiogram results greater than one year were the exclusion criteria of the study.

Ethical consideration

The ethics committees of Mashhad University of Medical Sciences approved the study, which was conducted in accordance with the tenets of the Declaration of Helsinki.

Statistical analysis

Logistic regression was applied to compare refractive errors, amblyopia, and strabismus in the two groups, and the odds ratios were reported with a 95% confidence interval. T-test was applied to compare quantitative figures such as spherical equivalent. $P < 0.05$ was considered statistically significant.

Results

254 deaf students had valid records for this report, and 506 normal students were examined. 52.8% of the case group and 53.2% of the control group were male ($P = 0.196$). The mean age of the two groups had no significant difference ($P = 0.254$). It was 14.5 ± 3.3 and 14.3 ± 3.9 years for the case and control groups, respectively (with ages ranging from 7 to 22 years old).