

ORIGINAL ARTICLE

Hearing loss and eye refractive disorders in patients admitted to Vali-e-Asr Hospital in Birjand, Iran, 2015

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Received: August 03, 2018

Revised: December 05, 2018

Accepted: December 05, 2018

Abstract

Introduction: There is insufficient information about the correlation between hearing and visual impairments. Its importance arises when trainers should care about medical issues of their clients. Refractive errors of the eye are one of the main causes of visual loss in the society. The purpose of this study was to evaluate the relationship between refractive errors in the eye (by the type of refractive error) and hearing loss in patients referred to Vali-e-Asr Hospital in Birjand, Iran.

Methods: In this case-control study was conducted on 124 patients referring to Ear, Nose, and Throat Clinic with hearing loss (case) and 117 patients with normal hearing status (control). The participants were selected non-randomly and they were matched in terms of age and gender. All data were analyzed by SPSS (version 21) using the Chi-square test and t-test. P-value less than 0.05 was considered statistically significant.

Results: A total number of 241 patients (case=124, control=117) participated in this study. There were 51.6% and 54.7% women in the case and control groups, respectively. The mean ages in the case and control groups were 36.03±17.13 and 35.95±18.22 years, respectively. The frequencies of refractive disorders were similar in both groups (i.e., 36.3% in case vs. 38.5% in control). The frequencies of myopia in the case and control groups were 85% versus 72.5% for the right eye and 88.4% versus 75.6% for the left eye. There was higher prevalence of myopia in the case group; however, the relationship was not significant. The results showed that the difference in the prevalence of refractive errors in the hearing loss of patients was not statistically significant, compared to patients with normal hearing.

Conclusions: There was no significant difference between hearing loss and refractive disorders. Individuals with hearing loss showed higher prevalence of myopia; however, the relationship was not statistically significant.

Key words: Hearing loss, Reduced vision, Refractive disorders

Introduction

Refractive errors of the eye are considered as one of the main causes of visual loss (1), and the risk factors of glaucoma in the society (2). Divergence in the shape or length of the eye leads

to myopia, hyperopia, or astigmatism. The most important symptoms of refractive errors include reduced eyesight, eye irritation, or eye fatigue (3). One of the most important basic skills of each person is communication, which is heavily dependent on the hearing ability. Hearing loss in

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one or both ears is conductive, sensory, or a combination of the two. The most important method for hearing diagnosis and assessment is audiometry using pure sound (4).

The main motivator for study of ophthalmic disorders in hearing impaired people was early diagnosis and appropriate treatment of these problems. Hearing impairment increases the role of vision as a way to interact in educational and environmental contexts (5). Deaf or hearing-impaired people seem to be at higher risk of eye problems and these problems may be due to the frequent use of vision in hearing-impaired people. The screening programs may include the type of vision problems in children with hearing impairment, as well as the simultaneous comparison of eye problems in children with hearing impairment and normal hearing children (6, 7).

The most important and advanced senses in the human beings are the sense of sight and hearing, and they are both susceptible to gradual impairment in the absence of the other one. It has been indicated that the occurrence of visual impairment and hearing loss can affect individuals' physical health. There are effective genetic and environmental factors, such as hypoxia, viruses, meningitis, or other conditions that affect vision and hearing (8, 9). Most of children's information for learning is acquired by sight and hearing, despite the fact that deaf children are more dependent on vision to improve their language communication, compared to other children. Sight plays an important role in the fulfillment of deaf children's potentials; however, it is difficult to diagnose and assess this issue among children. The good ocular assessment of deaf children requires a lot of knowledge and expertise. It is vital to resolve eye problems in deaf children and this end requires studies addressing the relationship between visual and hearing problems (10).

Although it is important to investigate the relationship between vision problems and hearing loss, there is a dearth of information in this regard. In fact, the importance of this issue can be highlighted among teachers and doctors who must rely on the visual performance of their students or their patients to achieve their educational or therapeutic goals. The purpose of this study was to evaluate the relationship between refractive errors in the eye (by the type of refractive error) and hearing loss in patients referred to Vali-e-Asr Hospital in Birjand, Iran.

Methods

This case-control study was conducted during

2015-2016 in Birjand. The inclusion criteria were referrals to the otolaryngology clinic with hearing loss complaints and the approval of hearing loss. The control group was selected out of individuals referring to other clinics of Vali-e-Asr Hospital in Birjand with the absences of hearing loss. The two groups were matched in terms of age, sex, and occupation. Ethical issues were followed in the study. Before the implementation of the design, its protocol was approved in Ethics Committee of University of Medical Sciences, Birjand (IR. Bums.1394.20).

To conduct the study, a questionnaire was designed based on the objectives of the study and the review of the literature. The questions include the first and last name (if participants were willing to answer), mobile phone number (if they were willing to answer), age (years), gender (male/female), place of residence (city/village), presence of hearing defects, diabetes, blood pressure, ear trauma, ear surgery, cataract, glaucoma, eye surgery, eye trauma, and refractive errors. Later, participants were asked to complete the questionnaire.

After obtaining participants consent, audiograms were prepared with the help of an audiologist, which were interpreted according to opinions of an Ear, Nose, and Throat (ENT) specialist. In the next step, participants were referred to ophthalmology clinic for eye examination through which their eyes prescriptions as well as refractive errors could be identified. All examinations and interpretations of data were carried out by three individuals (an audiologist, an ENT specialist, and an ophthalmologist). Data were entered into SPSS (version 21) software using the Chi-square and Fisher test to compare frequencies, and t-test to compare the mean values. P-value less than 0.05 was considered statistically significant.

Results

A total number of 241 patients were enrolled (case =124, control n=117) in this study. Gender distribution showed that there were 51.6% and 54.7% women in the case and control groups, respectively. Mean ages in case and control groups were 36.03 ± 17.13 and 35.95 ± 18.22 years, respectively ($t=0.03$, $P=0.09$). Frequency of refractive disorders (in both eyes) were similar in both groups ($P=0.07$, 36.3 and 38.5% in case and control, respectively). The comparison of the refractive disorder types in the right and left eyes (separately) between the two groups showed that although there is a higher prevalence of myopia in the case group, there is no observation of a

significant relation ($P=0.03$ both for right and left eyes). The comparison of occupations between the case and control groups showed that they were similar in this regard.

As can be seen in Table 1, the comparison of refractive errors in both eyes between the two groups indicated that there was no significant difference between the two groups ($P=0.07$, 36.3% in case group vs. 38.5% in the control group). After the removal of normal cases, the comparison of the right eye refractive errors in both case and control groups indicated that myopia was the most

common disorder in both groups. However, the frequency of this refractive error was higher in the case group, which was not significantly different from that of control group ($P=0.03$, 85% vs. 72.5%).

After the removal of normal cases, the comparison of the left eye refractive errors in the case and control groups indicated that left myopia was the most frequent disorder in both groups. Table 2 shows that the frequency of this refractive error is higher in the case group, although it is not significantly different from that of control group ($P=0.03$, 88.4% vs. 75.6%).

Table 1: Comparison of frequency distribution of refractive errors in case and control groups

Refractive Errors	Case 124=N	Control 117=N	Chi-square test
Have not	79 (63.7%)	72 (61.5%)	0.1= χ^2 1=df 0.07 =P
Have	45 (38.5%)	45 (36.3%)	

Table 2: Comparison of frequency distribution of refractive errors in the right and left eyes in case and control groups

Refractive Errors	Eye	Control N=81	Cases N=83	P-value
Hyperopia	Right eye	6 (15%)	2 (5%)	0.03
Myopia	Right eye	29 (72.5%)	34 (85%)	
Astigmatism	Right eye	5 (12.5%)	4 (10%)	
Hyperopia	Left eye	4 (9.8%)	2 (4.7%)	0.03
Myopia	Left eye	31 (75.6%)	38 (88.4%)	
Astigmatism	Left eye	6 (14.6%)	3 (7%)	

Discussion

This study was conducted to investigate the refractive errors in patients with auditory abnormalities. The obtained results of this study showed that refractive errors had a similar prevalence between the intervention and control groups although the difference between the two groups was not statistically significant. Most studies in this regard have been conducted on pediatrics. In this group of patients, the relationship between refractive disorders of the eye with hearing impairment appears to be more pronounced (11-12). In a study conducted by Gogate and Rishikeshi (2009) titled "The study of visual impairment in children with hearing impairment", it was found that eye problems were common in children with hearing impairment. Therefore, the screening of eye problems should be performed simultaneously with the evaluation of hearing impairments (11). A study titled "Ophthalmologic findings in children with ear implants" by Nikolas (2013) indicated that eye disorders in this group of patients had a significant

prevalence, most of which included refractive errors and then strabismus (12).

Osaiyuwu and Beigbe (2009) reported in a study titled "The study of the prevalence of visual impairment in deaf children in Benin" that visual complications could cause hearing loss or hearing impairment among children. In this research, 86 students were studied, 34% of whom were male. It was found that 63% of all the studied subjects had vision problems. The obtained results of Pearson correlation coefficient indicated that there was a negative correlation between the age and visual complaints. Moreover, it was suggested to emphasize the necessary treatment and attention to visual impairment in children with hearing impairment at younger ages (13).

In a survey titled "review of ophthalmology in the field of vision and deafness", the results of a study conducted by Greene (1911) showed that the incidence of hyperthyroidism in children with normal hearing impairment was 3%, whereas it was 13.3% in children with hearing impairment. The incidence of astigmatism and anisotropy was 1.4% and 7.3% in children with normal hearing

and those with hearing impairment, respectively. Moreover, this study showed that most of the visual problems were related to hearing, hypertension, and astigmatism. Finally, this study showed that children with hearing impairment had a much higher incidence of ocular problems except myopia (14). The lack of a significant relationship in this study can be associated with the increase in the prevalence of visual impairment. More specifically some defects, such as presbyopia are related to aging. Accordingly, this factor, independent of other factors, can lead to these disorders even in the general population.

Regarding hearing, vision, balance, and sensory impairments in elderly people over 70 years, Dillon et al. reported that sensory disorders, such as visual and hearing impairment could increase with aging. For instance, hearing and visual impairment were twice as high in people over 80 years, compared to people aged 70-79 years (6). With regard to the relationship between hearing impairment and age-related maculopathy, Klein et al. found that there was no significant relationship between age-related maculopathy lesions and hearing impairment. However, controlling the confounding factors led to the significant relationship. Accordingly, patients affected by age-related maculopathy suffered from hearing impairment more than those without the disease (15).

In the study of Jee et al., it was concluded that the simultaneous presence of two sensory impairments of hearing loss and vision was highly observed in the elderly population of industrialized countries (16). In a study by Chia et al., titled "The association between hearing impairment and vision and the effect of their simultaneous existence on quality of life", it was indicated that age-related cataract and age-related maculopathy were associated with hearing loss (OR=1.6 OR=1.3, respectively, 95% CI: 1.0-1.7). Furthermore, the presence of hearing and vision impairment has been accompanied by a lower level of life quality (17). Studies have also shown that visual impairment has a direct relation with other environmental conditions, such as income and poverty. Accordingly, 1 out of 5 Americans in the study of Dillon et al. suffered from this disorder, which is 50% higher than normal (6).

Conclusions

The obtained results of the present study revealed that the difference in the prevalence of refractive errors in hearing-impaired patients was not statistically significant, compared to

individuals with normal hearing. Hearing-impaired patients showed higher prevalence of myopia; however, it was not significant. It is suggested to conduct future studies with a larger more populations of patients, as well as different target groups, such as children or elderly people in order to obtain results that are independent of age. It is also worth mentioning that close attention to eye health assessment in hearing-impaired people may help to prevent eye problems. In order words, prevention of visual disorders may enhance their life quality.

Acknowledgments

This article is derived from the dissertation of the medical student, Negar Shamsaki (code No. 741), supervised by Dr. Golboie, and advised by Dr. Davari. We would like to thank our colleagues in the Ophthalmology Department and Clinical Research Center of Birjand Valli-e-asr Hospital, Birjand, Iran, particularly Mrs. Sannaei, who assisted us in this research.

Author's contribution

Dr. Mohammad Hossein Davari conceived and designed the research analysis and study monitoring, as well as writing the paper and conducting the final edition. Dr. Seyed Hasan Golboie collected the data and edited the article. Mrs. Negar Shamsaki monitored the plan, edited the article, and translated the article.

Funding

No funding is received from a known source.

Conflict of Interest

The authors declare that there is no conflict of interests.

References

1. Perera SA, Wong TY, Tay WT, Foster PJ, Saw SM, Aung T. Refractive error, axial dimensions, and primary open-angle glaucoma: the Singapore Malay Eye Study. *Arch Ophthalmol.* 2010; 128(7):900-5. [PMID: 20625053](#) [DOI: 10.1001/archophthalmol.2010.125](#)
2. Kuzin AA, Varma R, Reddy HS, Torres M, Azen SP; Los Angeles Latino Eye Study Group. Ocular biometry and open-angle glaucoma: the Los Angeles Latino Eye Study. *Ophthalmology.* 2010; 117(9):1713-9. [PMID: 20570359](#) [DOI: 10.1016/j.ophtha.2010.01.035](#)
3. Pan CW, Zheng YF, Anuar AR, Chew M, Gazzard G,

- Aung T, et al. Prevalence of refractive errors in a multiethnic Asian population: the Singapore epidemiology of eye disease study. *Invest Ophthalmol Vis Sci.* 2013; 54(4):2590-8. [PMID: 23513059](#) [DOI: 10.1167/iovs.13-11725](#)
4. Dobie RA. *Medical-legal evaluation of hearing loss.* San Diego: Plural Publishing; 2015.
 5. Hallahan DP, Kauffman JM, Pullen PC. *Exceptional learners: an introduction to special education.* New York: Pearson Higher Ed; 2011.
 6. Dillon CF, Gu Q, Hoffman HJ, Ko CW. Vision, hearing, balance, and sensory impairment in Americans aged 70 years and over: United States, 1999-2006. *NCHS Data Brief.* 2010; 31:1-8. [PMID: 20377973](#)
 7. Serenius F, Källén K, Blennow M, Ewald U, Fellman V, Holmström G, et al. Neurodevelopmental outcome in extremely preterm infants at 2.5 years after active perinatal care in Sweden. *JAMA.* 2013; 309(17):1810-20. [PMID: 23632725](#) [DOI: 10.1001/jama.2013.3786](#)
 8. Tucci DL, Merson MH, Wilson BS. A summary of the literature on global hearing impairment: current status and priorities for action. *Otol Neurotol.* 2010; 31(1):31-41. [PMID: 20050266](#)
 9. De Moraes CG, Juthani VJ, Liebmann JM, Teng CC, Tello C, Susanna R, et al. Risk factors for visual field progression in treated glaucoma. *Arch Ophthalmol.* 2011; 129(5):562-8. [PMID: 21555607](#) [DOI: 10.1001/archophthalmol.2011.72](#)
 10. Hickson L, Wood J, Chaparro A, Lacherez P, Marszalek R. Hearing impairment affects older people's ability to drive in the presence of distracters. *J Am Geriatr Soc.* 2010; 58(6):1097-103. [PMID: 20936734](#)
 11. Gogate P, Rishikeshi N, Mehata R, Ranade S, Kharat J, Deshpande M. Visual impairment in the hearing impaired students. *Indian J Ophthalmol.* 2009; 57(6):451-3. [PMID: 19861747](#) [DOI: 10.4103/0301-4738.57155](#)
 12. Nikolaos Z, Georgios P, Angeliki C, Theodoros L, Mattheos A, Iosif V. Ophthalmologic findings in a pediatric cochlear implant population. *Eur J Ophthalmol.* 2014; 24(2):254-7. [PMID: 23918076](#) [DOI: 10.5301/ejo.5000346](#)
 13. Osaiyuwu A, Ebeigbe J. Prevalence of visual disorders in deaf children in Benin city. *J Nigerian Optometric Assoc.* 2009; 15(1):20-3. [DOI: 10.4314/jnoa.v15i1.55600](#)
 14. Parasnis I. Vision and deafness: a review of ophthalmological studies. *J Acad Rehabil Audiol.* 1983; 16:148-60.
 15. Klein R, Cruickshanks KJ, Klein BE, Nondahl DM, Wiley T. Is age-related maculopathy related to hearing loss? *Arch Ophthalmol.* 1998; 116(3):360-5.
 16. Jee J, Wang JJ, Rose KA, Lindley R, Landau P, Mitchell P. Vision and hearing impairment in aged care clients. *Ophthalmic Epidemiol.* 2005; 12(3):199-205. [PMID: 16036479](#) [DOI: 10.1080/09286580590969707](#)
 17. Chia EM, Mitchell P, Rochtchina E, Foran S, Golding M, Wang JJ. Association between vision and hearing impairments and their combined effects on quality of life. *Arch Ophthalmol.* 2006; 124(10):1465-70. [PMID: 17030715](#) [DOI: 10.1001/archophth.124.10.1465](#)