

A Review of Hearing Disorders Prevalence and Risk Factors Among Elementary School Students in Ahvaz

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Hearing disorders are the most common causes of pediatric communicative and functional disorder which result in communicative and learning disorders, educational failure and vast socio-economic problems. This study is an attempt to study the result of health examination of children who were to enter first grade elementary school in Ahvaz. The present study aimed at promoting the quality of school health through more efficient planning. This was a descriptive and cross sectional study conducted on the medical examination records of 846 children. They were selected after primary assessment among 21150 children who were due to enter first grade in academic year 1387-1388 with hearing disorder in hearing screening. These children were screened by otoscopy, pure tone audiometry, and tympanometry. The results indicate 2.69% of children had hearing disorders. No difference was seen between boys and girls children in term of observed hearing loss. 457 were male and 389 were female. 56.3% had conductive hearing loss and 43.5% had sensorineural hearing loss and 0.2% mixed hearing loss. 9.2% had slight of hearing level, 77.2% mild, 4.6% moderate, 5.3% severe, 3.7% profound. 46.5% had unilateral H.L, 53.5% had bilateral H.L. 92.7% had H.L in high frequency and 7.3% in low frequency. 34.2% of children had impacted cerumen. Regarding the high prevalence of hearing loss among preschool children and ill effect of hearing disorder on learning in preschool age and also important of diagnosis and rapid intervention, more extensive and interventional studies as well as screening are required

Key words: Hearing Disorder, Hearing Screening, Preschool Children

Ear is a sensitive and important body organ which enables the human to communicate with its surrounding. The humans grow through oral and auditory communication with the society. The prevalence of hearing loss in children is 2-4%. Almost one-thirds of the children with hearing impairment suffer from at least another disease

which could lead to even more impaired function in the child and prevent him from communication with the society¹⁻³. A crucial issue influencing the progress of children and their talents is the status of hearing⁴.

The importance of hearing disorders in learning has been rigorously approved as 13% of the learning by human beings is achieved through hearing. If the students' hearing disorders are not properly diagnosed by their parents and teachers, they may be perceived as mentally retarded and grow with a low self-confidence and develop

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disappointment and indifference. A child facing hearing disorder will finally suffer from behavioral and spiritual disorders, which will in turn influence the child's future^{4,5,7}. Education and training incur much cost on these children. According to a survey by the center for research-university studies of Iran, education of a hearing-impaired child costs almost 8,000,000 Rials per year which is a huge financial burden to the state budget^{1,2,6}. Timely diagnosis of children's hearing loss has been of special priority in the auditory sciences since the old times. Timely intervention measures allow the family and the society benefit from quite better results out of aural rehabilitation⁸. In our country some programs are implemented for diagnosis of hearing disorder in children as they start school. These programs are called hearing screening which enable timely diagnosis to a great extent^{6,9}. It seems mandatory to review the results of hearing screening programs for the purpose of timely diagnosis of hearing impairments. This research is in fact a step to achieve this purpose. We hope that the results of this research are used to improve these programs.

MATERIALS AND METHODS

This research was performed by descriptive, analytical, and cross-sectional method on 846 male and female elementary school newcomers. After initial assessments by the trained examiners, the children were selected from 21150 elementary school pupils who were likely to have hearing disorder in the assessment plan hearing screening. A total of 25 pupils were excluded from the study as they did not take part in medical examinations and were ASSR and ABR applicants. The samples consisted of pupils who referred to assessment centers in Ahvaz in summer of school year 2008-2009. First, they were examined by trained examiners with audiometer screener. The test required the pupil to respond appropriately to 4 pure sound frequencies in speech frequency ranges of 500, 1000, 2000, and 4000 Hertz. The pupil's response to all frequencies was considered as natural hearing. The pupil was found suffering from hearing disorder in case of incorrect response even to one frequency or failure to cooperate accordingly and was then sent to hearing

assessment centers for specialized examinations to undergo autoscopy, audiometry, and tympanometry examinations. The students were then sent to otolaryngologists if they needed more specialized examinations, ear irrigation, and medical measures. The referred cases were examined and the children's audiogram and tympanograms were reviewed. They underwent autoscopy again after ear irrigation. Based on descriptive statistics methods including frequency distribution tables, diagrams, and numerical data, the studied variables were described in order to analyze data. The confidence level 95% was calculated for occurrence, and Chi2 test was used to compare the occurrence of disorders among male and female students. The significance level of the test was considered %5 and the data was analyzed with SPSS 19.

RESULTS

This study was performed on 21150 students of which 4% (846 individuals) were suspected to have hearing disorder. The audiometric studies proved that 69.4% (570 individuals) have hearing disorder and made 2.69% of the total sample size. In this study a sample of 846 elementary school pupils including 457 male and 389 female underwent audiometric studies. Seventy percent (including 311 male) and 68.7% (259 female) suspected individuals proved to have hearing disorder. Of the total children with hearing disorder in this study, 56.3% (321 children) had conductive hearing loss, 34.5% (248 children) had sensorineural hearing loss, and 2% (1 child) had mixed hearing loss. A total of 9.2% (52 children) had mild hearing loss, 2% (438 children) had slight hearing loss, 4.6% (26 children) had average hearing loss, 5.3% (30 children) had severe hearing loss, and 3.7% (21 children) had deep hearing loss. 5.6% (32 suffering children) in our study needed hearing aid, 0.7% (4 children) needed cochlear implant and 8 were deaf. Of the pupils with sensory neural hearing loss, 92.7% (165 individuals) showed hearing loss in high frequencies and 7.3% (13 individuals) in low frequencies. In this study, 34% (195 children) with hearing disorder had cerumen, 46.5% (265 children) unilateral and 53.5% (305 children) had bilateral hearing loss disorders.

DISCUSSION

In a study conducted on 2771 elementary school students in Zanjan in 1998, 7.8% of students were recognized as suspected group. Further assessments showed that 3.59% of sample had hearing disorder^{6,9}. In 2001, a study was performed on the elementary school newcomers in Yasooj and Gachsaran and reported a 2.4% prevalence of hearing disorder⁹. In this study with greater number of participating students, 4% were found to have suspected hearing disorder. The audiometry examinations diagnosed 2.69% of sample population with hearing disorder. In a study performed in Nigeria in 2000, the prevalence of hearing loss was reported 13.9%¹¹. The screening by the Shahed educational-cultural institute shows that 2.87% of 2717 students of Shahed schools in Tehran in school year 1995-1996 had hearing problem⁶. The study of the office of health of the ministry of health and medical education in 1995 and the results of health assessment on 973587 male and female preschoolers entering the elementary school found that 1.03% of rural and urban children had hearing problem in this age^{9,21}. The prevalence of hearing disorders was 17.4% in the countries like India⁷, 15% in Kenya⁹, 2% to 4% in Britain, and 4.4% in Saudi Arabia^{11,12}.

In a study conducted in Mashhad during the school year 2004-2005 the prevalence of hearing disorder was reported 2.76%¹¹. The 2.69% prevalence of hearing loss was almost similar to the figures reported by the studies conducted in other cities. These figures were close to the hearing loss prevalence in Zanjan (3.89%), Yasooj (2.4%), Tehran (2.87%), and Mashhad (2.76%). However, the prevalence of hearing loss is higher in Nigeria, Bushehr (Iran, South), India, Kenya, and Saudi Arabia. This is more likely due to the low level of health and the higher occurrence of middle ear infection. Also the prevalence of hearing loss is lower across Iran and this is due to the difference of sample size¹². In this study, 1.51% of total population had conductive hearing loss, 56.3% had hearing impairment, 1.17% of total population had sensorineural hearing loss, 43.5% had hearing impairment, and 0.2% had mixed hearing problem.

In the study conducted in Zanjan (Iran), 2.56% of total population and 65.7% of the hearing-impaired children had conductive hearing loss,

0.6% of the total population and 15.7% of the hearing-impaired children had sensor-neural hearing loss¹¹. In the Ahvaz study which was performed on preschoolers, 59.7% had conductive hearing loss and 40.3% had sensorineural hearing loss. No case of mixed hearing loss was observed⁴.

In the Mashhad study, 60.4% had conductive hearing loss, 27.9% had sensory-neural hearing loss, and 11.7% had mixed hearing loss. The sensorineural hearing loss showed an apparent increase compared to other studies. The most prevalent type of hearing loss observed among the pupils was conductive hearing loss.

In this study, the sample consisted of 846 students including 457 boys (54.1%) and 389 girls (45.9%). 311 boys (54.5%) had hearing disorder (1.47% of all students) and 259 girls (45.4%) had hearing disorders (1.22% of all students). There was no significant relationship between girls and boys concerning the prevalence of hearing loss ($p < 0.68$).

There was no significant relationship between hearing loss and gender and no reference was made in previous studies. In the Nigeria study, ear wax was found to be the most common disorder in 52.6% of children. Ear wax was significantly related with hearing loss ($p < 0.001$). The cerumen prevalence in this study was less than other studies.

In the Ahvaz study, 53% had mild hearing loss, 32% had moderate hearing loss, 10.4% had severe hearing loss, and 3.9% had deep hearing loss⁴. As concerns severity, Mashhad study reported 72.1% mild hearing loss, 20.9% moderate hearing loss, 2.3% severe hearing loss, and 4.7% profound hearing loss. The mild hearing loss is the most prevalent type of hearing loss as observed in other studies too. In a study carried out on the 3-6 year-old kindergarten children in Yazd, 46.5% of children showed unilateral hearing loss and 53.5% showed bilateral hearing loss⁹.

In the study performed in Ahvaz, 26% of students had bilateral hearing loss and 74% had unilateral hearing loss. In this study the prevalence of bilateral hearing loss was more than unilateral hearing loss. This is contrary to the finding of Ahvaz study in 2006, perhaps due to the difference in sample size. In similar studies no review was made concerning the use of hearing aid, cochlear implant, and hearing loss in special frequencies.

People believe that hearing loss is severe

and profound to the extent that the individual cannot hear anything^{13,14}. Most often, parents, kindergarten teachers, and other people engaged in working with children do not know that hearing loss has different degrees. Mild or average hearing loss could not be so problematic that parents and other people notice^{15,16}.

Generally speaking, the terms mild, moderate, severe, and profound may appropriately describe the degree of hearing loss to the audiometrists and the teachers of the hearing-impaired children, but they cannot indicate the degree of hearing disability because even mild hearing loss can trigger notable problems in speech and language growth and educational progress¹⁷⁻¹⁹. Moreover, factors such as close distance of parents and the child during childhood, Otitis media, behavioral changes and using compensating mechanism (such as lip reading) can hinder timely identification of mild and moderate sensorineural hearing losses^{20, 21}. The hearing screening programs during childhood can play an important role in timely identification of mild and moderate hearing losses^{21,22}.

Another reason that makes it necessary and important to implement hearing screening programs during childhood is the economic loss and the increased medical and rehabilitation expenses associated with delayed identification of hearing impairment and taking timely intervention measures for hearing loss. Studies show that the only measure to reduce the costs is the timely implementation of identification and intervention programs as timely identification leads to more effective measures which guarantee successful rehabilitation programs^{19,21}.

In the 1994 JCIH (Joint Committee of Infant Hearing) screening schedule, it is stipulated that the suitable age for identifying hearing loss is three months and the age of medical and rehabilitation intervention is six months^{21, 22}. Numerous studies particularly in recent years proved that in case deaf and hard-of-hearing children with natural cognitive skills are identified before reaching six months, their skills can be improved to natural levels by timely and appropriate intervention measures. On the other hand, these studies showed that the receptive language and expressive language capability in the late-identified children is lower by one standard

deviation than the children who are identified timely. Also their language skills are remarkably lower than the children identified before the age six months^{15, 18, 23}.

In general, once the hearing-impaired children are identified before the age six months and their medical intervention (including receiving sound amplifier device and using family-central rehabilitation programs) is implemented as early as possible, they will have much better performance concerning expressive language, receptive words, expressive words, communicative behavior, understanding speech and the number of vowels and consonants²⁰.

Therefore, enhancing the level of public information about hearing loss disorder and its adverse consequences through different approaches are necessary. It is also recommended that the health and medical centers across the country provide coordinated services and implement hearing screening program as the first priority in preventive and rehabilitative programs during the infancy^{21,22}.

CONCLUSION

Regarding the high prevalence of hearing loss among preschool children and adverse impacts of hearing disorder on learning process in preschool age as well as importance of diagnosis and rapid intervention of the disorder, further comprehensive and interventional studies as well as screening are required.

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