DOI: https://doi.org/10.54393/pjhs.v5i07.1619

PAKISTAN JOURNAL OF HEALTH SCIENCES
https://thejas.com.pk/index.php/pjhs
ISSN (P): 2790-9352, (E): 2790-9344
Volume 5, Issue 7 (July 2024)

Original Article

Frequency of Hearing Impairment in School-Going Children of District Hyderabad, Sindh, Pakistan

Muhammad Ali Bhatti[1], Shakil Ahmed Shaikh[2*], Salma Farukh Memon[3], Kiran Aamir[4], Aamir Ramzan[5] and Hanozia Shah[6]

[1]Department of Ear Nose Throat, Pakistan Air Force Hospital, Sargodha, Pakistan
[2]Department of Physiology, Suleman Roshan Medical College, Tando Adam, Pakistan
[3]Department of Physiology, Liaquat University of Medical and Health Sciences, Jamshoro, Pakistan
[4]Department of Pathology, Liaquat University of Medical and Health Sciences, Jamshoro, Pakistan
[5]Department of Pathology, Liaquat Institute of Medical and Health Sciences, Thatta Campus, Pakistan
[6]Department of Physiology, Bilawal Medical College, Jamshoro, Pakistan

ARTICLE INFO

Keywords:
Hearing Impairment, Audiometer, Neonatal Icterus, Otitis Media

How to Cite:
Bhatti, M. A., Shaikh, S. A., Memon, S. F., Aamir, K., Ramzan, A., & Shah, H. (2024). Frequency of Hearing Impairment in School-Going Children of District Hyderabad, Sindh, Pakistan: Frequency of Hearing Impairment. Pakistan Journal of Health Sciences, 5(07). https://doi.org/10.54393/pjhs.v5i07.1619

***Corresponding Author:**
Shakil Ahmed Shaikh
Department of Physiology, Suleman Roshan Medical College, Tando Adam, Pakistan
sshakilonly@hotmail.com

Received Date: 7th May, 2024
Acceptance Date: 27th July, 2024
Published Date: 31st July, 2024

ABSTRACT

Hearing impairment is prevalent disability in the general population; early intervention facilitates proper development. Without hearing rehabilitation, hearing impairment can cause detrimental effects on speech, language, developmental, educational and cognitive outcomes in children. **Objective:** This study aimed to document the frequency of hearing impairment in school-aged children of District Hyderabad, Sindh, Pakistan. **Methods:** This cross-sectional study was carried out in school-going children to find out the frequency of hearing loss of district Hyderabad, Sindh, Pakistan. The study was conducted from July 2023 to December 2023. The hearing threshold was assessed by a Type 2 audiometer (Manufactured by, Interacoustics A/S, Denmark). Hearing impairment was defined as ≥ 20 dB Hearing level. The results of hearing levels were independently documented in left and right ears, better and worse ears. The data obtained were analyzed on SPSS version 26.0. Statistical significance was set at $P<0.05$. **Results:** In this study, 1520 school-aged children were recruited. The mean age was 9.56 ± 1.56 years and most of the children were between 8 to 12 (85.7%) years. The frequency of hearing impairment was found 1.97%, and no age difference was found among participants. A positive relationship of neonatal icterus, and otitis media was found in participants. **Conclusions:** In this study, hearing loss was found in 1.97% of the population. It is suggested that the screening of children for hearing impairment is compulsory for diagnosis and treatment.

INTRODUCTION

Hearing loss is an invisible disability present in every region of the world. Approximately 10% of the world population has been affected by Hearing loss to some extent [1]. In developed countries, at birth 3 per 1000 children and > 6 per 1000 children in developing countries are affected. Approximately 1.5 billion people (about 20% of the world population) live with hearing disability. It is estimated that > 700 million people may have a disability of hearing loss by 2050 [2]. Hearing impairment in children is a prevalent condition that can have significant impacts on their development, communication, and overall well-being. According to the World Health Organization, it is expected that approximately 60% of children will experience some degree of hearing loss, spending a third of their time unable to hear within normal thresholds [3]. This can greatly affect their ability to learn and interact with others in school and social settings. Furthermore, research has shown that teachers often overlook the importance of sound quality in classrooms, which further exacerbates the challenges faced by children with hearing loss [4]. This article suggests that there are practical, low-cost actions that teachers can take to improve the hearing environment in

DOI: https://doi.org/10.54393/pjhs.v5i07.1619

classrooms, thereby decreasing stress levels for both students and teachers [5]. According to a study conducted in Rasht, Iran, the incidence of hearing loss in elementary school-age children was found to be approximately 2%. The study used audiometry to screen the hearing thresholds of 2019 children. This study found that the frequency rates of hearing loss greater than 15 dB in the low-frequency range (500-8000 Hz) were 1.94% in the right ear and 1.68% in the left ear [3, 5]. Research from Pakistan reported 7.9% of prevalence in school-going children. This research also reported that parents were late in noticing hearing problems in their children, with only 35% reporting it before 6 months, 14.3% between the age of 13-18 months, and the remaining 50.7% even later [6]. Generally hearing loss increases with the increase of age, and it is 3% in people aged 20 to 35, 11% in people aged 44 to 55, and 43% aged 65 to 85 years of age [7]. In adults irrespective of age, extended exposure to loud noise is the major cause of hearing impairment, other causes include wax and ear infections that blockage the ear passage, which cause temporary hearing loss which can be corrected by professional treatment. In most cases, hearing loss may be permanent due to damage to the auditory nerve or inner ear [8]. In particular, the burden of hearing impairment during life is important and it may be worse by harmful attitudes and behavior of the society with the particular individual [9]. Generally hearing loss has negative impacts on interpersonal communications, mental health, quality of life, and economics. In children, unaddressed hearing loss mainly damages the development of language, lack of schooling, social, and mental problems [10]. Continuing these problems in adulthood may cause a decreased connection with society that leads to isolation, anxiety, depression, disgrace, and mental and physical health problems. These individuals find it very hard to develop relationships with partners, and children. These individuals also have limited job opportunities and comparatively low income [11]. Since 2007, the World Health Organization has promoted higher public awareness of hearing loss by World Hearing Day on 3rd March each year. This program aims to decrease the cases of hearing impairment and to better the quality of life of individuals who were suffering from hearing loss [12]. Progress is inadequate in low and middle-income countries because of a lack of capability to coup up the established intervention at all levels healthcare delivery system. This shortening is mostly due to a lack of funding support and initiatives like screening newborns for suspected cases of hearing loss that is mostly carried out in high-income countries [13].

This study aimed to document the frequency of hearing impairment in school-aged children of District Hyderabad, Sindh, Pakistan. It is necessary to identify the early detection that is crucial for timely intervention.

METHODS

This cross-sectional study was conducted in school-going children to find out frequency of hearing loss in the district of Hyderabad, Sindh, Pakistan. After approval from institutional research ethics committee letter no. DRGS/Physio-152. The sample size was calculated by using Epi info software and non-probability convince type of sample was done to collect the data. Inclusion criteria included the participants aged between 6 to 13 years of age, participants who were enrolled in school, participants who were residents of district Hyderabad. Exclusion criteria included those participants who were not aged between 6 to 13 years, not enrolled in schools, not residents of district Hyderabad and diagnosed case ear discharge/ or any disease of ear. A self-designed questionnaire was used to collect the data including sociodemographic, and health status of the participants. Type 2 audiometer used for hearing threshold in participants. The study was conducted from July 2023 to December 2023. Sampling was done using multistage random cluster sampling method from different schools of district Hyderabad. A total of 1700 children were approached aged from 06 years to 13 years old. Informed written consent was taken from parents of all children before recruitment. Parents were volunteers to assess the hearing of their children and to provide necessary information. The response rate was 89.41%. The remaining 10.59% of parents were unwilling to participate in this study hence, the total number of 1520 children recruited in this study (Boys 925 and girls 592). Two sittings were carried out, in the first sitting parents also participated to provide complete information, in the pre-designed questionnaire, and in the second sitting hearing loss were assessed by the audiologist. A general medical examination was conducted by general practitioners; the ear examination was conducted by an ENT specialist with an otoscope. Any foreign material, wax, or impacted debris was removed. Any children having acute or chronic ear infections, or effusion were not included in this study. The audiometry was done in a quiet room of each school with <45 dB noise level. A calibrated Type 2 audiometer (Manufactured by, Interacoustics A/S, Denmark) was used with Radio Ear 3045 earphones and audiocups for extra attenuation. The threshold for hearing level was assessed by the standard of different frequency levels of 500Hz, 1000Hz, 2000Hz, and 4000Hz. Type 2 audiometer was classified into two levels, one is Low-Frequency Pure Tone (LPTA), and the other is High-Frequency Pure Tone (HPTA) and their mean hearing threshold were 0.5-2, and 4-8 kHz, respectively. Hearing impairments were categorized into three groups, including unilateral (less than 20 dB Hearing Level in the better ear and equal or more than 35dB Hearing Level in the bad ear), mild (20 to 34 dB Hearing Level), and moderate (equal or more than35 dB Hearing Level). Hearing loss was classified into sensorineural hearing loss and

DOI: https://doi.org/10.54393/pjhs.v5i07.1619

conductive hearing loss if the air-bone gaps were less than 15dB and more than 15 dB, respectively. In mixed types of hearing loss, both air-bone gap and bone conduction thresholds were more than 15 dB. The hearing level was documented in the right and left, and worse and better ears. The frequency of hearing loss was calculated in percentages with a 95% Confidence Interval. Logistic regression tests were used to examine the relationship between hearing loss and possible risk factors. T test was used to measure mean between groups including age, hearing threshold. A P <0.05 considered statistically significance was set. The data obtained were first via Microsoft Excel and later confirmed through SPSS version 26.0.

RESULTS

In this study, 1520 school-aged children including; boys were 755 (49.67%) and girls were 765 (50.32%) recruited. The mean age was 9.56 ± 1.56 years most of the children were between 8 to 12 years (85.7%), and 76% of participants had a history of neonatal icterus in 76 participants (5%), and otitis media was found in 3 participants. In this study, both ears of all participants were assessed; the socio-demographic characteristics were shown in table 1 in which Boys were 755 and Girls were 765.

Table 1: Sociodemographic Characteristics of Participants (n=1520)

Variables	Total	Boys	Girls
Age < 10 Years	990	465	525
Age ≥ 10 Years	530	290	240
Neonatal Icterus	76	11	65
Middle Ear Infection	3	1	2
Family History (Hearing Loss)	113	43	70
Socioeconomic Status			
Moderate to Low	1201	532	669
High	319	118	201
Audiometry (Mean ± SD)			
Mean Audiometry	4.9 ± 3.2	4.9 ± 2.9	5.0 ± 3.3

The frequency of hearing impairment was found 1.97%, a total of 30 participants (i.e., 15 boys and 15 girls). The most common type of hearing impairment was found conductive deafness (unilateral or bilateral). Furthermore, 18 children were found affected with conductive hearing impairment (Unilateral/Bilateral), 10 children were found to have a sensorineural hearing impairment (unilateral/bilateral) and 2 children were found to have a mixed type (Unilateral). Furthermore, one participant had conductive hearing loss in one ear and in other sensorineural hearing loss. Binary logistic regression revealed a significant effect for a history of otitis media (OR=7.9, P=0.008). However, there was no significant effect for age, gender, family history, or socioeconomic status. When the effects of various factors on conductive and sensorineural hearing loss were separately assessed, the results showed only a strong association between the history of otitis media and sensorineural hearing loss (adjusted odds ratio: 11.8; 95% CI 1.4-102.7) as shown in table 2 in which Boys were 925 and Girls were 592.

Table 2: Type of Hearing Loss (n=1520)

Variables	Total	Boys	Girls
Bilateral Conductive	11	4	7
Bilateral Sensorineural	5	3	2
Unilateral Conductive	7	5	2
Unilateral Sensorineural	5	2	3
Unilateral Conductive/ Sensorineural	2	1	1

Depending on the LPTA, in the right ear in 2.1% of children and the hearing level in the left ear in 1.7% of children were equal or more than 20 dB. In HPTA, in the right ear, 1.5% and in the left ear 1.4% hearing impairment was found as seen in table 3.

Table 3: Hearing Levels Depending on HPTA and LPTA among Participants for Right and Left Ears

Audiometry	Normal N (%)	Mild N (%)	≥ Moderate N (%)
Low Frequency			
Right Ear	1488 (97.9)	26 (1.7)	6 (0.4)
Left Ear	1494 (98.3)	21 (1.4)	5 (0.3)
High Frequency			
Right Ear	1497 (98.5)	18 (1.1)	5 (0.4)
Left Ear	1499 (98.6)	15 (1)	6 (0.4)

DISCUSSION

Hearing loss in school-going children can have significant impacts on their academic performance, language development, social interactions, and overall quality of life. The literature review on hearing loss in school-going children provides valuable insights into the frequency, causes, and impact of hearing impairment in this population. It emphasizes the importance of early screening and identification of hearing loss to provide appropriate interventions and support for affected students. The study found that the overall frequency of hearing impairment was 1.97% among the participants, which is relatively low compared to some other studies conducted in different regions and countries. Awais M *et al.*, conducted a study in Lahore that reported an 11.3% prevalence in school-aged children, this higher prevalence may be due to low sample size of only 142 participants [14]. Maharjan M *et al.*, found a 5.37% prevalence in Nepal, this study was conducted in children studying in government schools from grade 1 to grade 10 and also concluded the highest incidence of conductive hearing loss and the main cause documented chronic otitis media. This study was conducted on a larger scale and recruited 79340 participants in 509 different government schools [15]. Jalali MM *et al.*, found similar findings with a frequency of

DOI: https://doi.org/10.54393/pjhs.v5i07.1619

1.5% and 1.0%. Consistent with this study documented the same trends and found conductive and sensorineural hearing impairment in 0.9% and 0.4% of participants. In this study, the reduced frequency of hearing impairment may be due to wax in participants who were removed, rescreened and counted as normal. Furthermore, wax was considered a cause of conductive hearing impairment in previous studies [5]. Furthermore, the study found that conductive deafness was the major type of hearing loss, affecting both boys and girls in similar proportions. The study also explored the association between risk factors and hearing loss. The relationship between otitis media and sensorineural or conductive hearing impairment was found to be strong, highlighting the importance of early detection and management of otitis media in children. These results have important implications for the screening and management of hearing loss in school-aged children. Similarly, Intakorn P *et al.*, conducted a study to find an association between a middle ear infection and bacteria in Thailand, and they documented that 18% of the participants were affected with Haemophilus Influenza type b (Hib) in countries of Eastern Mediterranean [16]. However, immunization against Hib is not in the immunized program in Pakistan. It was found that middle ear infection is the major reason for hearing loss in school-aged children. This result was found in consistent with the other studies of underdeveloped countries [17-19]. In this study, there is no significant gender difference; however, the result of this study is not in agreement with the past studies [16]. This result may be recognized as a pattern of exposure to noise-induced hearing loss that requires more investigation. Also, no significant relationship was found between socioeconomic status and hearing impairment. Jalali MM *et al.*, and Youngs R suggested that poor hygiene conditions, decreased vaccination rate and needless consumption of ototoxic drugs were the factors related to hearing impairment [5, 20].

CONCLUSIONS

Hearing impairment in children is a significant health concern that can have detrimental effects on their overall development and well-being. In this study, the overall frequency was 1.97% among school-going children. Also, it is suggested to screen children for hearing through Public Health centers and this should be compulsory medical inspection. This program helps to find hearing impairment in children so that may be further referred to audiological/otolaryngological assessment. Also recommended for childhood immunization against Haemophilus influenza immunization that may decrease the frequency of childhood hearing impairment due to otitis media.

Authors Contribution

Conceptualization: SAS
Methodology: MAB
Formal analysis: SFM, KA, AR, HS
Writing, review and editing: SAS, SFM, KA

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

Source of Funding

The authors received no financial support for the research, authorship and/or publication of this article.

REFERENCES

[1] Orji A, Kamenov K, Dirac M, Davis A, Chadha S, Vos T. Global and regional needs, unmet needs and access to hearing aids. International Journal of Audiology. 2020 Mar; 59(3): 166-72. doi: 10.1080/14992027.2020.1721577.

[2] Achwoka D, Waruru A, Chen TH, Masamaro K, Ngugi E, Kimani M *et al.* Noncommunicable disease burden among HIV patients in care: a national retrospective longitudinal analysis of HIV-treatment outcomes in Kenya, 2003-2013. BioMed Central Public Health. 2019 Dec; 19: 1-0. doi: 10.1186/s12889-019-6716-2.

[3] Prasad BK and Nayak SV. Study of effect of smoking on auditory acuity. Indian Journal of Public Health Research & Development. 2013; 4(4): 162-7. doi: 10.5958/j.0976-5506.4.4.165.

[4] Cole EB and Flexer C. Children with hearing loss: Developing listening and talking, birth to six. 4th Edition Plural Publishing. 2020.

[5] Jalali MM, Nezamdoust F, Ramezani H, Pastadast M. Prevalence of hearing loss among school-age children in the north of Iran. Iranian Journal of Otorhinolaryngology. 2020 Mar; 32(109): 85-92. doi: 10.22038/ijorl.2019.36090.2191.

[6] Mumtaz N, Saqulain G, Babur MN. Hearing impairment and its impact on children and parents in Pakistan. Eastern Mediterranean Health Journal. 2023; 29(1): 33-9. doi: 10.26719/emhj.23.012.

[7] Bowl MR and Dawson SJ. Age-related hearing loss. Cold Spring Harbor Perspectives in Medicine. 2019 Aug; 9(8): a033217. doi: 10.1101/cshperspect.a033217. Hoffman HJ, Dobie RA, Losonczy KG, Themann CL,

[8] Flamme GA. Declining prevalence of hearing loss in US adults aged 20 to 69 years. Journal of the American Medical Association Otolaryngology-Head & Neck Surgery. 2017 Mar; 143(3): 274-85. doi: 10.1001/jamaoto.2016.3527.

DOI: https://doi.org/10.54393/pjhs.v5i07.1619

[9] Lash BN and Helme DW. Managing hearing loss stigma: Experiences of and responses to stigmatizing attitudes & behaviors. Southern Communication Journal. 2020 Oct; 85(5): 302-15. doi: 10.1080/1041794X.2020.1820562.

[10] Nordvik Ø, Heggdal PO, Brännström KJ, Aarstad AK, Aarstad HJ. Importance of personality and coping expectancy on patient-reported hearing disability, quality of life and distress level: a study of patients referred to an audiology service. Health and Quality of Life Outcomes. 2021 Jun; 19(1): 168. doi: 10.1186/s12955-021-01802-z.

[11] Shaikh SA, Memon SF, Laghari ZA, Bhatti MA, Shah H, Nizamani GS. Effects of Cigarette Smoking on Blood Pressure and Hearing Level of Male Adults of Hyderabad, Sindh, Pakistan. Journal of Liaquat University of Medical & Health Sciences. 2020 Apr; 19(01): 33-6.

[12] De Sousa KC, Smits C, Moore DR, Chada S, Myburgh H, Swanepoel DW. Global use and outcomes of the hearWHO mHealth hearing test. Digital health. 2022 Jul; 8: 20552076221113204. doi: 10.1177/20552076221113204.

[13] Davis AC and Hoffman HJ. Hearing loss: rising prevalence and impact. Bulletin of the World Health Organization. 2019 Oct; 97(10): 646. doi: 10.2471/BLT.19.224683.

[14] Hussain T, Alghasham AA, Raza M. Prevalence of hearing impairment in school children. International Journal of Health Sciences. 2011 Jul; 5(2): 46-8.

[15] Maharjan M, Phuyal S, Shrestha M. Prevalence of hearing loss in school aged Nepalese children. International Journal of Pediatric Otorhinolaryngology. 2021 Apr; 143: 110658. doi: 10.1016/j.ijporl.2021.110658.

[16] Intakorn P, Sonsuwan N, Noknu S, Moungthong G, Pirçon JY, Liu Y *et al.* Haemophilus influenzae type b as an important cause of culture-positive acute otitis media in young children in Thailand: a tympanocentesis-based, multi-center, cross-sectional study. BioMed Central Pediatrics. 2014 Dec; 14: 1-9. doi: 10.1186/1471-2431-14-157.

[17] Kumar S, Aramani A, Mathew M, Bhat M, Rao VV. Prevalence of hearing impairment amongst school going children in the rural field practice area of the institution. Indian Journal of Otolaryngology and Head & Neck Surgery. 2019 Nov; 71: 1567-71. doi: 10.1007/s12070-019-01651-9.

[18] Luo Y, He P, Wen X, Gong R, Hu X, Zheng X. Otitis media and its association with hearing loss in Chinese adults: a population based study of 4 provinces in China. Frontiers in Public Health. 2022 May; 10: 852556. doi: 10.3389/fpubh.2022.852556.

[19] Fitzpatrick EM, McCurdy L, Whittingham J, Rourke R, Nassrallah F, Grandpierre V *et al.* Hearing loss prevalence and hearing health among school-aged children in the Canadian Arctic. International Journal of Audiology. 2021 Jul; 60(7): 521-31. doi: 10.1080/14992027.2020.1731616.

[20] Youngs R. Preventing hearing loss. Community Ear & Hearing Health. 2021 Dec; 18(22): 1-. doi: 10.56920/cehh.19.