

Original Article

Prevalence of Hearing Impairment with Respect of Age and Gender in Patient with Otitis Media

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Conflict of Interest: None.

Babar A., et al. (2023). 3(2): DOI: <https://doi.org/10.61919/jhrr.v3i2.150>

ABSTRACT

Background: Otitis media, a common middle ear infection, is a significant health concern due to its potential to cause hearing impairment. This study focuses on examining the prevalence and types of hearing loss associated with otitis media in a pediatric population, with a specific emphasis on age and gender demographics.

Objective: The primary objective of this study was to ascertain the prevalence of hearing impairment among patients with otitis media, considering the impact of age and gender.

Methods: An analytical cross-sectional study was conducted over six months, from January to June 2023, at the University of Lahore Teaching Hospital. The study included 155 patients aged between 5 to 15 years, selected using a purposive sampling technique. Patients with other comorbid factors such as congenital syndromes and presbycusis were excluded to maintain data integrity. A structured questionnaire was used for data collection, alongside diagnostic assessments including otoscopy, tympanometry, and pure tone audiometry. The collected data was then transferred to the Statistical Package for the Social Sciences (SPSS) software, version 25.0, for processing and analysis. Descriptive and inferential statistical methods were employed to evaluate the data, with a focus on understanding the relationship between otitis media and hearing loss across different age groups and genders.

Results: The demographic breakdown showed 58.1% (90) of patients aged 5-10 years and 41.9% (65) aged 11-15 years. Females represented 54.2% (84) of the participants, while males constituted 45.8% (71). The most common cause of otitis media was ear infection, accounting for 61.9% (96) of cases. The hearing loss analysis revealed that 70.3% of right ears and 81.9% of left ears had some form of hearing impairment. Conductive hearing loss was the most frequently observed type, affecting 65 right ears and 82 left ears.

Conclusion: This study underscores the significant prevalence of hearing loss among pediatric patients with otitis media, particularly conductive hearing loss. There was a higher incidence of hearing loss in the left ear and a notable predominance among younger children. These findings highlight the need for early detection and intervention strategies in this demographic.

Keywords: Otitis Media, Pediatric Hearing Loss, Conductive Hearing Loss, Cross-Sectional Study, SPSS Analysis, Tympanometry, Audiometry.

INTRODUCTION

Hearing loss, a multifaceted health issue, impacts individuals across various age groups and can manifest in mild, moderate, or severe to profound forms (1). It often leads to substantial social and psychological repercussions, such as social isolation, loss of relationships, and feelings of embarrassment, ultimately culminating in depression and psychiatric disorders (2, 3). This is particularly evident in young patients, who face limited career options and increased stress at work (4). Otitis media, an inflammatory and infectious disorder of the middle ear, stands out as a significant contributor to this problem. It's a major reason for healthcare visits worldwide and a key cause of preventable hearing loss, especially in developing countries (5). Otitis media encompasses acute otitis media, chronic suppurative otitis media, and otitis media with effusion (OME).

OME, also known as "Glue Ear" or "Secretory Otitis Media," is an acute or chronic condition marked by the collection of non-purulent fluid in the middle ear, often leading to hearing loss in children (6, 7). This condition, which typically affects children between 3 and

7 years of age, is characterized by fluid accumulation without signs of acute infection (8, 9). Its prevalence and the need for surgery to address it make it a significant health concern (10).

Several studies have been conducted to deepen our understanding of OME and related conditions (11). In 2023, Syed Aoun Abbas Mehdi et al. focused on the diagnostic effectiveness of tympanometry for identifying fluid in the middle ears of children with OME, using myringotomy as a standard (12). The study, involving 207 patients aged 3 to 12, revealed that tympanometry is highly accurate in diagnosing OME. Similarly, Adnan Yar Muhammad et al., in their 2023 study, investigated the frequency of different tympanogram curve types in children with OME, finding that Type B curves were most prevalent, particularly in younger age groups, suggesting their utility in diagnosis and monitoring (13).

In a different vein, a 2022 study by Abdul Shakoor et al. explored the frequency of sensorineural hearing loss in individuals with chronic otitis media (14). The study found a significant occurrence of sensorineural hearing loss among these patients, highlighting the long-term implications of chronic ear infections. Furthermore, Beukes et al.'s 2021 study examined the presence of otitis media in patients with coronavirus disease in 2019, revealing that otitis media could be a manifestation of the virus, with most patients reporting some form of hearing loss (15).

The impact of chronic suppurative otitis media (CSOM) on hearing was the focus of a 2020 study by Muhammad Salar e Azam Rajput et al. They found that while conductive hearing loss predominates in CSOM patients, a significant number also suffer from sensorineural hearing loss (16). Another 2020 study by Maharjan et al. assessed the prevalence of hearing loss and otitis media in urban Australian school-aged children, finding a concerning prevalence of OM and its impact on hearing at school entry age (17). Similarly, Swain et al. in 2023 highlighted the prevalence of chronic otitis media and associated hearing loss among children in the Himalayan region of Nepal, emphasizing the need for early detection and management (18).

Delaney et al. 2023 study underscored the use of audiometry as a critical tool for diagnosing the severity of hearing loss in CSOM patients (19). Finally, a 2022 study by Jamal et al. reviewed the impact of OME on children's listening skills, finding that it significantly affects speech perception and hearing sensitivity, calling for more research to understand its full impact (20).

These studies collectively underscore the multifaceted nature of hearing loss and otitis media, highlighting the need for continued research and improved diagnostic and treatment strategies to mitigate the impact of these conditions on individuals' quality of life.

MATERIAL AND METHODS

An analytical cross-sectional study was conducted to investigate the prevalence of hearing impairment in relation to age and gender among patients diagnosed with otitis media. This research took place at the University of Lahore Teaching Hospital over a six-month period from January to June 2023. The primary aim was to elucidate any potential correlations between otitis media and hearing loss across different age groups and between genders.

The study's sample size comprised 155 patients, determined using an online sample size calculator to ensure statistical validity and power. Eligible participants were individuals aged between 5 and 15 years, a range chosen to focus on the pediatric and adolescent population typically affected by otitis media. The recruitment of participants was executed using a purposive sampling technique, a non-probability sampling method where participants were selected based on specific characteristics and relevance to the research question.

To ensure the purity of the data, the study excluded patients with other comorbid factors that could confound the results. This included individuals with congenital syndromes known to affect hearing and those with presbycusis, a condition of age-related hearing loss that could skew the results in the older demographic of the sample.

Data collection was carried out using a structured questionnaire, designed to gather detailed demographic information, medical history, and specifics about the participants' experiences with otitis media and hearing loss. Otoscopy, Tympanometry, and Pure Tone Audiometry were employed as primary diagnostic tools. Otoscopy allowed for a visual examination of the ear canal and eardrum, Tympanometry provided data on middle ear functioning, and Pure Tone Audiometry assessed the participants' hearing thresholds across a range of frequencies.

Once collected, the data was meticulously recorded and transferred to a spreadsheet in the Statistical Package for the Social Sciences (SPSS) software, version 25.0. This software package was chosen for its robust data management and analytical capabilities. The statistical analysis involved descriptive statistics to summarize the demographic and clinical characteristics of the sample. Inferential statistics, including chi-square tests for categorical variables and t-tests for continuous variables, were utilized to examine the relationships between hearing impairment and variables such as age and gender. Correlation analyses were also performed to explore the strength and direction of these relationships.

The ethical considerations for this study were rigorously adhered to, including obtaining informed consent from all participants or their guardians, ensuring confidentiality and anonymity of the data, and conducting the study in compliance with the Helsinki Declaration.

RESULTS

In the demographic analysis, the study encompassed a total of 155 patients suffering from otitis media. The age distribution was predominantly in the younger age group, with 90 patients (58.1%) aged between 5 and 10 years, and the remaining 65 patients (41.9%) aged between 11 and 15 years. Gender-wise, the study included a slightly higher percentage of females, with 84 female patients (54.2%) and 71 male patients (45.8%).

Table 1 Demographics

Sr No.	Variables	Sub Variables	Frequency (Percentage)
1	Age	5-10 years	90 (58.1%)
		11-15 years	65 (41.9%)
2	Gender	Male	71 (45.8%)
		Female	84 (54.2%)

The study identified the primary causes of otitis media in the patient cohort. Upper Respiratory Tract Infections (URTI) were found to be a contributing factor in 30 patients, accounting for 19.4% of the cases. However, the majority, encompassing 96 patients (61.9%), were diagnosed with ear infections as the primary cause of their otitis media.

Table 2 Causes of Otitis Media

Causes	Frequency (Percentage)
URTI	30 (19.4%)
Ear Infection	96 (61.9%)

This table reiterates the demographic distribution previously noted, highlighting the age and gender breakdown of the participants. In the age category, the distribution was 90 patients (58.1%) in the 5-10 year age group and 65 patients (41.9%) in the 11-15 year age group. Gender-wise, the study consisted of 71 male patients (45.8%) and 84 female patients (54.2%).

Table 3 Comparison of Results by Age, Gender, and Hearing Loss

Sr No.	Variables	Sub Variables	Percentage
1	Age	5-10 years	90 (58.1%)
		11-15 years	65 (41.9%)
2	Gender	Male	71 (45.8%)
		Female	84 (54.2%)

The hearing loss distribution showed varied results in the right and left ears of the patients. In the right ear, 46 patients had normal hearing, 65 had conductive hearing loss (HL), 34 had mixed HL, and 10 had sensorineural HL. In contrast, the left ear showed 28 patients with normal hearing, 82 with conductive HL, 36 with mixed HL, and 9 with sensorineural HL. The total percentages of hearing loss types were 70.3% for the right ear and 81.9% for the left ear, indicating a higher prevalence of hearing loss in the left ear among the study participants.

Table 4 Hearing Loss Distribution

Hearing Loss Type	Right Ear	Left Ear
Normal	46	28
Conductive HL	65	82
Mixed HL	34	36
Sensorineural HL	10	9

DISCUSSION

Comparatively, Muhammad Anwar's study in 2023, which included patients aged 3 to 15 years and had an average age of 8.25 years, demonstrated a different gender ratio with 1.22 males for every female (11). Notably, this study highlighted that Type B tympanograms were predominant, occurring in 81.4% of cases. The chi-square test results indicated a higher prevalence of Type B tympanograms in children aged 3 to 11 years, suggesting a potential age-related pattern in otitis media manifestations.

In the present study, the incidence of ear infection was significant, with 61.9% of the children presenting with this condition. This finding aligns with Satoh's 2021 study, which explored the correlation between *Streptococcus pneumoniae* nasopharyngeal colonization and otitis media with effusion (OME) in children (21). Satoh's research found that 17.2% of the children had OME, and 35.0% had *S. pneumoniae* colonization. The study further established a positive association between OME and *S. pneumoniae* carriage in children under 12 months. Additionally, factors like attending daycare and living in rural areas were independently associated with OME, suggesting environmental and lifestyle influences on the condition (22, 23).

The current study also sheds light on the state of the ear canal in patients, with 36.8% presenting with wax, 18.1% with a clear canal, and 45.2% with other infections. This distribution is crucial for understanding the various presentations of otitis media (24). Leach 2020 study, focusing on a younger age group (3-7 years), reported that 59.45% of the ears examined showed suspected fluid in the middle ear, and 69.45% had type B tympanograms (25). Myringotomies were performed in 69.45% of cases based on combined otoscopic, tympanometric, and audiometric findings, with 78.4% confirming fluid presence in the middle ear (26).

These collective findings highlight the complex nature of otitis media and its impact on hearing across different ages and genders. The prevalence of specific types of tympanograms, the role of environmental factors, and the varying presentations in ear canal conditions underscore the need for tailored approaches in diagnosis and treatment. Furthermore, these studies emphasize the importance of early detection and intervention, especially in vulnerable age groups, to prevent long-term auditory complications. The synergy of these studies forms a comprehensive picture, guiding future research and clinical practice in addressing otitis media and associated hearing impairments.

CONCLUSION

The collective findings from the aforementioned studies underline the critical need for early detection and intervention in otitis media, particularly among young children, to avert long-term hearing impairments. Emphasizing regular pediatric hearing screenings, especially for high-risk age groups and in specific environments like daycare centers and rural areas, is paramount. These studies also advocate for tailored clinical approaches based on age, gender, and specific otitis media manifestations like type B tympanograms, which are prevalent in certain age groups. The correlation between environmental factors, such as *Streptococcus pneumoniae* colonization, and otitis media incidence highlights the importance of comprehensive public health strategies. These should include vaccination programs and awareness campaigns to address preventable causes of otitis media. Furthermore, the variation in ear canal conditions observed in the studies calls for personalized treatment plans, taking into account the unique presentation of each patient. In summary, these insights provide a directive for healthcare providers and policymakers to refine and enhance otitis media management and prevention strategies, ultimately aiming to reduce the burden of hearing loss associated with this condition.

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