

## ORIGINAL RESEARCH

# Determining the causes and pattern of hearing loss in a tertiary hospital: An observational study

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### ABSTRACT

**Aim:**The aim of the present study was to determine the causes and pattern of hearing loss in a tertiary hospital. **Methods:**This was a retrospective descriptive study of patients who were managed for hearing loss at Department of ENT, BRLSABVMC Rajnandgaon (C.G.) over a 1-year period from May 2018 to May 2019. 2000 patients were included in the study. **Results:**There were 1200 (60%) males and 800 (40%) females. The mean age was 45.5 years with SD of  $\pm 2.20$ . Majority of the patients 1140 (57%) reviewed were above 20 years of age. The most common cause of hearing loss was presbycusis (age related) 400 (20%) followed by ototoxicity 200 (10%), congenital 200 (10%), meningitis 200 (10%), chronic suppurative otitis media (CSOM) 200 (10%), and noise-induced hearing loss 160 (8%). Most of the patients 1300 (65%) had bilateral hearing loss while 700 (35%) had unilateral hearing loss. Sensorineural hearing loss was the most common 1560 (78%), followed by conductive 340 (17%) and mixed 100 (5%) hearing losses, respectively. Majority of the patients 1300 (65%) had mild to moderately severe with the remaining 700 (35%) having severe to profound hearing losses respectively. There was no statistically significant relationship between the ages of the patients and occurrence of Type B tympanogram ( $P > 0.05$ ).

**Conclusion:**This study concluded that sensorineural hearing loss was the commonest type among the patients with a complaint of the hearing loss. Age-related hearing loss was the most common cause of hearing loss followed by ototoxicity in this study. Majority of the patients were adult male with bilateral mild to moderately severe sensorineural hearing loss.

**Key words:**Age related, causes of hearing loss, pattern of hearing loss

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### INTRODUCTION

The hearing is said to be impaired when there is a reduction in hearing acuity. This can be picked during conversation or otorhinolaryngology hearing assessment. The ear is one of the five special senses with which a human is gifted and it is the most affected and neglected sensory organ in our body. Moreover, hearing impairment is more expensive to manage than sight<sup>1,2</sup>. World Health Organization (WHO) estimates that prevalence of hearing impairment is 4% worldwide<sup>1</sup>. However, the prevalence of hearing impairment varies from one place to another. A prevalence of 6.3% was reported

in a study in India<sup>2</sup>.

There are several aetiologic factors of hearing impairment and this includes congenital or genetic predisposition such as maternal rubella, birth asphyxia, and ototoxicity. Acquired disorders such as ageing, an infection like meningitis, chronic ear infections, use of ototoxic drugs and exposure to excessive noise<sup>3</sup>. The epidemiologic factors in developing hearing impairment are augmented by male sex, less education status, occupational hazard like noise from transportation, industrial or military service<sup>4,5</sup>. Hearing impairment is usually secondary to some chronic disorders. The manifestation has a negative consequence on quality of life. Hearing loss may limit meaningful communication, interaction and

social connectivity and further leading to a lower health-related quality of life<sup>6</sup>. It may decrease the physical and cognitive function of the sufferers<sup>7</sup>. Affected quality of life in hearing impaired individual that are mostly implicated includes depression, isolation and dementia<sup>8-10</sup>.

According to the World Health Organization (WHO), 360 million persons in the world have disabling hearing loss and 328 million of these are adults mostly in developing countries. Poor health-care systems and paucity of hearing health-care physicians may be the contributing factors. Hearing impairment may be associated with severe physically challenged such as poor or no speech acquisition in children, social, emotional and economic burden in adults<sup>11</sup>.

Hearing loss can be divided into conductive, sensorineural and mixed. Conductive occurs when there is defect in the sound conducting mechanism of the ear. The lesion could be anywhere from external auditory canal to the footplate of the stapes<sup>12</sup>, usually easily treatable<sup>13</sup>. Sensorineural hearing loss may be due to abnormality in the cochlear, auditory nerve, neural pathway or their connection with auditory cortex<sup>13</sup>. Moreover, may be associated with grievous consequences usually requiring rehabilitation<sup>14</sup>. Mixed hearing loss is due to abnormality causing both conductive and sensorineural hearing losses. Pure tone audiometry (PTA) is a tool used for the diagnosis of hearing loss. It is performed by the audiologists as per the recommendation from the otorhinolaryngologists<sup>15</sup>. PTA gives information regarding the degree, type, configuration of hearing loss and helps in further management planning<sup>16</sup>.

The aim of the present study was to determine the causes and pattern of hearing loss in a tertiary hospital.

**MATERIALS AND METHODS**

This was a retrospective descriptive study of patients who were managed for hearing loss at Department of ENT, BRLSABVMMC Rajnandgaon (C.G.) over a

1-year period from May 2018 to May 2019. 2000 patients were included in the study.

Excluded from the study were patients whose case records were either not found or did not have complete information. Ethical approval for the study was obtained from Ethics committee. During the evaluation of our patients, pure tone audiometry (PTA) was conducted by the audiology technician. PTA was performed in a soundproof room. A duly calibrated diagnostic audiometer was applied to each of the two ears of the patients at frequencies of 0.5, 1, 2, 4, 6 and 8 kHz, respectively and the average of 0.5-4 kHz values was used to determine the level of hearing loss. Tympanometric test was conducted using tympanometer and results are plotted automatically as Types A, B, C, Ad and As based on Jerger's classification<sup>17</sup>. OAE test result was automatically generated as "pass" or "refer".

Information obtained from the case files included demographic characteristics such as age and sex. Clinical information included main presenting symptoms, duration and cause of hearing loss. Findings from PTA were classified into slight/mild (26-40 dB), moderate (41-55 dB), moderately severe (56-70dB), severe (71-90 dB) and profound (91 +dB) hearing losses respectively based on the American Speech-Language-Hearing Association (ASHA) criteria<sup>18</sup>. Findings from OAE tests were interpreted as pass (normal cochlear function) or refer (abnormal cochlear function) findings from tympanometry were interpreted as Type A (normal), Type B (fluid in the middle ear) and Type C (Eustachian tube dysfunction).

The data were entered into the spreadsheet and analyzed using the Statistical Package for Social Science version 21.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were summarized as frequencies and percentages and presented as tables. Furthermore, statistical tools of mean, standard deviation (SD) and Fisher's exact test were also used.  $p \leq 0.05$  was considered statistically significant.

**RESULTS**

**Table 1: Age-sex distribution of the study population**

| Age group (years) | Male      | Female   | Total(%)   |
|-------------------|-----------|----------|------------|
| 1-10              | 260       | 200      | 460 (23)   |
| 11-20             | 300       | 100      | 400 (20)   |
| 21-30             | 160       | 120      | 280 (14)   |
| 31-40             | 200       | 120      | 320 (16)   |
| 41-50             | 100       | 60       | 160 (8)    |
| 51-60             | 60        | 60       | 120(6)     |
| 61-70             | 40        | 80       | 120(6)     |
| 71-80             | 60        | 60       | 120(6)     |
| 81-90             | 20        | 0        | 20(1)      |
| Total(%)          | 1200 (60) | 800 (40) | 2000 (100) |

There were 1200 (60%) males and 800 (40%) females. The mean age was 45.5 years with SD of  $\pm 2.20$ . Majority of the patients 1140 (57%) reviewed were above 20 years of age.

**Table 2: Distribution of causes of hearing loss**

| Cause                            | Male      | Female   | Total(%)   |
|----------------------------------|-----------|----------|------------|
| Age related (presbycusis)        | 200       | 200      | 400 (20)   |
| Ototoxicity                      | 80        | 120      | 200 (10)   |
| Chronic Suppurative Otitis Media | 60        | 40       | 100 (5)    |
| Meningitis                       | 120       | 80       | 200 (10)   |
| Noise induced                    | 100       | 60       | 160 (8)    |
| Otitis Media with Effusion       | 120       | 40       | 160 (8)    |
| Sudden Hearing Loss              | 90        | 30       | 120 (6)    |
| Measles                          | 90        | 30       | 120(6)     |
| Neonatal jaundice                | 70        | 30       | 100(5)     |
| Radiotherapy                     | 20        | 20       | 40(2)      |
| Unknown                          | 140       | 60       | 200 (10)   |
| Total(%)                         | 1200 (60) | 800 (40) | 2000 (100) |

The most common cause of hearing loss was presbycusis (age related) 400 (20%) followed by ototoxicity 200 (10%), congenital 200 (10%), meningitis 200 (10%), chronic suppurative otitis media (CSOM) 200 (10%) and noise-induced hearing loss 160 (8%).

**Table 3: Distribution of the hearing loss by affected ear among the patients**

| Agegroup(years) | Unilateral Hearing Loss | Bilateral Hearing Loss | Total(%)   |
|-----------------|-------------------------|------------------------|------------|
| 1-10            | 120                     | 320                    | 440 (22)   |
| 11-20           | 120                     | 320                    | 440 (22)   |
| 21-30           | 80                      | 200                    | 280 (14)   |
| 31-40           | 120                     | 200                    | 320 (16)   |
| 41-50           | 60                      | 140                    | 200 (10)   |
| 51-60           | 60                      | 40                     | 100(5)     |
| 61-70           | 60                      | 40                     | 100(5)     |
| 71-80           | 80                      | 20                     | 100(5)     |
| 81-90           | 0                       | 20                     | 20(1)      |
| Total(%)        | 700 (35)                | 1300 (65)              | 2000 (100) |

Most of the patients 1300 (65%) had bilateral hearing loss while 700 (35%) had unilateral hearing loss.

**Table 4: Type of hearing loss among the study population**

| Types of Hearing Loss | Frequency(%) |
|-----------------------|--------------|
| Conductive            | 340 (17)     |
| Sensorineural         | 1560 (78)    |
| Mixed                 | 100(5)       |
| Total                 | 2000 (100)   |

Sensorineural hearing loss was the most common 1560 (78%), followed by conductive 340 (17%) and mixed 100 (5%) hearing losses, respectively.

**Table 5: Degree of hearing loss by gender among the patients**

| Grades of Hearing loss       | Male      | Female   | Total(%)   |
|------------------------------|-----------|----------|------------|
| Mild(26-40dB)                | 260       | 200      | 460 (23)   |
| Moderate(41-55 dB)           | 300       | 100      | 400 (20)   |
| Moderately severe (56-70 dB) | 300       | 140      | 440 (22)   |
| Severe(71-90 dB)             | 80        | 120      | 200 (10)   |
| Profound (91 + dB)           | 260       | 240      | 500 (25)   |
| Total(%)                     | 1200 (60) | 800 (40) | 2000 (100) |

Majority of the patients 1300 (65%) had mild to moderately severe with the remaining 700 (35%) having severe to profound hearing losses respectively.

**Table 6: Pattern of tympanometry by age group among the patients**

| Agegroup | TypeA | TypeB | TypeC | Total(%) |
|----------|-------|-------|-------|----------|
| 1-10     | 300   | 100   | 0     | 400 (20) |
| 11-20    | 280   | 20    | 0     | 300 (15) |
| 21-30    | 280   | 20    | 0     | 300 (15) |
| 31-40    | 320   | 0     | 40    | 360 (18) |
| 41-50    | 200   | 0     | 0     | 200 (10) |
| 51-50    | 120   | 20    | 0     | 140 (7)  |

|          |           |         |       |            |
|----------|-----------|---------|-------|------------|
| 61-70    | 140       | 0       | 0     | 140(7)     |
| 71-80    | 120       | 0       | 0     | 120(6)     |
| 81-90    | 40        | 0       | 0     | 40(2)      |
| Total(%) | 1800 (90) | 160 (8) | 40(2) | 2000 (100) |

Tympanometric findings showed that 1800 (90%) and 160 (8%) had Types A and B tympanograms, respectively. Only 40 (2%) had Type C tympanogram. There was no statistically significant relationship between the ages of the patients and occurrence of Type B tympanogram ( $P > 0.05$ ).

## DISCUSSION

Hearing impairment is a common problem that affects people of all age groups. It affects more than 1.33 billion people globally<sup>19</sup>. Hearing impairment at any stage of life can compromise individual's quality of life<sup>20</sup>. Hearing impairment may lead to negative consequences like poor general health, poor academic performance, higher unemployment, social isolation and an increased risk of depression<sup>21</sup>. The burden of hearing loss is higher in developing countries<sup>22</sup>. Shaheen MM *et al.* observed a prevalence of 11.9% in Bangladesh<sup>23</sup>. Furthermore, 10.4% and 9.8% prevalence were documented in two separate studies in Turkey<sup>24,25</sup> and prevalence of 14.3% was observed in Iran<sup>26</sup>. All this high prevalence of hearing impairment was due to ear diseases, an aging society and the growing use of personal listening devices such as mobile phone and transistor<sup>27</sup>.

Worldwide, the prevalence of hearing loss is more common in adults than the children<sup>11</sup>. Our study found hearing loss to be more common in adults constituting about 57% while 43% were children. This is similar to the findings by Rabbaniet *al.*<sup>28</sup> The most common cause of hearing loss was presbycusis (age related) 400 (20%) followed by ototoxicity 200 (10%), congenital 200 (10%), meningitis 200 (10%), chronic suppurative otitis media (CSOM) 200 (10%), and noise-induced hearing loss 160 (8%). This was comparable to the findings by Adobamen<sup>29</sup> where ototoxicity, CSOM and presbycusis were the most common. Most of the patients 1300 (65%) had bilateral hearing loss while 700 (35%) had unilateral hearing loss. This is comparable to the findings by Adobamen *et al.*<sup>29</sup> in which unilateral and bilateral hearing losses were 32% and 68%, respectively. A similar study by Rabbaniet *al.*<sup>28</sup> in Bangladesh showed that bilateral hearing loss occurred among 76% of their study population.

Sensorineural hearing loss was the most common 1560 (78%), followed by conductive 340 (17%) and mixed 100 (5%) hearing losses, respectively. This was also the findings of several other studies<sup>28,30</sup>. Sensorineural hearing loss may be due to wide range of genetic, infectious, vascular, neoplastic, traumatic, toxic, iatrogenic, degenerative, immunologic and inflammatory pathologies that can affect the cochlea<sup>14</sup>. Majority of the patients 65 (65%) had mild to moderately severe with the remaining 35 (35%) having severe to profound hearing losses respectively. This was in line with the findings of Amedofuet *al.*<sup>31</sup> where up to 80% of their patients had mild-to-moderate hearing loss. Tympanometric

findings showed that 1800 (90%) and 160 (8%) had Types A and B tympanograms, respectively. Only 40 (2%) had Type C tympanogram. There was no statistically significant relationship between the ages of the patients and occurrence of Type B tympanogram ( $P > 0.05$ ). Studies by other workers<sup>32,33</sup> also showed that Type A tympanogram was the most common followed by Types B and C, respectively. OME is a middle ear disease characterized by the presence of serous or mucoid effusion in the middle ear with intact tympanic membrane and without any signs of acute infection<sup>32,34</sup>.

## CONCLUSION

This study concluded that sensorineural hearing loss was the commonest type among the patients with a complaint of the hearing loss. Age-related hearing loss was the most common cause of hearing loss followed by ototoxicity in this study. Majority of the patients were adult male with bilateral mild to moderately severe sensorineural hearing loss.

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