

## Evaluation of hearing loss in HIV infected patients in a tertiary care centre

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### Abstract

**Background:** Hearing loss manifestations are common among HIV/AIDS patients. Understanding the effects and treatment of HIV/AIDS on the auditory system has become crucial for improving the quality of life of the patients.

**Objectives:** To estimate the prevalence of hearing loss and to determine the risk factors for hearing loss in HIV positive patients.

**Materials and Methods:** A cross-sectional observational study conducted in the Department of Otorhinolaryngology, Regional Institute of Medical Sciences, Imphal, Manipur, India for a period of 2 years from October 2019 to September 2021. 91 HIV positive patients were enrolled for the study. Prevalence of hearing loss and association of various risk factors for hearing loss were studied.

**Results:** The prevalence of hearing loss was 34.06%. The age ranged from 16 to 62 years, with mean age of 39.00±9.82 years. The study showed a pre-ponderance to male with M:F of 1.4:1. The median duration of treatment was 4 years with a minimum of one year and a maximum of nine years. Majority had CD4 count > 200 (89% patients), followed by 50 to 200 in 8.8% of the patients. With every unit increase in age the hearing loss increases and was found to be statistically significant (p = 0.04). But in adjusted analysis, it was not significant. With every unit increase in the duration of treatment for HIV, the hearing loss increases and was found to be statistically significant (p= 0.001). Even after adjusted analysis, it was found to be significant (p =0.006). Also, CD4 count < 200 is significantly associated with hearing loss than those with CD4 count ≥200 (p=0.03). But in adjusted analysis, it was not significant. Gender of the patients was not significant with the prevalence of hearing loss in unadjusted and adjusted analysis.

**Conclusion:** HIV patients with hearing loss manifestations should be recognized early and managed promptly to prevent disease morbidity and mortality, and to assure the patients a better quality of life.

**Keywords:** Hearing loss, HIV/AIDS, Sensorineural

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### Introduction

Acquired immunodeficiency syndrome (AIDS) is caused by Human immunodeficiency virus (HIV), the etiological agent that causes significant immunological impairment in individuals with AIDS. This retrovirus mainly invades cells related to the immune system, triggering a progressive reduction of lymphocyte and hence causing opportunistic infections. HIV is transmitted by sexual intercourse, blood transfusion, the use of injection drugs, occupational accidents and perinatal transmission.[1]

Currently, in India, HIV prevalence is approximately 0.22% in the population between 15 and 49 years of age, 0.20% among women and 0.24% among men.[2] One of the potential long-term consequences of HIV is on hearing impairment. In high-income countries, up to 75% of adults infected with HIV experience various otorhinolaryngological symptoms during the course of their disease, including hearing loss.[3] The origin of hearing loss associated with HIV/AIDS, either sensorineural or central, may occur as a result of a central nervous system neoplasm, as a secondary effect of iatrogenic causes after ototoxic drug administration, as a direct result of the effects of HIV

on the central nervous system or on the peripheral auditory nerve, or as a result of other infection (cytomegalovirus, cryptococcal meningitis, herpes virus, toxoplasmosis, or viral or bacterial infection).[4]

The nature of the relationship between HIV and hearing loss, is still not yet clear. Strategies for screening, prevention and treatment have not yet been outlined. Also, patients with HIV/AIDS are living longer due to the positive effects of anti-retroviral therapy (ART), thus understanding the effects and treatment of HIV/AIDS on the auditory system has become crucial for improving the quality of life of the patients.

Knowledge about the hearing changes and early diagnosis concerning hearing loss helps in the prognosis, reduces the damages caused by disease development, reduces sensorial deprivation, improves inclusion in society and, it also contributes to improving quality of life. Thus, it is relevant to investigate how such hearing loss happened and its relationship with the HIV infection/AIDS in affected people.[5] Hence, our study was aimed at determining the frequency and identifying the factors associated with hearing loss in people living with HIV/AIDS.

### Materials and Methods

A cross-sectional observational study was conducted in the Department of Otorhinolaryngology, Regional Institute of Medical

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Sciences, Imphal, Manipur, India for a period of 2 years from October 2019 to September 2021 after obtaining approval from Institutional Ethics Committee. A total of 91 patients diagnosed as having HIV/AIDS were included irrespective of age, sex, religion, duration of illness and severity of the condition who attended the Department of Otorhinolaryngology or ART centre and willing to participate in the study were included. Patients who were not willing to give informed consent or assent, recent (<3 years) or current history of radiotherapy, pre-existing middle ear pathology, exposure to any ototoxic drugs not related to HIV treatment, congenital causes of deafness, any past or present history of ear surgery or trauma were excluded from the study. Consent was obtained from all the patients included in this study. Demographic details of all the patients were recorded. All the patients underwent an otoscopic examination and Pure Tone Audiometry (PTA) and hearing loss if present was recorded according to the type and severity.

The data obtained were descriptively analysed using SPSS software version 21.0 (IBM Corp., Armonk, NY, USA). Chi square test was used to see the association between age, gender, duration of ART, CD4 count and presence of hearing loss. Multivariate analysis was done to adjust the confounders. P value of <0.05 was taken as statistically significant.

### Results

In this study, a total of 91 HIV positive patients were recruited. The age ranged from 16 to 62 years, with mean age of 39.00±9.82 years. More than half (59.3%) of the study participants were males with a male to female ratio of 1.4: 1.

The median duration of treatment was 4.0 (Interquartile range: 3.0-6.0) years with a minimum of one year and a maximum of nine years. The mean duration of treatment was 4.4 (1.9) years (Figure 1). CD4 count was > 200 in 89% patients, 50 to 200 in 8.8% of the patients

and 2.2% of the patients with < 50 (Table 1). Prevalence of hearing loss among HIV positive patients in this study was 34.06% (Figure 2). Major type of hearing loss among the patients with HIV infection was sensory neural hearing loss (SNHL) (19.8%), followed by conductive hearing loss (12.1%) (Figure 3).

Association of age with hearing loss showed that the age was higher among the patients with hearing loss when compared to patients without hearing loss (43.0 years vs 36.8 years) and was found to be statistically significant (P=0.005) (Table 2).

Association of gender with hearing loss showed no significant association between the gender and the prevalence of hearing loss among the HIV patients (P=0.47) (Table 3).

Association of duration of treatment with hearing loss showed that the patients with hearing loss had a longer duration of treatment when compared to the patients without hearing loss (6.0 years vs 3.6 years) and was found to be statistically significant (P<0.001) (Table 4).

Association of CD4 count with hearing loss revealed that the prevalence of hearing loss was higher for patients with CD4 ≤ 200 when compared to the patients with CD4 >200 (42.9% vs 8.0%) and was found to be statistically significant (P=0.005) (Table 5)

In unadjusted analysis, with every unit increase in age the hearing loss increases and was found to be statistically significant (P = 0.04). But in adjusted analysis, it was not significant. With every unit increase in the duration of treatment for HIV, the hearing loss increases and was found to be statistically significant (P= 0.001). Even after adjusted analysis, it was found to be significant (p =0.006). Also, when the CD 4 count <200 is significantly associated with hearing loss than those with CD 4 count ≥200 (P=0.03) but in adjusted analysis, it was not significant. Gender of the patients was not significant with the prevalence of hearing loss in unadjusted and adjusted analysis (Table 6).

**Table 1:** Distribution of patients by CD4 count (N=91)

| CD4 count | Frequency (n) | Percentage |
|-----------|---------------|------------|
| > 200     | 81            | 89.0       |
| 50 - 200  | 8             | 8.8        |
| < 50      | 2             | 2.2        |
| Total     | 91            | 100.0      |

**Table 2:** Association of age with hearing loss (N=91)

| Hearing loss | Age in years |                    | P value |
|--------------|--------------|--------------------|---------|
|              | Mean         | Standard deviation |         |
| Yes          | 43.0         | 11.1               | 0.005   |
| No           | 36.8         | 8.4                |         |

**Table 3:** Association of gender with hearing loss (N=91)

| Hearing loss | Gender    |           | P value |
|--------------|-----------|-----------|---------|
|              | Male      | Female    |         |
| Yes          | 20 (37.0) | 34 (63.0) | 0.47    |
| No           | 11 (29.7) | 26 (70.3) |         |

**Table 4:** Association of duration of treatment in years with hearing loss (N=91)

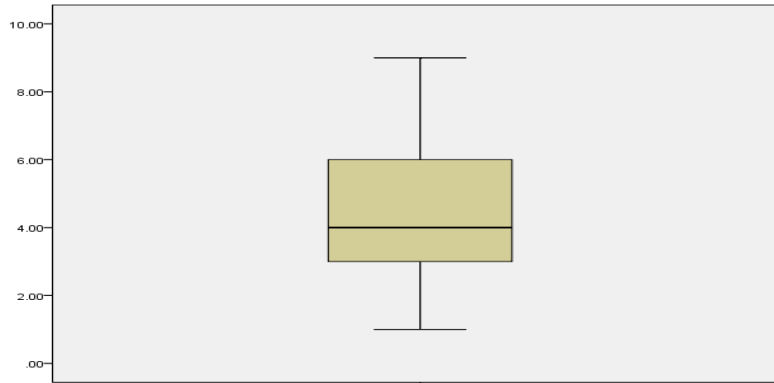
| Hearing loss | Duration of treatment (years) |     | P value |
|--------------|-------------------------------|-----|---------|
|              | Mean                          | SD  |         |
| Yes          | 6.0                           | 1.8 | <0.001  |
| No           | 3.6                           | 1.4 |         |

**Table 5:** Association of hearing loss with the CD4 count (N=91)

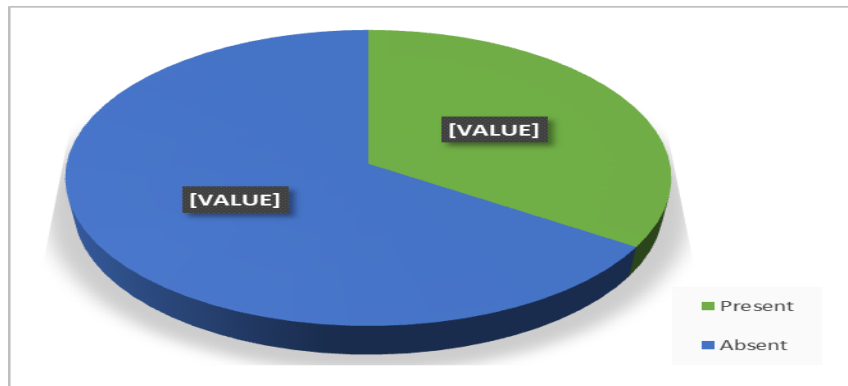
| CD4 count | Hearing loss |           | P value |
|-----------|--------------|-----------|---------|
|           | Yes n (%)    | No n (%)  |         |
| ≤ 200     | 3 (42.9)     | 7 (57.1)  | 0.005   |
| >200      | 12 (8.0)     | 69 (92.0) |         |

**Table 6:** Univariate and multivariable logistic regression for associated factors with hearing loss (N=91)

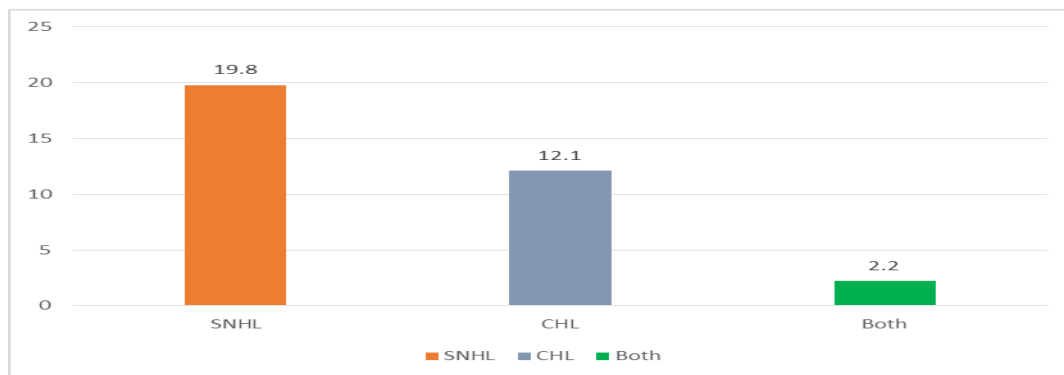
| Variables             | Unadjusted OR (95% CI) | Unadjusted P value | Adjusted OR (95% CI) | Adjusted P value  |      |
|-----------------------|------------------------|--------------------|----------------------|-------------------|------|
| Age                   | 1.04 (1.001-1.09)      | 0.04               | 1.02 (0.92-1.06)     | 0.72              |      |
| Gender                | Male                   | 1.43 (0.59-3.44)   | 0.42                 | 1.2 (0.33-2.60)   | 0.92 |
|                       | Female                 | Reference          |                      | Reference         |      |
| Duration of treatment | 1.67 (1.28-2.19)       | 0.001              | 1.7 (1.16-2.51)      | 0.006             |      |
| CD 4 count            | <200                   | 4.6 (1.11-19.4)    | 0.03                 | 3.06 (0.59-15.84) | 0.18 |
|                       | ≥200                   | Reference          |                      | Reference         |      |



**Fig 1:** Box plot showing the duration of treatment in years among HIV positive patients (N=91)



**Fig 2:** Prevalence of hearing loss among HIV positive patients (N=91)



SNHL – Sensorineural hearing loss      CHL – Conductive hearing loss

**Fig 3:** Distribution of patients with hearing loss according to its type (N= 31)

**Discussion**

The nature of the relationship between HIV and hearing loss, is still not yet clear. Strategies for screening, prevention and treatment have not yet been outlined. Also, patients with HIV/AIDS are living longer due to the positive effects of ART, thus understanding the effects and treatment of HIV/AIDS on the auditory system has become crucial.[6]

In this study, a total of 91 HIV positive patients were evaluated, and we observed that the prevalence of hearing loss was 34.06%. Similar finding was reported in the study conducted by Mathews SS et al[7]. In a study conducted by Luque AE et al[8], the prevalence was lesser. But in the studies conducted by Jafari et al[9] and Kallail KJ et al[10] the prevalence was higher. The discrepancy in the prevalence rate

maybe due to the research methodology employed in the different studies and the differences in the population enrolled. Also, the lack of consensus on the disease definitions of hearing loss may be one of the main reasons.

Gender of the patients was not significant with the prevalence of hearing loss in unadjusted and adjusted analysis. With increasing age of the participants chances of hearing loss increased, though not statistically significant in adjusted analysis, probably because of the confounding factors. Similar findings were reported in studies conducted by Ensink et al[11] and Sebothoma et al[12].

In this study, the median duration of treatment was 4 years with a minimum of one year and a maximum of nine years. The mean duration of treatment was 4.4 (1.9) years. With every unit increase in the duration of treatment for HIV, the hearing loss increased and was found to be statistically significant ( $P= 0.001$ ). Even after adjusted analysis, it was found to be significant ( $P=0.006$ ). Comparable results were found in the study conducted by Fasnla AJ et al[13] where significant association was seen between duration of treatment and hearing loss.

In our study, majority had CD4 count  $> 200$  (89% patients), followed by 50 to 200 in 8.8% of the patients and 2.2% of the patients with  $< 50$ . This study showed that in unadjusted analysis, with every unit increase in age the hearing loss increased and was found to be statistically significant ( $P = 0.04$ ). But in adjusted analysis, it was not significant. Torre et al[6] reported HIV as a factor for hearing loss, and the magnitude of hearing loss seems to increase with the severity of HIV. The association of hearing loss with low CD4 count in this study supports the notion that high level of HIV virus and low CD4 count may contribute to worsening hearing. But chances of confounding factors of CD4 count with age might have led to non-significant in our study. The observed none association between hearing thresholds, and CD4 cell count and viral load of the participants supports the neurotoxic aetiopathogenesis effect of HIV on the auditory system.[14,15]

One of the strengths of this study was employing a representative sample of population among HIV positive, although the sample size could have been larger to generalize to the whole population. Since this was a cross sectional study, to explore and confirm additional potential predictors and influential factors of hearing loss, further research through longitudinal study or clinical trials is recommended.

### Conclusion

The prevalence of hearing loss among HIV patients was 34.06%. Hearing loss was strongly associated with duration of treatment for HIV than with increased age and low CD4 count. Hearing loss is a serious condition, and HIV patients with hearing loss should be recognized early and managed promptly to prevent disease morbidity and mortality, and to assure the patients a better quality of life.

**Conflict of Interest: Nil Source of support: Nil**

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