International Journal of Otorhinolaryngology and Head and Neck Surgery
Chakravarti A et al. Int J Otorhinolaryngol Head Neck Surg. 2025 Jun;11(3):237-244
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937
DOI: https://dx.doi.org/10.18203/issn.2454-5929.ijohns20251503

Original Research Article

Otorhinolaryngological manifestations and hearing status in pediatric HIV/AIDS patients: a cross-sectional study from Northern India

Arunabha Chakravarti[1], Arti Rai[2], Vibhor Malhotra[1]*, Anju Seth[3]

[1]Department of ENT, LHMC, New Delhi, India
[2]Department of ENT, RML Hospital, New Delhi, India
[3]Department of Paediatrics, LHMC, New Delhi, India

Received: 01 January 2025
Revised: 18 March 2025
Accepted: 19 March 2025

***Correspondence:**
Dr. Vibhor Malhotra,
E-mail: malhotravibhor3@gmail.com

ABSTRACT

Background: Pediatric HIV/AIDS patients are prone to various otorhinolaryngological (ENT) manifestations due to immunosuppression. Despite the widespread use of antiretroviral therapy (ART), ENT complications remain prevalent, affecting the quality of life. This study evaluates the ENT manifestations and hearing status in pediatric HIV/AIDS patients, emphasizing the role of regular monitoring and multidisciplinary care.
Methods: This cross-sectional observational study was conducted at tertiary medical college and hospital, in Northern India from November 2018 to March 2020. 276 HIV-positive children under 18 years were assessed for ENT manifestations and audiological abnormalities. The study analyzed the correlation between these conditions and CD4 counts.
Results: The majority of participants (39.9%) were aged 11-15 years, with a male predominance (63.8%). ENT manifestations were common, with chronic otitis media (19.6%) and oral candidiasis (19.2%) being the most frequent. Audiological assessments revealed hearing abnormalities in 25% of children, including 16.7% of children under 5 years with sensorineural hearing loss (SNHL). Nasopharyngeal lymphoid hypertrophy (8.6%) was the most common rhinological issue, while cervical lymphadenopathy was found in 80.8% of cases. Low CD4 counts were significantly associated with oral candidiasis and gingivitis but not with otitis media or rhinological conditions.
Conclusions: ENT complications remain prevalent in pediatric HIV patients despite ART. Regular ENT evaluations and early interventions are crucial for better management. Otorhinolaryngologists play a key role in multidisciplinary care to improve patient outcomes.

Keywords: Pediatric, HIV/AIDS, Otorhinolaryngological manifestations

INTRODUCTION

Human immunodeficiency virus (HIV) and acquired immune deficiency syndrome (AIDS) encompass a range of conditions caused by the HIV virus, a single-stranded, positive-sense enveloped RNA virus belonging to the Lentivirus genus within the Retroviridae family. This virus predominantly targets the human immune system, especially CD4+ T cells, macrophages, and dendritic cells. HIV transmission occurs primarily through three main routes: sexual contact, significant exposure to infected bodily fluids or tissues, and vertical transmission from mother to child during pregnancy, delivery, or breastfeeding. Notably, vertical transmission accounts for approximately 90% of HIV cases in children.[1-5]

HIV remains a critical global public health challenge. By the end of 2018, an estimated 37.9 million people worldwide were living with HIV, with 1.7 million new infections occurring that year. Among the infected population, 36.2 million were adults, and 1.7 million were children under 15 years of age. Additionally, 24.5

million people were receiving ART by the end of June 2019, which equated to 62% of all individuals living with HIV, with 62% of adults aged 15 and older and 54% of children aged 0-14 years having access to ART.

India, despite having a low HIV prevalence rate of 0.22%, ranks as the country with the third-largest number of HIV-infected individuals globally, with approximately 2.1 million people living with the virus. Each year, India witnesses an estimated 87,000 new infections and 69,000 AIDS-related deaths.

ENT disorders are particularly prevalent in individuals with HIV, given that the upper airways serve as a primary interface between the body and the environment. Studies suggest that up to 80% of HIV-positive patients will eventually develop ENT manifestations, with oral diseases being the most common. HIV infection ranks as the fourth leading cause of death worldwide and the ninth leading cause among children aged 1-4 years. ENT symptoms often emerge early in the course of the disease, with 55% of affected children exhibiting such symptoms before the age of three and nearly 98% by the age of nine.

ENT manifestations in HIV-infected patients are varied and can involve all otolaryngological sites. Oropharyngeal manifestations include conditions such as candidiasis, periodontal and gingival diseases, Herpes simplex virus, Human papillomavirus infections, oral hairy leukoplakia (OHL), Kaposi's sarcoma, and non-Hodgkin's lymphoma (NHL). Cervical lymphadenopathy or parotid gland enlargement is common in the neck, while nasal symptoms can include sinusitis and allergic rhinitis. Otological issues, such as otitis (externa or media), inner ear involvement, and facial nerve palsy, are also frequently observed. These ENT manifestations are often the initial signs of immunodeficiency, presenting before the HIV infection itself has been detected, making it crucial to consider the HIV as a potential underlying cause.

The prevalence and nature of hearing loss in children infected with HIV/AIDS have not been extensively studied, and the primary pathologies leading to hearing difficulties in these children remain unclear. HIV can impact hearing through various mechanisms, leading to sensorineural, conductive, or mixed hearing loss. Contributing factors may include infections such as otitis media, mastoiditis, or meningitis; ototoxic drug effects on the peripheral hearing system; direct viral effects on neural pathways and structures; and underlying inflammation. Otitis media is a particularly common finding in HIV-positive patients.

Comprehensive data on ENT manifestations in pediatric HIV infection are limited, and there is a scarcity of literature on this topic within the Indian context. A search of available English-language literature did not reveal any studies specifically focused on the hearing status of children with HIV/AIDS in India. This study aims to provide detailed data on otorhinolaryngological manifestations, with a particular focus on hearing status in pediatric HIV patients, and to assess any associations between ENT manifestations and CD4 counts.[6-12]

Aims and objectives

To determine the prevalence of otorhinolaryngological manifestations in children with HIV/AIDS, to evaluate the hearing status in this group of children and to evaluate association of ENT manifestations and immunological status (CD4 counts) in this group of children.

METHODS

Study design

This research was conducted as a cross-sectional observational study.

Study period

The study spanned from November 2018 to March 2020.

Location

The study took place in the department of otorhinolaryngology and head and neck surgery, in collaboration with the ART centre of the national AIDS control organization (NACO), under the ministry of health and family welfare (MOHFW), government of India (GOI) at tertiary medical college and hospital, in Northern India.

Study population

The study included all diagnosed cases of HIV/AIDS in children up to 18 years of age who presented to the ART centre for the first time or were attending the centre regularly for treatment.

Sample size

A total of 276 HIV-infected children who met the inclusion criteria were enrolled in the study.

Inclusion criteria

All newly diagnosed cases of HIV/AIDS up to the age of 18 years presenting to the ART centre at Kalawati Saran Children’s hospital. All follow-up cases of HIV/AIDS up to the age of 18 years presenting to the ART centre. Children whose parents or caregivers provided consent for their enrolment in the study.

Exclusion criteria

Children whose parents or caregivers were unwilling to participate in the study were excluded.

Approach to the patient

All pediatric patients (up to 18 years) who attended the ART centre at Kalawati Saran Children's hospital and Sir Sunderlal hospital (SSKH) and provided consent were subjected to a comprehensive ENT clinical assessment and, where necessary, additional investigations.

This assessment included:

Demographic profile: Detailed recording of each patient's demographic information.

Clinical history and examination: Thorough documentation of history related to ENT manifestations and a complete clinical examination.

CD4 counts: CD4 cell counts were measured in cells per cubic millimeter (cells/mm^3). Given that CD4 counts can fluctuate, the trend over time was considered more significant than a single measurement. CD4 counts were estimated using baseline CD4% and absolute lymphocyte counts, measured by an automated flow cytometry machine. The CD4 estimate was calculated by multiplying the absolute lymphocyte count by the baseline CD4 percentage.

Clinical staging: All patients were classified according to WHO clinical staging (Annexure II).

Immunological staging: Immunological staging of HIV-infected patients was conducted according to WHO criteria (Annexure III).

Pathological/microbiological or radiological investigations: Additional investigations were performed as indicated.

Hearing evaluation

For children under 5 years of age, otoacoustic emission (OAE) screening was conducted. Those who failed the OAE test underwent brainstem evoked response audiometry (BERA) for threshold estimation.

Children over 5 years of age underwent air conduction audiometry (screening audiometry). If hearing loss was detected, these children underwent pure tone audiometry.

Pure tone audiometry was conducted using conventional audiometry with the Modified Hughson-Westlake procedure in a sound-treated audiometry room. A two-channel audiometer (LABAT AUDIOLAB, M/S Labat Srl, Italy) was used. Air conduction testing was performed with SENNHEISER HDA 300 headphones, and frequencies from 250 Hz to 8000 Hz were tested. Bone conduction was measured using a Radioear B71 bone conductor at frequencies ranging from 250 Hz to 4000 Hz. The hearing thresholds obtained were recorded in the proforma.

OAEs testing included distortion product OAEs (DPOAE) using a neuro-audio-screen portable OAE device (Neurosoft Limited, Russia). Frequencies tested ranged from 0.6 kHz to 8.7 kHz, with f1 and f2 delivered at 65 dB SPL and 55 dB SPL, respectively, and a frequency ratio of 1.22. A signal-to-noise ratio of 6 dB was considered a valid response.

The collected data were recorded in a pre-designed proforma, tabulated in a Microsoft excel chart, and analyzed using SPSS software (version 16.0). In addition to ART, patients received medical or surgical treatment according to standard protocols.

Statistical analysis

Data were entered into Microsoft excel and analyzed using SPSS version 16.0. Descriptive analysis was performed using mean values for continuous variables. Associations between continuous variables were calculated using the unpaired t-test. A p value of less than 0.05 was considered statistically significant.

RESULTS

Demographic characteristics

A total of 276 children, all below the age of 18 years and diagnosed with HIV/AIDS, were included in the study. The majority of the participants were between the ages of 11 and 15 years, accounting for 39.9% (110 cases). This was followed by 83 children (30.1%) aged between 6 and 10 years, 59 children (21.4%) aged between 16 and 18 years, and 24 children (8.7%) aged between 1 and 5 years. No participants were below the age of 1 year (Figure 1).

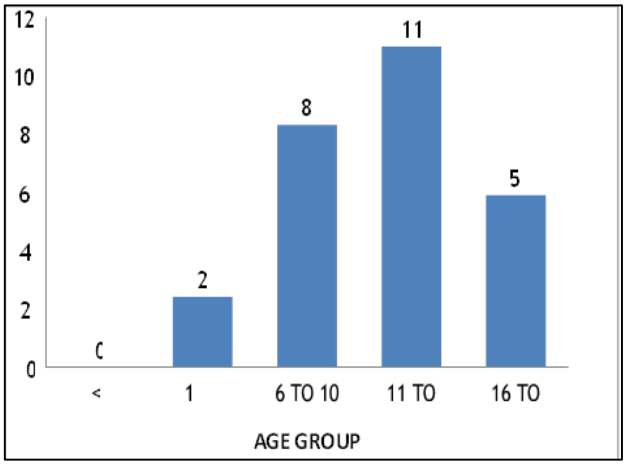

Figure 1: Age distribution.

Gender distribution

Among the 276 participants, there was a male predominance, with 176 boys (63.8%) and 100 girls (36.2%), resulting in a male-to-female ratio of 1.7:1.

Geographical distribution

Most of the children were residents of Delhi, with 200 (76.5%) hailing from the city. Other participants came from Haryana (43 children, 15.6%), Uttar Pradesh (29 children, 10.5%), Bihar (3 children, 1.1%), and Nagpur (1 child, 0.4%).

Socioeconomic status

According to the modified Kuppuswamy scale, the majority of the children belonged to the "upper lower" socioeconomic class (84.1%, or 232 children), followed by the "lower" class (12.7%, or 35 children). Only 9 children (3.3%) were classified under the "lower middle" class. None of the participants belonged to the "upper" or "upper middle" classes.

Clinical staging at diagnosis and assessment

Based on the WHO clinical staging system, at the time of diagnosis, 34.8% of the children were at stage T3, followed by 24.6% at stage T2, 21.0% at stage T4, and 19.6% at stage T1. At the time of assessment, a significant majority of the children (84.0%) were at stage T1, with 10.5% at stage T2, 3.6% at stage T4, and only 1.3% at stage T3 (Figure 2).

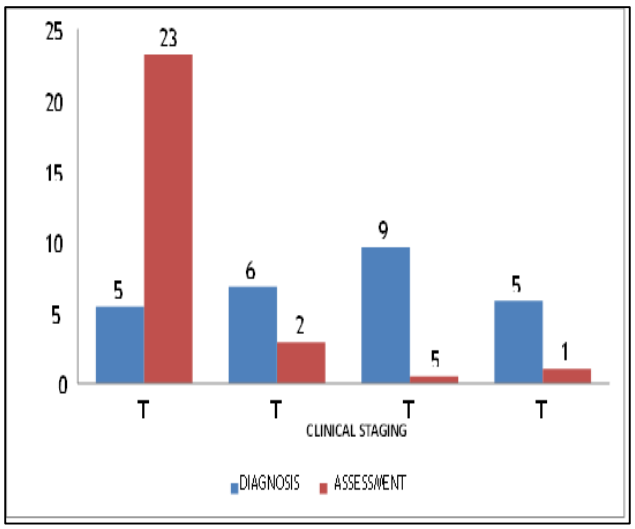

Figure 2: Clinical staging at diagnosis and assessment.

Mode of transmission

The most common mode of HIV transmission among the children was vertical transmission, accounting for 81.2% (224 cases), which includes transmission during pregnancy, childbirth, or breastfeeding. Blood transfusions accounted for 7.2% (20 cases), and 2.5% (7 cases) were attributed to needle pricks. The mode of transmission was unknown for 9.1% (25 cases). Among the children infected through blood transfusions, 6 had β-thalassemia, and the others contracted HIV during hospital admissions (Figure 3).

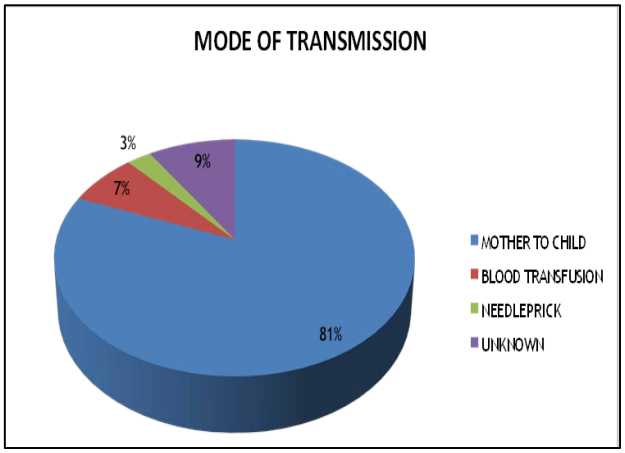

Figure 3: Mode of transmission.

ENT manifestations

Otological manifestations

Chronic otitis media was observed in 19.6% (54 cases) of the children, all of whom were over 5 years old. Acute otitis media was present in 10.5% (29 cases), with 4 cases occurring in children under 5 years old. Otitis externa was diagnosed in 5.1% (14 cases), and otitis media with effusion was seen in 4.3% (12 cases). Otomycosis was identified in 2.9% (8 cases), with 2 cases in children under 5 years old. Average CD4 counts for these otological conditions ranged from 575.0 to 839.0 cells/mm^3. However, no significant association between these manifestations and CD4 counts found (Figure 4).

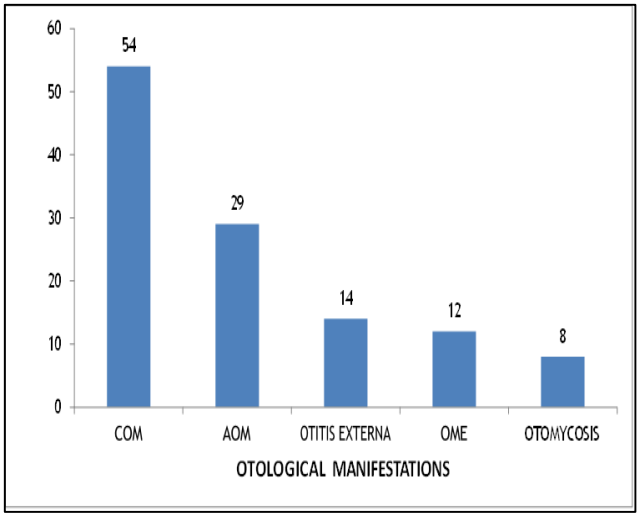

Figure 4: Otological manifestations.

Audiological manifestations

Hearing abnormalities were detected in 25% (69 cases) of the children. Among children under 5 years old, 16.7% (4 out of 24) failed the DPOAE test and were subsequently diagnosed with SNHL through auditory brainstem response (ABR) testing. Pure tone audiometry, conducted

on 252 children, revealed that 25.8% (65 cases) had hearing loss, with 19.6% (54 cases) exhibiting mild to moderately severe conductive hearing loss, 3.6% (10 cases) with bilateral mild SNHL, and 0.4% (1 case) with mixed hearing loss.

Rhinological manifestations

Rhinological issues were present in 32.2% of the participants, with nasopharyngeal lymphoid hypertrophy being the most frequent (8.6%), followed by chronic rhinosinusitis (7.2%).

Oropharyngeal manifestations

Oral candidiasis was the most common manifestation, observed in 19.2% of the children, followed by gingivitis in 14.1%, (Figure 5 and 6).

Figure 5: Hyperplastic candidiasis.

Figure 6: Angular cheilitis.

Head and neck manifestations

Cervical lymphadenopathy was the most prevalent head and neck condition, affecting 80.8% of the children. Fine needle aspiration cytology (FNAC) suggested reactive lymphadenitis in 67.2% of these cases.

Other notable conditions included parotid hypertrophy, which was less common, and NHL, observed in a small percentage of cases (Figure 7-9).

Association with CD4 counts

Significant associations were found between low CD4 counts and the presence of oral candidiasis, gingivitis, and neck abscesses ($p<0.05$). However, no significant correlations were observed between CD4 counts and the otological or rhinological manifestations.

Figure 7: Submandibular abscess.

Figure 8: Lymphoepithelial cyst of right parotid.

Figure 9: MRI showing multiple cysts in parotid.

DISCUSSION

This cross-sectional observational study was conducted at Lady Hardinge medical college and Kalawati Saran children hospital between November 2018 and March 2020. The primary aim was to investigate the diverse presentations of ear, nose, throat (ENT), head, and neck manifestations, as well as to assess hearing in children with HIV infection.

Age and gender distribution

The study included 276 children, all under 18 years of age. The majority of ENT manifestations were observed in the 10-15 years age group, which constituted 39.9% of the total cases. The gender distribution showed a male predominance, with a male-to-female ratio of 1.7:1, similar to studies by Adebola et al, Ranganathan et al and others, which reported slight male preponderance (M ratios ranging from 1.2:1 to 1.5:1). However, some studies, such as those by Kirti et al reported a higher male predominance (M=3:1), while others, like Smith et al observed no significant gender bias.[13-16]

Socioeconomic status

The majority of the children in this study (84.1%) belonged to the "upper lower" socioeconomic class according to the modified Kuppuswamy scale. This classification provides insight into the socioeconomic background of the participants, which may influence the accessibility of healthcare and treatment outcomes.

Clinical staging at diagnosis and assessment

Upon initial diagnosis, 34.8% of the children were in WHO clinical stage T3, followed by 24.6% in stage T2, 21.0% in stage T4, and 19.6% in stage T1. However, at the time of assessment during the study, a significant shift was observed, with 84.0% of the children classified in stage T1. This improvement could be attributed to the effectiveness of ART in managing HIV symptoms and improving overall health.

Mode of transmission

Vertical transmission was identified as the most common mode of HIV transmission, accounting for 81.2% of the cases. This mode includes transmission during pregnancy, childbirth, or breastfeeding. Blood transfusions accounted for 7.2% of the cases, and needle pricks for 2.5%, while the mode of transmission remained unknown in 9.1% of the cases. The high rate of vertical transmission is consistent with findings from other studies, such as those by Gondim et al, Kumar et al and Ranganathan et al which also reported vertical transmission as the predominant mode.[14,17,18]

Otorhinolaryngological manifestations

Otological manifestations

Chronic otitis media was the most prevalent otological condition, observed in 19.6% of the children. The occurrence of chronic otitis media in HIV-infected patients, despite adequate CD4 counts, is likely due to poor tympanic membrane healing and decreased immune response to encapsulated organisms. Acute otitis media was present in 10.5% of the cases, with no significant association found between otological manifestations and CD4 counts.

Audiological manifestations

Hearing abnormalities were detected in 25% of the children, with SNHL present in 16.7% of children under 5 years, confirmed through ABR testing. The possible causes of SNHL in this population may include direct effects of the HIV virus on the auditory system, co-infections, or the potential ototoxic effects of ART.

Rhinological manifestations

Nasopharyngeal lymphoid hypertrophy was the most common rhinological manifestation, observed in 8.6% of the children. Other common rhinological issues included chronic rhinosinusitis (7.2%) and epistaxis (6.2%). However, no significant correlation was found between these rhinological manifestations and CD4 counts.

Oropharyngeal manifestations

Oral candidiasis (19.2%) and gingivitis (14.1%) were the most frequently observed oropharyngeal conditions. These conditions were significantly associated with low CD4 counts, indicating a compromised immune status in the affected children.

Head and neck manifestations

Cervical lymphadenopathy was the most prevalent head and neck manifestation, affecting 80.8% of the children. Reactive lymphadenitis was the most common cause, identified through FNAC.

Association with CD4 counts

Significant associations were observed between low CD4 counts and the presence of oral candidiasis, gingivitis, and neck abscesses. However, no significant correlations were found between CD4 counts and the otological or rhinological manifestations, indicating that while some ENT manifestations are closely linked with immune status, others may occur independently of CD4 levels.[19-33]

CONCLUSION

The findings of this study highlight the importance of regular ENT evaluations in children with HIV, as these manifestations can be among the first indicators of immunosuppression. Despite the widespread use of ART, ENT manifestations remain prevalent, underscoring the need for ongoing monitoring and management of these conditions in the pediatric HIV population.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Sepkowitz KA. AIDS—the first 20 years. New England J Med. 2001;344(23):1764-72.
2. Alimonti JB, Ball TB, Fowke KR. Mechanisms of CD4+ T lymphocyte cell death in human immunodeficiency virus infection and AIDS. J General Virol. 2003;84(7):1649-61.
3. Rom WN, Markowitz SB, editors. Environmental and occupational medicine. Lippincott Williams & Wilkins. 2007; 4th edition:745.
4. Coutsoudis A, Kwaan L, Thomson M. Prevention of vertical transmission of HIV-1 in resource-limited settings. Expert Rev Anti-Infective Therap. 2010;8(10):1163-75.
5. World Health Organization, 2019. HIV/AIDS. Available at: https://www.who.int/news-room/fact-sheets/detail/hiv-aids. Accessed on 26 June 2020.
6. National AIDS Control Organisation. HIV facts and Figures. Available at: http://naco.gov.in/hiv-facts-figures. Accessed on 26 June 2020.
7. Prasad HK, Bhojwani KM, Shenoy V, Prasad SC. HIV manifestations in otolaryngology. Am J Otolaryngol. 2006 May 1;27(3):179-85.
8. Hadfield PJ, Birchall MA, Novelli V, Bailey CM. The ENT manifestations of HIV infection in children. Clin Otolaryngol Allied Sci. 1996;21(1):30-6.
9. Williams MA. Head and neck findings in pediatric acquired immune deficiency syndrome. The Laryngoscope. 1987;97(6):713-6.
10. Vlastarakos PV, Papacharalampous G, Kampessis G, Nikolopoulos TP. Diagnosis and treatment of HIV-associated manifestations in otolaryngology. Infect Dis Reports. 2012;4(1):22-9.
11. Singh A, Georgalas C, Patel N, Papesch M. ENT presentations in children with HIV infection. Clin Otolaryngol Allied Sci. 2003;28(3):240-3.
12. Campanini A, Marani M, Mastroianni A, Cancellieri C, Vicini C. Human immunodeficiency virus infection: personal experience in changes in head and neck manifestations due to recent antiretroviral therapies. Acta Otorhinolaryngologicaitalica. 2005;25(1):30.
13. Adebola AR, Adeleke SI, Mukhtar M, Osunde OD, Akhiwu BI, Ladeinde A. Oral Manifestation of HIV/AIDS infections in paediatric Nigerian patients. Nigerian Med J: J Nigeria Med Association. 2012;53(3):150
14. Ranganathan K, Geethalakshmi E, Krishna MR, Vidya KM, Kumarasamy N, Solomon S. Orofacial and systemic manifestations in 212 paediatric HIV patients from Chennai, South India. Int J Paediatr Dent. 2010;20(4):276.
15. Kirti YK, Yashveer JK, Poorey VK. Changing Trends of HIV/AIDS in Otorhinolaryngology with CD 4+ Count Correlation. Indian J Otolaryngol Head Neck Surg. 2015;67(1):12-5.
16. Smith AF, Ianacone DC, Ensink RJ, Melaku A, Casselbrant ML, Isaacson G. Prevalence of hearing-loss among HAART-treated children in the Horn of Africa. Int J Pediatr Otorhinolaryngol. 2017;98:166-70.
17. Saleem SM. Modified Kuppuswamy scale updated for year 2018. Indian J Res. 2018;7(3):436.
18. Gondim LA, Zonta RF, Fortkamp E, Schmeling RO. Otorhinolaryngological manifestations in children with human immunodeficiency virus infection. Int J Pediatric Otorhinolaryngol. 2000;54(2-3):97-102
19. Kumar RK, Mohan G, Reddy NV, Rao VA, Shameer M, Christopher A. Associated oral lesions in human immunodefeciency virus infected children of age 1 to 14 years in anti retroviral therapy centers in Tamil Nadu. Contemporary Clin Dentist. 2013;4(4):467.
20. Ianacone DC, Smith AF, Casselbrant ML, Ensink RJ, Buchinsky F, Melaku A, Isaacson G. Prevalence of chronic ear disease among HIV+ children in Sub-Saharan Africa. Int J Pediatr Otorhinolaryngol. 2017;103:133-6.
21. Taipale A, Pelkonen T, Taipale M, Roine I, Bernardino L, Peltola H, Pitkäranta A. Otorhinolaryngological findings and hearing in HIV-positive and HIV-negative children in a developing country. Euro Arch Oto-Rhino-Laryngol. 2011Oct 1;268(10):1527.

22. Rzewnicki I, Olszewska E, Rogowska-Szadkowska D. HIV infections in otolaryngology. Med Sci Monit. 2012;18(3):RA17-21.
23. Sturt AS, Anglemyer AT, DuBray K, Maldonado YA. Temporal trends in otolaryngologic findings among HIV-1-infected children in a population-based cohort. Pediatric Infect Dis J. 2014;33(3):e76-80.
24. Chaloryoo S, Chotpitayasunondh T, Chiengmai PN. AIDS in ENT in children. Int J Pediatr Otorhinolaryngol. 1998;44(2):103-7.
25. Chandrasekhar SS, Connelly PE, Brahmbhatt SS, Shah CS, Kloser PC, Baredes S. Otologic and audiologic evaluation of human immunodeficiency virus-infected patients. Am J Otolaryngol. 2000;21(1):1-9.
26. Christopher N, Edward T, Sabrina BK, Agnes N. The prevalence of hearing impairment in the 6 months–5 years HIV/AIDS-positive patients attending paediatric infectious disease clinic at Mulago Hospital. Int J Pediatr Otorhinolaryngol. 2013;77(2):262-5.
27. Lauritano D, Moreo G, Oberti L, Lucchese A, Di Stasio D, Conese M, Carinci F. Oral Manifestations in HIV-Positive Children: A Systematic Review. Pathogens. 2020;9(2):88.
28. Ponnam SR, Srivastava G, Theruru K. Oral manifestations of human immunodeficiency virus in children: An institutional study at highly active antiretroviral therapy centre in India. J Oral Maxillofacial Pathol: JOMFP. 2012;16(2):195.
29. Oliscovicz NF, Pomarico L, de Araújo Castro GF, Souza IP. Effect of highly active antiretroviral therapy use on oral manifestations in pediatric patients infected with HIV. Indian J Dental Res. 2015;26(2):200.
30. Ellison E, LaPuerta P, Martin SE. Supraclavicular masses: results of a series of 309 cases biopsied by fine needle aspiration. Head Neck: J Sci Specialties Head Neck. 1999;21(3):239-46.
31. Gurney TA, Murr AH. Otolaryngologic manifestations of human immunodeficiency virus infection. Otolaryngologic Clin North Am. 2003;36(4):607-24.
32. Dosemane D, Kumar V, Madi D, Kanthila J. Human Immunodeficiency Virus Infection: Does Highly Active Antiretroviral Therapy Influence Ear Nose Throat Manifestations?. Indian J Otolaryngol Head Neck Surg. 2018;70(4):555-8
33. Jafari S, Razmpa E, Saeedinejad Z, Sadrhosseini M, Paydary K. Otolaryngological Manifestations in HIV Infected Patients, Tehran. Iran. J AIDS Clinic Res. 2012;3:1-4.

Cite this article as: Chakravarti A, Rai A, Malhotra V, Seth A. Otorhinolaryngological manifestations and hearing status in pediatric HIV/AIDS patients: a cross-sectional study from Northern India. Int J Otorhinolaryngol Head Neck Surg 2025;11:237-44.