

Prevalence of Audiological Impairment in Children with Cleft Palate: An Observational Study**Luzoo Prachishree¹, Biswakesh Panigrahy², Chandan Kumar Gantayat³, Jagnyaseni Panda⁴**¹Assistant professor, Department of Obstetrics and Gynaecology, MKCG Medical College & Hospital, Berhampur, Odisha²Associate Professor, Department of Orthopaedics, PGIMER and Capital Hospital, Bhubaneswar, Odisha³Assistant Professor, Department of General Medicine, MKCG Medical College & Hospital, Berhampur, Odisha⁴Associate Professor, Department Of Physiology, MKCG Medical College & Hospital, Berhampur, Odisha

Received: 25-11-2023 / Revised: 23-12-2023 / Accepted: 26-01-2024

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Conflict of interest: Nil

Abstract:**Background:** Clefts of the lip, alveolus, and palate are prevalent congenital malformations, affecting various aspects of the craniofacial region. The impact of cleft palate extends beyond physical appearance, often leading to emotional, financial, and psychological challenges. Therefore, this study aims to investigate the prevalence of audiological impairment in children with cleft palate, emphasizing the importance of early detection and management.**Methodology:** This observational study enrolled 80 children diagnosed with cleft palate, aged between 1 and 6 years, attending the Ear, Nose, and Throat (ENT) Outpatient Department of MKCG Medical College and Hospital, Berhampur, from February 2019 to March 2020. Detailed medical histories were obtained, and each child underwent comprehensive clinical and otological examinations.**Results:** The study comprised 68 (85%) male and 12 (15%) female participants. Unilateral cleft palate was predominant (77.5%), followed by bilateral cleft palate (18.7%) and submucous cleft palate (3.7%). Otoscopic examination revealed signs of middle ear dysfunction in 22.5% of patients, including retraction of the pars tensa. Otitis media with effusion (OME) was the most common pathology, affecting 52.5% of children, followed by chronic otitis media in 22.5% of cases.**Discussion:** Consistent with previous research, our study highlights the substantial burden of middle ear disorders in children with cleft palate. Despite the predominance of facial deformity correction, auditory health remains a critical aspect of care. The observed gender disparity and high prevalence of OME underscore the need for comprehensive audiological assessment and early intervention to mitigate hearing loss risks.**Conclusion:** This study emphasizes the importance of thorough audiological evaluation in children with cleft palate to prevent progressive hearing loss and associated complications. A multidisciplinary approach involving ENT specialists and audiologists is essential for optimizing long-term outcomes.**Keywords:** Cleft Palate, Audiological Impairment, Otitis Media, Middle Ear Disorders, Impedance Audiometry.

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Introduction

Clefts of the lip, alveolus, and palate represent a significant subset of congenital malformations, ranking as one of the most prevalent anomalies affecting the head and neck and the second most common congenital malformation overall [1].

These anomalies arise due to incomplete fusion of facial and oral tissues during embryonic development, typically occurring by the 2nd or 3rd month of gestation [2]. The impact of cleft lip and palate extends beyond physical appearance,

exerting emotional, financial, and psychological strains on affected individuals and their families. Children born with these conditions often undergo multiple corrective surgeries and require on-going management to address associated complications.

Of particular concern is the heightened risk of otitis media observed in children with cleft palate, attributed to Eustachian tube dysfunction resulting from impaired palatal muscle function [2,3]. Studies have shown that a substantial majority of

these children experience at least one episode of otitis media by the age of three, with recurrent episodes common, including otitis media with effusion [4]. In fact, research indicates a staggering 97% incidence of otitis media with effusion in cleft palate patients under 24 months of age [5,6]. Despite the significant impact of hearing impairment on developmental and cognitive functions, the emphasis in children with cleft palate has traditionally been on correcting the facial deformity, often neglecting auditory health. Early detection and management of audiological issues are paramount for optimizing the long-term outcomes of these individuals. Thus, this study aims to investigate the prevalence of audiological impairment in children with cleft palate, shedding light on an often-overlooked aspect of their healthcare needs.

Materials and Methods:

This observational study involved 80 children diagnosed with cleft palate who attended the Ear, Nose, and Throat (ENT) Outpatient Department (OPD) of MKCG Medical College and Hospital in Berhampur.

The data collection period spanned from February 2019 to March 2020, encompassing children aged between 1 year and 6 years. Prior to data collection, written consent was obtained from the parent or guardian of each participant. Detailed medical histories were gathered from the accompanying parent or guardian. Each child underwent a comprehensive clinical and otological examination.

Audiometric Assessment:

Impedance audiometry was performed on all participants by an experienced audiologist. This method provides valuable insights into middle ear function and can help identify conditions such as otitis media with effusion.

Inclusion Criteria: Children aged between 1 year and 6 years with a diagnosis of cleft palate were included in the study.

Exclusion Criteria: Children who had previously undergone corrective surgery for cleft palate or who had any other congenital or craniofacial anomalies were excluded from the study.

Understanding the anatomy of the middle ear is crucial for interpreting audiological findings in children with cleft palate. The middle ear cavity, which extends from the tympanic membrane to the inner ear, plays a vital role in sound transmission. Its volume is approximately two cubic centimeters. The Eustachian tube, which connects the middle ear cavity to the nasopharynx, is responsible for pressure equalization and ventilation of the middle ear. Optimal sound transmission occurs when air pressure is balanced between the outer and middle ear. Discrepancies in air pressure can lead to discomfort and reduced sound transmission.

The tensor veli palatini muscle plays a critical role in opening the Eustachian tube, facilitating ventilation and drainage of the middle ear. Dysfunction of this muscle, often observed in children with cleft palate, contributes to the pathophysiology of middle ear diseases in this population. Permission to conduct the study was obtained from the institutional ethics committee. Informed and valid consent was obtained from the parent or guardian of each participant, given the pediatric nature of the subjects involved.

Results

Out of the 80 children included in the study, the majority were male, comprising 68 (85%) of the participants, while only 12 (15%) were female.

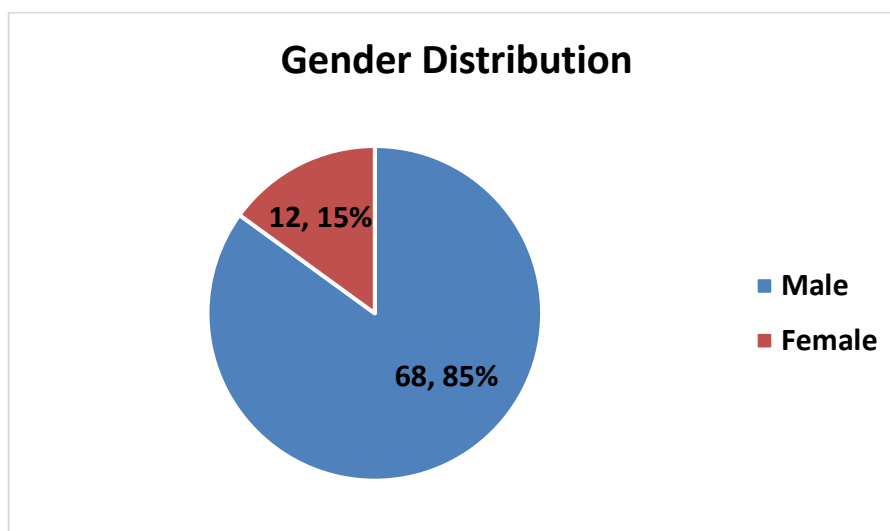


Figure 1: Gender distribution among study participants

Among the 80 children with cleft palate, unilateral cleft palate was the most common presentation, noted in 62 (77.5%) children, followed by bilateral cleft palate observed in 15 (18.7%) children.

A smaller subset, consisting of 3 (3.7%) children, presented with submucous cleft palate. Otoloscopic examination revealed notable findings indicative of past or present middle ear dysfunction in a significant proportion of patients. Specifically, retraction of the pars tensa was observed in 18

(22.5%) patients. Among the 80 children assessed, various middle ear pathologies were identified. Notably, findings consistent with otitis media with effusion (OME) were present in 42 (52.5%) children. Additionally, 18 (22.5%) children exhibited signs of chronic otitis media, with 7 (38.8%) cases classified as squamous type and 11 (61.2%) cases classified as mucosal type.

The remaining 20 (25%) children had normal tympanic membrane findings.

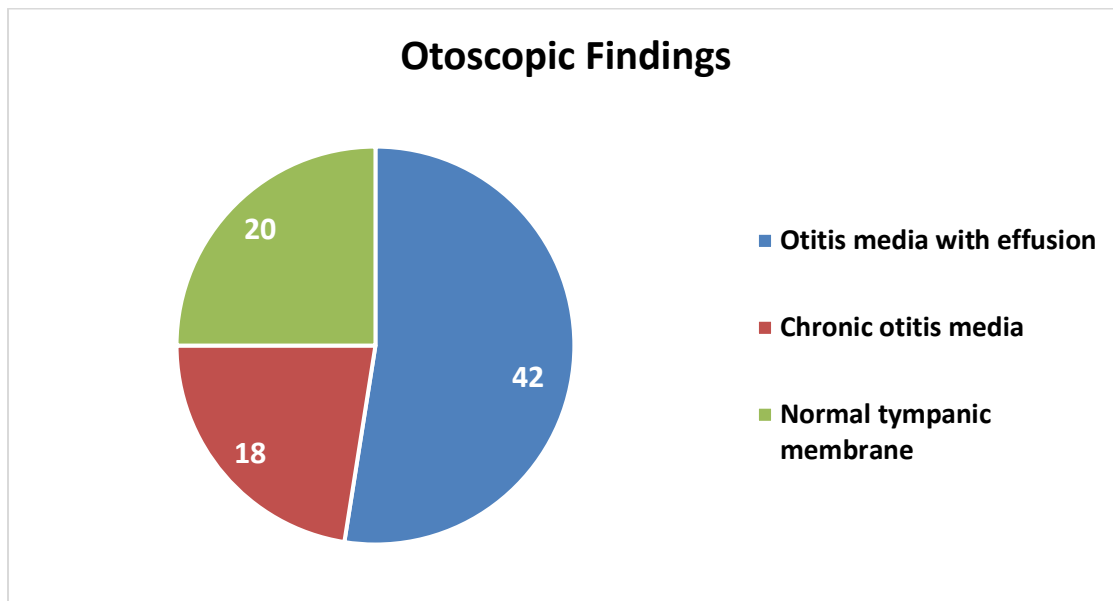


Figure 2: Pie Chart Depicting Otoscopic Findings

Objective assessment of middle ear function through tympanometry revealed distinct patterns. The most common type of tympanogram curve observed was Type B, noted in 48 (60%) children, consistent with clinical findings. Type A tympanogram, the second most common type, was present in 16 (20%) children. Type As was identified in only 3 (3.4%) ears, while Type D was observed in 13 (16.6%) ears.

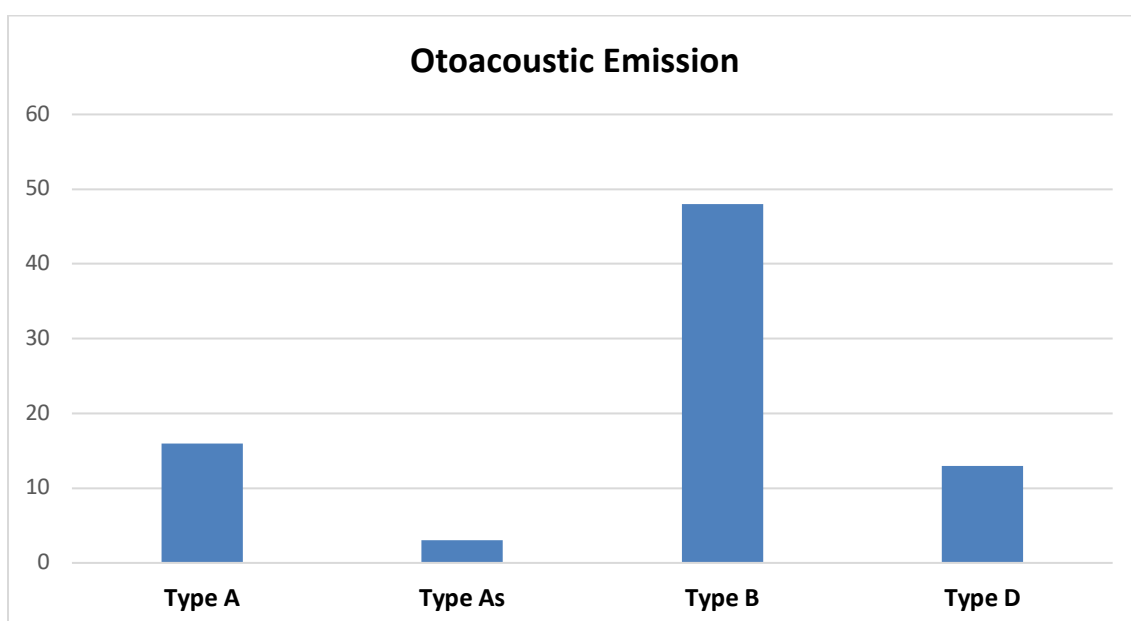


Figure 3:

Overall, the results highlight a high prevalence of middle ear pathologies among children with cleft palate, underscoring the importance of thorough evaluation and management of auditory health in this population.

Discussion

Clefts of the orofacial region represent a significant burden in pediatric healthcare, being the most prevalent congenital anomaly of the craniofacial region, with an annual incidence estimated to be between 27,000 to 33,000 live births [3-5]. The association between cleft palate and middle ear disorders, including hearing loss, is well-documented, with studies reporting a high prevalence ranging from 50% to 90% in affected children [6-9]. This study reinforces these findings, highlighting the substantial risk of middle ear pathology in children with cleft palate, attributed to the impaired function of palatal muscles leading to Eustachian tube dysfunction [10].

Consistent with previous research, our study observed a male predominance among children with cleft palate, with a male to female ratio of 1.9:1, aligning closely with the reported ratio of 2:1 in similar studies [11]. This gender disparity underscores the need for further investigation into potential underlying genetic or environmental factors influencing the development of cleft palate.

Otoscopic examination revealed noteworthy findings, with a significant proportion of children exhibiting signs suggestive of past or present middle ear dysfunction. Notably, 20% of cases exhibited retracted pars tensa, indicative of possible otitis media history, consistent with findings from previous studies conducted in India [12, 13]. Despite the high prevalence of ear problems reported by parents, a concerning observation was the low proportion of children who had received medical treatment for hearing-related complaints, highlighting potential gaps in healthcare access and awareness.

The prevalence of otitis media with effusion (OME) was notably high in our study, affecting over half of the children examined. This finding aligns with prior research, underscoring the substantial burden of OME in the cleft palate population [11]. Additionally, a significant proportion of children exhibited signs suggestive of chronic otitis media, further emphasizing the need for comprehensive audiological evaluation and early intervention to mitigate the risk of progressive hearing loss.

Impedance audiometry revealed distinct tympanogram patterns, with Type B tympanogram being the most common, consistent with previous studies [11]. However, the distribution of tympanogram types varied across different studies,

highlighting the heterogeneity of middle ear pathology in children with cleft palate [16].

Despite the valuable insights provided by this study, several limitations should be acknowledged. Firstly, the relatively small sample size may limit the generalizability of the findings. A larger cohort would allow for more robust analysis and validation of the observed associations. Additionally, the study's single-center design may introduce selection bias and limit the extrapolation of results to broader populations. Furthermore, the retrospective nature of data collection may introduce inherent biases and inaccuracies in the reported outcomes. Future studies incorporating larger, multicenter cohorts and prospective study designs are warranted to further elucidate the complex relationship between cleft palate and middle ear pathology.

Conclusion

In conclusion, this study underscores the significant burden of middle ear disorders in children with cleft palate and emphasizes the critical importance of comprehensive audiological assessment in this population. Early detection and intervention are paramount to prevent the progression of hearing loss and minimize associated complications. A multidisciplinary approach involving ENT specialists, audiologists, and pediatricians is essential for optimizing the long-term outcomes and quality of life for children with cleft palate. Further research with larger sample sizes and prospective study designs is needed to enhance our understanding of middle ear pathology in this population and inform evidence-based management strategies.

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