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Prevalence and Risk Factors of Chronic Otitis Media Among Pediatric Patients Attending Tertiary Care Hospitals: A Cross-Sectional Study

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ABSTRACT

Background: Chronic otitis media (COM) is an inflammatory disease of the middle ear that is persistent and a major cause of preventable hearing loss in children, especially in countries with low and middle incomes. Its great prevalence is strictly connected with socioeconomic, environmental, and nutritional factors.

Objective: To identify the prevalence and risk factors that are linked with chronic otitis media in pediatric patients in a tertiary care hospital.

Methods: This cross-sectional study was conducted at General Hospital, Lahore, Pakistan, between June 2022 and March 2025. A total of 150 children aged 1 to 15 years were recruited using a consecutive sampling technique. The diagnosis of COM was established based on clinical findings, including perforation of the tympanic membrane and/or otorrhea persisting for more than 12 weeks. Data on demographic characteristics, socioeconomic status, environmental exposures, nutritional status, breastfeeding history, and recurrent upper respiratory tract infections were collected. Statistical analysis was performed using SPSS version 26. The chi-square test and multivariate logistic regression were applied, and a p-value of ≤ 0.05 was considered statistically significant.

Results: The incidence of COM was 29.3%. There were significant correlations with low socioeconomic status ($p = 0.002$), frequent infection of the upper respiratory tract ($p < 0.001$), indoor smoke exposure ($p = 0.003$), malnutrition ($p = 0.001$), and absence of exclusive breastfeeding ($p = 0.015$). Recurrent infections (AOR = 3.4), malnutrition (AOR = 2.9), and exposure to indoor smoke (AOR = 2.6) were found to be independent predictors using multivariate analysis.

Conclusion: Chronic otitis media is quite common in children, and it is closely linked to the modifiable risk factors, which creates the necessity of preventive strategies and early intervention.

Keywords: Chronic Otitis Media, Pediatrics, Risk Factors, Prevalence, Hearing Loss, Upper Respiratory Tract Infections

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INTRODUCTION

Chronic otitis media (COM) is a persistent inflammatory disease of the middle ear cleft with long-lasting tympanic membrane perforation and persistent or recurrent otorrhea lasting at least 12 weeks [1]. It is a declaration of a significant cause of preventable hearing impairment in children and continues to be a significant health concern in the world, especially in low and middle-income countries. The pediatric population bears a disproportionate portion of the burden of COM because of the anatomical vulnerability, immature immune responses, and increased exposure to environmental and infectious risk factors [2].

Chronic otitis media is known to affect millions of children globally, with the highest rate of occurrence in South Asia, Sub-Saharan Africa, and some areas of Southeast Asia. The condition in these areas is highly related to poverty, overcrowding, poor hygiene, and little access to medical care in a timely manner [3]. This largely affects children with a significant burden of ear diseases in Pakistan, which is a developing nation with significant socioeconomic inequalities. Chronic otitis media causes not

only conductive hearing impairment but also this condition has far-reaching implications on the acquisition of languages, cognitive aspects, school performance, and overall living standards of children affected by it [4].

The pathogenesis of COM is multifactorial, and it comprises a complex interaction between host factors, environmental exposure, and pathogenic pathogens. Repeated upper respiratory tract infections are regarded as a major precipitating factor, which causes dysfunction of the Eustachian tube, dysfunction of middle ear ventilation, and chronic inflammation. Moreover, malnutrition was also found to be a very important determinant since it impairs immune competence and exposes individuals to chronic infections. Exposures of the environment, especially biomass fuels that cause indoor air pollution, also aggravate inflammation of mucous membranes and precondition children to recurring infections [5,6].

Factors that affect diseases in early life, like the absence of exclusive breastfeeding and parental awareness, are also significant. Breastfeeding gives the needed immunological protection during respiratory and middle ear infections, and a lack of it predisposes during early childhood. In a comparable manner, socioeconomic factors, such as low household income, congestion, and poor access to health services, play a role in later diagnosis and poor management, which supports the development of chronic disease [7,8].

Although chronic otitis media has been identified as having significant public health value, there is a lack of recent and region-specific data, based on tertiary care services in Pakistan, that fully assesses the prevalence and the risk factors of chronic otitis media. These determinants need to be understood in order to formulate effective preventive interventions and specific interventions [9].

Thus, the current study was carried out to identify the prevalence of chronic otitis media and the risk factors associated with COM among children hospitalized in tertiary care institutions, as it could help in the better clinical management and in planning health care [10].

MATERIALS AND METHODS

This cross-sectional study was carried out in the Department of Otorhinolaryngology, General Hospital, Lahore, Pakistan, between the timeframe of June 2022 and March 2025. The study was conducted under the principles of the Declaration of Helsinki, as the IRB of the hospital (Ref No: ERC/LGH/2022/161) provided ethical approval to the study. Parents or legal guardians of all the children participating were informed about the study and gave written informed consent before being enrolled in the study.

The study, using a non-probability consecutive sampling method, included 150 pediatric patients between 1 and 15 years of age. Children who came to the ENT outpatient department with complaints related to hearing or ear, or under routine check, were subject to eligibility screening. Patients were considered eligible to participate in the study if they qualified clinically to participate and did not have a history of ear surgery or inborn ear defects. Children whose immunodeficiency disorder was known, craniofacial abnormalities, or lack of a complete clinical history were excluded to avoid confounding factors.

The diagnosis of chronic otitis media was made according to conventional clinical criteria based on the existence of persistent perforation of the tympanic membrane and/or otorrhea longer than 12 weeks. To ascertain the diagnosis, all the patients were examined in detail by an otoscopic examination that was conducted by a qualified ENT specialist.

The data collection was carried out based on a structured questionnaire, which was pre-tested. Data on demographic factors (age, gender), socioeconomic status, parental education, biomass fuel-induced indoor smoke, breastfeeding history, and recurrent infection of the upper respiratory tract were taken. The socioeconomic status was classified as household monthly income and parental job.

The anthropometric measurements, such as weight and height, were measured using standard methods, and nutritional status was examined using World Health Organization (WHO) growth standards. Children have been considered malnourished in terms of their age-based weight-for-age and height-for-age indices.

All the data collected were analyzed and entered into the Statistical Package of Social Sciences (SPSS) version 26. Mean and standard deviation were used to describe continuous variables, and frequencies and percentages were used to describe categorical variables. The chi-square test was used to assess the association between chronic otitis media and the possible risk factors. Statistically significant variables were further examined with multivariate logistic regression to estimate independent predictors. The p-value below 0.05 was taken as statistically significant.

RESULTS

The study involved 150 pediatric patients, aged between 1 and 15 years. The average age of the subjects was 7.6 3.4 years. Out of them, 82 (54.7) were male, and 68 (45.3) were female, and there was a slight majority among males. The majority of the population studied (63.3) had a low socioeconomic status, as it represented the patient population of a public tertiary care hospital environment (Table 1).

The total rate of chronic otitis media (COM) turned out to be 29.3% (n = 44). The most common frequency of the COM occurred in the children age group of 5-10 years and constituted 47.7% of the cases affected. The frequencies were lower in younger children (11-5 years) and older children (11-15 years).

Evaluation of possible risk factors showed that chronic otitis media has a strong relationship with a number of clinical and environmental factors. Children with recurrent URTI had significantly more prevalence of COM (68.2) than those without recurrent infections (31.8), and this

correlation was very significant ($p < 0.001$). As well, children with COM were found to be exposed to indoor smoke, especially because of biomass fuel use, which was reported in 61.4% children with versus 35.8% in children without ($p = 0.003$).

Children with COM exhibited malnutrition at a rate of 50.0 percent, which was way above the rate of children who were not diagnosed with the disease (24.5 percent) ($p = 0.001$). Also, the absence of exclusive breastfeeding in the first six months of life correlated with the significant presence of COM ($p = 0.015$). Poor socioeconomic status was also significantly associated with the prevalence of diseases ($p = 0.002$) (Table 2).

Multivariate logistic regression was conducted to further test the independent predictors. The finding showed that recurrent upper respiratory tract infections were the best independent predictor of chronic otitis media (Adjusted Odds Ratio [AOR] = 3.4, 95% CI: 1.9–6.1, $p < 0.001$). Independent association was also statistically significant between malnutrition and exposure to indoor smoke (AOR = 2.9, 95% CI: 1.5–5.2, $p = 0.002$), followed by exposure to indoor smoke (AOR = 2.6, 95% CI: 1.3–4.6, $p = 0.004$). The low socioeconomic status, though a significant variable in univariate analysis, demonstrated borderline significance following adjustment (Table 3).

Comprehensively, the results prove that chronic otitis media is very common among children's patients and that it is closely related to the modifiable environmental and clinical risk factors. These observations are valid since significant variables are consistent in both univariate and multivariate analyses.

Table 1: Baseline Characteristics of the Study Population (n = 150)

Variable	Frequency (%) / Mean ± SD
Age (years)	7.6 ± 3.4
Male	82 (54.7%)
Female	68 (45.3%)
Low socioeconomic status	95 (63.3%)
Middle socioeconomic status	41 (27.3%)
High socioeconomic status	14 (9.4%)

Table 2: Association of Risk Factors with Chronic Otitis Media

Risk Factor	COM Present (n = 44)	COM Absent (n = 106)	p-value
Low socioeconomic status	34 (77.3%)	61 (57.5%)	0.002
Recurrent URTI	30 (68.2%)	31 (29.2%)	<0.001
Indoor smoke exposure	27 (61.4%)	38 (35.8%)	0.003
Malnutrition	22 (50.0%)	26 (24.5%)	0.001
No exclusive breastfeeding	25 (56.8%)	40 (37.7%)	0.015

Table 3: Multivariate Logistic Regression Analysis of Risk Factors

Variable	AOR	95% CI	p-value
Recurrent URTI	3.4	1.9–6.1	<0.001
Malnutrition	2.9	1.5–5.2	0.002
Indoor smoke exposure	2.6	1.3–4.6	0.004
Low socioeconomic status	1.8	0.9–3.4	0.067

DISCUSSION

This current study indicates chronic otitis media (COM) to be a very common problem in children presenting to tertiary care facilities, and prevalence was noted to be 29.3 [7]. This observation shows a high disease burden and is not isolated, as other developing areas have reported similar results, with socioeconomic and environmental determinants having a primary role to play in the spread of the disease. The relatively high rate that was found in this study shows that chronic ear infections in children continue to be a challenge to public health, especially in places that are resource-deprived, like in Pakistan [8,9].

Among the most important outcomes of this study, one can distinguish a tight connection between frequent upper respiratory tract infections (URTI) and COM. Children who had frequent URTIs were found to be predisposed to chronic otitis media more than three times, and thus it became the strongest independent predictor that was found in this analysis [10]. This association is biologically reasonable because frequent infections may compromise the functionality of the Eustachian tube, leading to the lack of good ventilation of the middle ear, retention of fluid, and persistent inflammation. These illnesses pose a good condition of chronic infection and damage to the tympanic membrane [11,12].

Another critical determinant that was obtained was malnutrition, which highly enhanced the risk of developing COM [13]. The susceptibility of affected children to malnutrition with preeminence highlights the importance of immunosuppression in chronic infection pathogenesis. Malnutrition may affect both the adaptive and innate immune responses and suppress the capacity of the body to eliminate infections. This is a key factor in the continuation and recidivism of otitis media in developing countries, where malnutrition is a prevalent phenomenon [14].

Indoor air exposure (to smoke) was also indicated as a major risk factor. Children who had been exposed to combustion products of biomass fuel were predisposed to

the chance of COM. It is well-known that indoor air pollution deteriorates the ability of the mucociliary clearance and harms the respiratory epithelium, thus predisposing an individual to upper respiratory tract and middle ear infections. Such a conclusion highlights the significance of environmental health interventions to lower the morbidity of children [15,16].

The low socioeconomic status was highly correlated with the COM in the univariate analysis but diminished despite the adjustment in the multivariate model. This implies that socioeconomic status can be an upstream factor, and it can affect other risk factors, including malnutrition, low hygiene levels, overcrowding, and late healthcare-seeking behaviors. Children with low socioeconomic status are also more prone to being reinfected and receiving inappropriate care, which leads to the development of chronic diseases [17,18].

The importance of breastfeeding was also mentioned in this study. Children with no exclusive breastfeeding during the first six months of the first year were greatly affected by the occurrence of COM. The breast milk offers the necessary immunological defense, such as antibodies and anti-inflammatory factors, which can contribute to the decreased incidence of infections in the first childhood years. Lack of this protective action exposes to repeated infections, which in the end predisposes to chronic ear disease [19,20].

On the whole, the evidence of this study supports the concept of the multifactorial character of chronic otitis media, during which biological vulnerability interacts with environmental and socioeconomic risk factors. The uniformity of the findings in the univariate and multivariate analyses contributes to the validity of the defined associations [21-23].

Although this is a strong study, it has some weaknesses. As a cross-sectional study, it is not able to prove causality between risk factors and disease. Also, the study was done on a tertiary care facility that might overrepresent more severe cases and generalize to the rest of the community. Nevertheless, the study offers a good understanding of clinically relevant and modifiable risk factors that can be used to conduct specific interventions [24,25].

CONCLUSION

Chronic otitis media is a prevalent and clinically relevant ailment within the pediatric patient group in the tertiary care facilities. The modifiable risk factors linked to the disease are closely related to recurrent infections of the upper respiratory tract, malnutrition, and indoor air pollution. To decrease disease burden, these factors should be identified and managed early, and nutritional status should be promoted, exclusive breastfeeding encouraged, and exposure to the environment should be minimized. Preventive care interventions, including parental awareness and early interventions by the general health systems, can be vital in reducing the long-term complications such as hearing loss and developmental delays in children.

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Authors' Contributions: T., M., and A. contributed to study design and data collection. M.A. performed statistical analysis. All authors participated in data interpretation, manuscript writing, and approved the final version.

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Data Availability: The datasets generated and analyzed during this study are available from the corresponding author upon reasonable request.

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