Recognizing Patterns of CSOM in Children at Sargodha: Insights for Primary Care Provider

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Abstract

Background: Chronic suppurative otitis media (CSOM) is considered one of the most common pediatric infections in underdeveloped countries. World Health Organization considers it a public health problem, particularly owing to its propensity as a significant risk factor for pediatric hearing loss.

Objective: This study aimed to assess the pattern of chronic suppurative otitis media (CSOM) with its dynamic clinical features among children in Sargodha.

Methods: This cross-sectional study was conducted at the Department of Otorhinolaryngology at Niazi Welfare Foundation Teaching Hospital, Sargodha, from 1st October 2023 to 30th September 2024. The sample size (381) was calculated using an online calculator, keeping the national data of the pediatric population in view. The children, aged 6 months to 18 years, who presented with a history of chronically discharging ear, were enrolled for the study. For all the cases, a detailed history was followed by a comprehensive ENT examination. The descriptive statistical analysis was performed using SPSS version 23.

Results: Out of 381 patients, 57.74% were male, with a mean age of 6.56±4.77 years. The study found a high prevalence of mucosal CSOM 79.26%, rural residency (41.99%), bottle feeding (66.40%), passive smoking exposure (79%), recurrent adeno-tonsillitis (38.32%), poor literacy, and a history of discharging ear in parents.

Conclusion: By recognizing the basic clinical features of CSOM, this study helps primary care providers play a pivotal role in identifying these features, facilitating timely referrals to specialized care, and ultimately reducing complications while improving outcomes for affected children.

Keywords: *Chronic suppurative otitis media, eustachian tube, hearing loss, mastoiditis, middle ear, tympanic membrane perforation.*

INTRODUCTION

Chronic suppurative otitis media (CSOM) is defined as chronic suppurative inflammation of the mucosa of part or the entire middle ear cleft, characterized by recurrent or persistent otorrhea through a permanent perforation of the tympanic membrane, with chronicity variably defined by different authors as lasting from more than 2 weeks to up to 12 weeks [1].

Among 31 million global sufferers of the disease, 22.6% of the patients are under the age of 05 years [2]. Middle ear infections bear 118th rank for disability-adjusted life years (DALYs) and 62nd for years lived with disability (YLDs) among global burden of diseases, the CSOM being the most common reason for hearing loss in this spectrum, particularly in the underdeveloped countries [3]. Its two clinical subtypes include; mucosal type, which is considered to be safe, and squamosal, which is known to cause lethal complications due to its bone-eroding properties [4], like mastoiditis, meningitis, labyrinthitis, bezold abscess, brain abscesses, *etc.* [5]. In a national research study, intracranial complications were evidenced mostly in the age group of 3-5years (30.8%), and brain abscess (10.8%) was the most commonly prevalent complication [6]. Upper respiratory tract illnesses including rhinitis, sinusitis, adenoiditis, tonsillitis, *etc.* serve as strong etiological factors in the pathogenesis of middle ear diseases, where the Eustachian tube functions as the route for transmission of infection [7]. In a child, the Eustachian tube is smaller and horizontal, while recurrent upper respiratory tract illnesses lead to its mucosal edema which deranges its functions of middle ear aeration and drainage, significantly contributing to chronic ear discharge [8]. CSOM is caused by a wide spectrum of pathogens, particularly Staphylococcus aureus and Pseudomonas aeruginosa, which are known to be the most common disease-causing organisms [9]. Although conventional culturing and drug sensitivity testing are still in use, in less privileged countries like Pakistan, molecular techniques such as polymerase chain reactions and next-generation sequencing are gradually replacing them, corroborating more complex bacterial profiles with regional variability [10].

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Chronic middle ear diseases are greatly influenced by the complex interplay of medical and environmental factors [11]. The poor socioeconomic status, intertwined with various actualities, like ignorance, poor hygienic living standards, overcrowded residences, late arrival at specialist clinics, *etc.*, is considered to have the strongest impact on the course of CSOM [12]. The negative impact of impaired hearing at an early age leads to speech defects, hurdles in studies, difficulty in establishing social interactions multiple psychological issues, *etc.* [13]. The disease remains a significant public health concern, particularly in less privileged areas where healthcare facilities are inaccessible for the majority of the population and people lack awareness about preventive measures. Despite its considerable burden, data are scarce on the clinical profile of CSOM among children in the region of Sargodha. The objective of this study was to identify the pattern of presentation of CSOM in affected children of this region for early recognition of disease symptoms and associated characteristics, providing an objective basis for cost-effective healthcare planning to minimize and prevent complications. Moreover, given the pivotal role of primary care providers in the early detection of disease, the study aimed to offer valuable insights that could enhance early diagnosis and improve referral pathways.

MATERIALS AND METHODS

This cross-sectional study was conducted at the Department of Otorhinolaryngology, Niazi Welfare Foundation Teaching Hospital, Sargodha, from 1st October 2023 to 30th September 2024. The ethical review committee approval was obtained from the institution before the research (Reference number 005-12/23, received on 12th September 2023).

The sample size (381) was calculated *via* an online calculator at Calculator.net, taking the under-18-year population of Pakistan as 102449594 (45% of the total population), keeping the level of confidence at 95% and the margin of error at 5%. The consecutive sampling technique was used.

This study was planned to focus on the initial, uncomplicated presentation of CSOM, thus, all the children, aged 6 months to 18 years who presented to the Otorhinolaryngology outpatient department and were diagnosed with Chronic Suppurative Otitis Media (CSOM) were included in this study, irrespective of gender or race. Informed consent was obtained from their guardians before enrolling them in the study. Children with acute ear infections, acute respiratory tract infections, and those with complications of chronic suppurative otitis media were excluded from the study.

The diagnostic criteria for Chronic Suppurative Otitis Media (CSOM) were a history of chronic ear discharge for 12 weeks or more, along with the presence of a permanent perforation of the tympanic membrane. The mucosal variant was identified by a pars tensa perforation and a non-foul-smelling mucopurulent discharge. The squamosal variant was identified by a perforation in pars flaccida, foul-smelling ear discharge, and/or the presence of cholesteatoma. A detailed history was taken and a comprehensive ENT examination was done. Examination under the microscope was done for all the cases. All symptoms and examination findings indicating the presence or absence of cholesteatoma were recorded on a predesigned proforma. Computed Tomography scans were done in all the cases of cholesteatoma to assess the extent of the disease and check bony integrity. Relevant investigations were done wherever and whenever considered necessary based on clinical decisions. The rules of Helsinki were followed throughout the study.

SPSS version 23 (IBM) was used for statistical analysis. Descriptive analysis was done for all the study variables. Frequencies and percentages were computed for categorical variables whereas numerical variables were expressed as mean ± standard deviation. An Independent t-test was employed to assess the statistical significance of the type of CSOM with age considering statistical significance at 0.05 level.

RESULTS

A total of 381 children were enrolled in the study, comprised of 220 (57.74%) males and 161 (42.26%) females. The mean age of the patients was 6.56±4.77 years.

Table **1** demonstrates the sociodemographic characteristics of the study population. A total of 160 (41.99%) patients presented from rural areas, 141 (37.01%) from urban slum areas, and 80 (20.99%) from urban areas. Up to 291 (76.38%) children were living in joint family systems, while 140 (36.75%) were living in nuclear families. A total of 253 (66.40%) parents gave a history of bottle feeding. Up to 301 (78.95%) children were exposed to passive smoking regularly.

Table 1: Sociodemographic profile of study participants (n=381).

Study parameters	Factors	Frequency	Percentages
Gender	Males	220	57.74
	Females	161	42.26
Residential Habitats	Rural	160	41.99
	Urban slums	141	37.01
	Urban	80	20.99
Parental literacy rates	Illiterate Mothers	172	45.14
	Illiterate Fathers	126	33.07
Family system	Joint Family System	291	76.38
	Nuclear Family System	140	36.75
Parental history of discharging ears	Mothers	143	37.53
	Fathers	80	20.99
	Both	100	26.24
Mode of Feeding	Bottle feeding	253	66.40
Smoking Exposure	Exposure to passive smoking	301	78.95

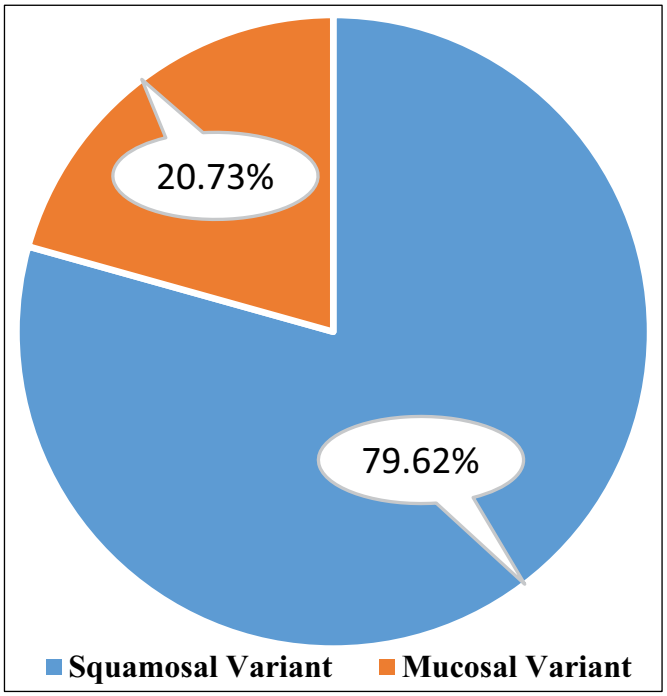

Fig. (1): Frequency of atticoantral *versus* tubotympanic type of CSOM (n= 381).

The literacy rate was poor among parents, up to 126 (33.07%) fathers were either illiterate or were barely able to read Urdu, the native language of the country, the primary education was completed by 110 (28.87%), 87 (22.83%) were matriculated and only 58 (15.22%) completed college education. Among mothers, 172 (45.14%) were either illiterate or were barely able to read Urdu, 112 (29.39%) completed primary education, 64(16.79%) were matriculated and 33 (8.66%) gained college education. Parental history of the discharging ear was present in 143 (37.53%) mothers, 80 (20.99%) fathers, and 100 (26.24%) both parents.

The frequently identified comorbidities were enlarged adenotonsillitis (38.32%), Allergic rhinitis (23.37%), recurrent tonsillitis (19.68%), and deviated nasal septum (10.49%). No identifiable factor was found in 7.87% of cases.

The mucosal type of CSOM was seen in 79.26% of the study participants and 20.73% of the patients were suffering from the squamosal variant of the disease (**Fig. 1**). The most common presenting symptom was otorrhea (92.91%) followed by itchy ear (78.74%) and decreased hearing (52.49%). The ear discharge was foul-smelling in 17.06% of the cases and blood-stained discharge was seen in 5.51% of the cases.

Independent t-test was employed to assess the statistical significance of the type of CSOM with age; the Welch's t-test yielded a statistically significant difference in age between the two groups ($t(106.32) = 5.683$, $p < .001$), with patients in the atticoantral group being on average 3.68 years older than those in the mucosal group (Mean difference = 3.681, 95% CI [2.397, 4.965]).

DISCUSSION

This study discovered the patterns of CSOM, which referred to the different clinical variants, symptoms, and sociodemographic characteristics in the study population. In our study, the mean age of the patients was 6.56±4.77 years. Purwanto *et al.* stated in their results, the mean age of the participants was 9.14 ± 2.95 years [14]. The male gender was found slightly more affected (57.74%) in our study. Comparing our results, Mohamed *et al.* verified 50.8% of male children in their study [15] and 56.25% of male children were included in a study conducted by Pandey *et al.* [16].

Falgas *et al.* in their study stated that male children suffer from middle ear infections greater in number probably due to higher chances of defective pneumatization of the mastoid process, and disproportionately narrower peripheral airways [17].

The mucosal type of CSOM was found in greater proportion (79.26%) as compared to the squamosal type. It has a strong relationship with a malfunctioning eustachian tube [18]. The smaller and horizontal eustachian tube at an early age permits the nasopharyngeal secretions to enter the middle ear, particularly in the presence of inflammatory reactions in neighboring structures like the nose, sinuses, and oropharynx [19]. The various inter-dependent factors, stating a malfunctioning eustachian tube, were identified in our study. A total of 66.40% of the children used to take bottle feeding in the supine position, and 78.95% were exposed to second smoke. Among various associated morbidities, enlarged adeno-tonsillitis (38.32%) was highly prevalent followed by allergic rhinitis (23.37%), recurrent tonsillitis (19.68%), and deviated nasal septum 40 (10.49%). Ikramova *et al.* reported the frequency of recurrent acute upper respiratory tract infections as 34%, hypertrophied adenoids at 22.6%, and a history of hay fever and food allergies at 13.3% [20]. Ural *et al.* also reported the link between eustachian tube blockage due to nasal diseases with mucosal type of CSOM, which is more prevalent among children [21].

Discharging the ear was the frequently encountered presenting complaint, it indicates the hyperactivity of mucosal glands. Kumar *et al.* reported the same in their study [22].

The impacts of low social class on disease pathogenesis are proven, with multiple pieces of evidence like the joint family system, where children and parents live along with extended family members, is quite common in low-income settings leading to overcrowding which facilitates the early spread of droplet infections, also greater social responsibilities of parents in such families render a child to negligence and carelessness [23] *etc.*, moreover low education in low resource backgrounds exposes them to poor sanitary environments. In our results, the majority of the participants (41.99%) were living in rural areas or in urban slums (37.01%) areas, and a large proportion

of the participants (76.38%) were living in the joint family system. The poor literacy rate among parents indicated that a large proportion of (36.74%) fathers and (39.37%) mothers were either illiterate or were barely able to read Urdu, the national language of the Country. The overall findings of substandard living were supported by the history of discharging ear in a large proportion of parents too (37.53% mothers, 26.24% fathers, and 20.99% both parents). Heward *et al.* in their meta-analysis evidenced the strong impact of low socioeconomic status and lower rate of maternal education in the pathogenesis of CSOM among children [24].

Umoh *et al.* in their study stated overcrowded living places as one of the strongest factors associated with CSOM among children and with a high illiteracy rate among parents (88%) [25].

The study suggested that the mucosal variant of CSOM is more prevalent among the children of the Sargodha region. There is a need for ENT outreach programs in remote and underprivileged areas. Primary care providers and interns should also be adequately trained for early symptom detection and timely referral to specialist clinics. Most of the clinical features seen with CSOM, particularly those impacted by living conditions, are potentially modifiable. The long-term complications considerably affect the quality of life, like hearing abnormality due to CSOM impacts the cognitive and educational development of affected children, weakening their ability to communicate effectively and hindering their social interactions [26]. The process of record-keeping should be continued to gather evidence-based information, enabling the recognition of changes in disease patterns particularly at the primary care level, and the development of targeted interventions at the specialist care level. The limitations of this study included its observational cross-sectional design, which did not account for patient follow-up. Additionally, the study was based on data from a single center, limiting the generalizability of the findings. More extensive research involving multiple centers is needed to provide a broader and more representative understanding of the condition.

CONCLUSION

This study identified a high prevalence of the mucosal variant of chronic suppurative otitis media (CSOM) among the study population with commonly seen features including substandard living conditions, comorbidities such as enlarged adenoids indicating Eustachian tube dysfunction, passive smoking exposure, bottle feeding, and low parental literacy rates. By recognizing these basic clinical features, primary care providers can play a pivotal role in the early detection and management of CSOM, facilitate timely referrals to specialist clinics, and ultimately help reduce complications while improving outcomes for affected children. Moreover, concerned authorities are suggested to implement public service programs to help communities recognize the need for specialist care at the early stages of the disease, thus preventing complications.

ETHICS APPROVAL

Before the study, approval was obtained from the ethical review committee with reference number 005-12/23, received on 12th September 2023. The rules of the Declaration of Helsinki were followed throughout the study.

CONSENT FOR PUBLICATION

Informed consent was obtained from the guardians of the patients.

AVAILABILITY OF DATA

Data are available from the corresponding author upon request.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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Declared none.

AUTHORS' CONTRIBUTION

Maqbool Ahmad: Study conceptualization and data collection;

Sajid Rashid Nagra: Critical review of the initial draft;

Zeeshan Ali: Manuscript drafting and finalization for publication;

Saad Rashid: Statistical analysis;

Junaid Hussain: Manuscript critical review and revision of the initial draft.

Sana Muhammad Sadiq: Data collection, literature review.

All authors read and approved the final manuscript.

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