

## Original Research Article

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# Prevalence of *Pseudomonas aeruginosa* in cholesteatoma patients in tertiary care hospital in North India

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## ABSTRACT

**Background:** Chronic suppurative otitis media (CSOM) is middle ear infection that lasts for more than three months and is accompanied by a perforation of tympanic membrane. Cholesteatoma is a well know complication of CSOM. Prevalence of CSOM varies between racial and socioeconomic groups. The aim of present study was to determine the principal bacteria in ear discharge in patients with cholesteatoma.

**Methods:** This was a prospective study conducted in department of ENT in tertiary care hospital and medical college in north India from March 2017 to May 2017. Total 80 patients attended ENT OPD with complain of ear discharge and deafness during the study period, but only 47 patients were clinically diagnosed unsafe type of CSOM or cholesteatoma. Ear swabs were collected and send for microbiology laboratory for bacteriological process.

**Results:** Out of 80 patients, 47(58.75%) were clinically diagnosed cholesteatoma and of 29(61.70%) were male and 18(38.29%) were female. Most commonly affected age group was between 10 to 20 year (40.42%) followed by 21 to 30 (21.27%). More than 60 Year was less affected by cholesteatoma. Most common isolated organism was *Pseudomonas aeruginosa* (66.66%) followed by *Klebsiella pneumonia* (19.44%) and we used *Piperacillin tazobactam* and amikacin, and ciprofloxacin in all cases in perioperative period and noticed good response and modified radical mastoidectomy was done in all patients.

**Conclusions:** *P. aeruginosa* was found to be the most common isolate in CSOM with cholesteatoma case and piperacillin-tazobactam, amikacin, and ciprofloxacin was found to be cost effective antibiotics.

**Keywords:** Ear discharge, Chronic suppurative otitis media, Cholesteatoma, Perioperative

## INTRODUCTION

Suppurative otitis media is a purulent inflammation of middle ear cleft that may present with recurrent ear discharges through a tympanic perforation. The cause is often purely infective but other agents such as allergy, cholesteatoma, chemical irritants, malignancies, and autoimmune diseases. Chronic suppurative otitis media (CSOM) is a mucosal disease in which discharge through perforation in the pars tensa persist for three Month and known as safe ear disease or tubo-tympanic disease other type is unsafe disease, attico-antral disease or marginal

perforation which involve pars flaccida skin typically involves epitympanum and mastoid antrum and can be very erosive and causing serious local complications.<sup>1,2</sup> The term cholesteatoma was first used by the anatomist, Johannes Muller, in 1838. By simple definition it is described as skin in wrong in place. It is three dimensional epidermal and connective tissue structure that has capacity for progressive and independent growth at expense of underlying bone and has tendency to recur after removal.<sup>3</sup> It has been classified as being congenital and acquired. Acquired cholesteatoma is associated with CSOM. Most useful working classification for cholesteatoma is based on anatomical site of disease, with

reference to tympanic membrane pathology. Three types of cholesteatoma are recognised: pars tensa cholesteatoma, pars flaccida, and occult type which is mostly congenital in origin.<sup>4</sup> The principal clinical features of cholesteatoma are bone erosion but the mechanism of erosion is not completely understood. Recent research has implicated the release of inflammatory mediators such as the cytokine interleukin-1 from macrophages and epidermal keratinocytes as being important in osteoclast activation.<sup>5</sup> Other factors are prostaglandins, cathepsin D, parathyroid hormone-like protein and bone erosion also associated with osteogenesis process in cholesteatoma. This Phenomena mostly found in attic and mastoid cavity and thought to be response to infection in early stage of disease.<sup>6</sup> Infection can spread from middle-ear to other structures such as mastoid, facial nerve, labyrinth, lateral sinus, meninges and brain leading to mastoid abscess, facial nerve paralysis, deafness, lateral sinus thrombosis, meningitis and intracranial abscess.<sup>7,8</sup>

## METHODS

This prospective study conducted in ENT department of tertiary care hospital and medical college where average 24 patients daily attend OPD with complain of ear discharge and deafness. Maximum patients belong to MP state, and Rajasthan state villages where medical facilities are poor in rural area and public are unable to pay for their medical health. The present study was done to established the most common organism and cost effective antibiotic in ear swab collected from complicated cases of CSOM like cholesteatoma in which most patients require surgical interventions to eliminate the disease processes, to prevent recurrence of disease and patients is left with dry, safe and trouble free ear, so that decrease the expenditure by patients. Study period was for three Month (from March to May 2017).

### Specimen collection and processing

#### Inclusion criteria

Inclusion criteria were all age group patients who attend ENT OPD; Patients who clinically diagnosed complicated CSOM and require surgical intervention- a. Complain of ear discharge and deafness b. Otoscopic finding includes attic and marginal perforation, granulation tissues, post pockets, ear bones degeneration; Audiogram with severe conductive deafness and less common sensorineural.

#### Exclusion criteria

Exclusion criteria were patients who did not attend ENT OPD and have complain of ear discharge and deafness.

Sample was taken by ENT consultant in OPD with sterile ear swab stick and send in microbiology department where within 30 minute of collection the process for culture was started. All swabs were cultured on blood,

chocolate and MacConkey agar and incubated aerobically at 37° C for 24 hours. Isolated organisms were identified using standardized biochemical tests.<sup>9,10</sup> Disc diffusion method was used for antibiotic sensitivity testing. After sample collection patients admitted in ENT ward. Consent was taken from every patient for surgery after dry ear than started antibiotic combination Amikacin and ciprofloxacin ear drop in each patient up culture and sensitivity report awaited. After dry ear required surgical intervention was undertaken and sensitive antibiotic was started and response was good in all patients.

### Data collection

Collected data included basic demographic characteristics of patients (age and sex), chief complain, clinical diagnosis, otoscopic finding, isolated organisms.

### Data analysis

Data obtained on demographic characteristics of patients, clinical diagnosis, isolated organisms and treatment part were analysed by simple descriptive statistics (i.e. proportions, ratios and percentages). Age of the patients were categorized into 10-20, 21-30, 31-40, 41-50, 51-60, >61 years, to determine prevalence of CSOM associated with cholesteatoma in different age groups. The isolated pathogens were categorized pure and mixed.

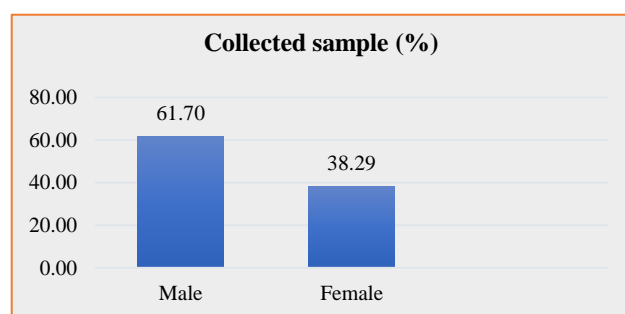
## RESULTS

Ear swabs were collected from total 80 patients who attend ENT OPD with complain of recurrent ear discharge and deafness for more than three months. Out of 80, 47 (58.75%) patients were diagnosed cholesteatoma or unsafe CSOM (Table 1).

**Table 1: Pattern of CSOM on basis of clinical diagnosis.**

Pattern of CSOM	Collected samples	%
<b>Safe type</b>	33	41.25
<b>Unsafe type</b>	47	58.75
<b>Total</b>	80	100

Among that 29 (61.70%) were male and 18 (38.29%) were female (Figure 1). Male to female ratio was 1.61.



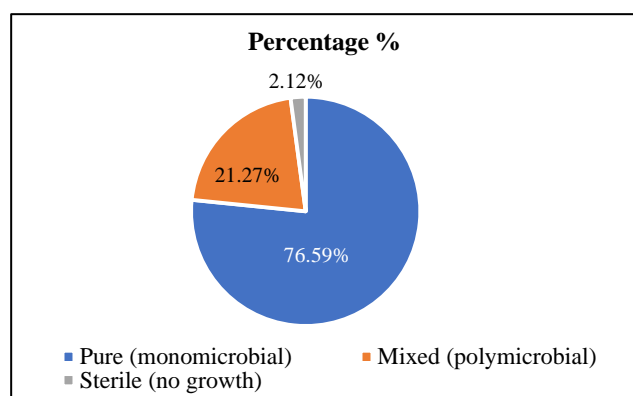
**Figure 1: Graphical presentation of gender.**

Majority of patients 19 (40.42%) were between 10-20 years of age followed by 10 (21.27%) patients between 21-30 years of age. Peak incidence of CSOM was observed in age group between 10 to 20 years (Table 2) shows the age wise distribution of unsafe CSOM.

**Table 2: Age wise distribution of unsafe CSOM.**

Age (year)	No of samples collected	Percentage (%)
10-20	19	40.42
21-30	10	21.27
31-40	08	17.02
41-50	05	10.63
51-60	03	6.38
>61	02	4.25
<b>Total</b>	<b>47</b>	<b>100</b>

A study conducted in USA revealed that cholesteatoma prevalence is 6 per 100 000 and within this population it was most common in children aged 10-19 years, with a prevalence of 9.2 per 100 000.<sup>11</sup> Our result about most commonly affected age group was similar to above study. Out of total 47 samples, pure bacterial growth was seen in 36 samples (76.59%), mixed growth was seen in 10 patients (21.27%), and in one sample there was no growth found (Figure 2).



**Figure 2: Microorganism growth pattern in culture media.**

**Table 3: Isolated microorganism distribution in CSOM.**

Isolated microorganism	Percentage (%)
<i>P. aeruginosa</i>	24 66.66
<i>K. pneumoniae</i>	07 19.44
<i>S. aureus</i>	03 8.33
<i>P. vulgaris</i>	01 2.77
<i>Aspergillus</i>	01 2.77
<b>Total</b>	<b>36 100</b>

In total 36 pure isolates, *P. aeruginosa* was isolated in 24 samples (66.66%), followed by *K. pneumoniae* in 7 (19.44%), *S. aureus* 3 (8.33%), *P. vulgaris* in 1 (2.77%),

*Aspergillus* in 1 (2.77%) (Table 3) showed distribution of various isolates in collected sample.

## DISCUSSION

The principal aim of our study to treat cholesteatoma and remove the disease, and to eliminate the risk of major complications, thereby producing a safe and dry ear if possible and to restore the hearing mechanism if has been compromised by the disease. The effective treatment of cholesteatoma requires surgical approach in vast majority of patients but medical management has a role to play in the treatment of many cases. In our Institute most of the patents come in OPD with complain of active discharge with granulation tissue and middle ear inflamed mucosa. For uncomplicated cases of CSOM there are various modalities of treatments are available including aural toilet, topical medication, systemic antibiotic and trial of 1% sodium hyaluronate to the margins of central perforation, use of trichloroacetic acid in extreme cases.<sup>12</sup> Number of factors responsible for failure to respond to given treatment including poor drainage of inflammatory exudates, persistent osteitis, infection with resistant pathogens, inadequate penetration of antibiotic, infection in nasopharynx, palatine tonsils or sinuses. In heavily infected ears with cholesteatoma a course of systemic antibiotic treatment based on microbiological culture of discharge can be produce significant reduction in otorrhea. As in non cholesteatomatous chronically ears disease the most frequents organism is pseudomonas species for which quinolone derivatives such as ciprofloxacin and ofloxacin are effective.<sup>13</sup> But in children and adolescent quinolone derivatives are contraindicated because of potential side effects. This limit the choice in children to broad spectrum penicillin, cephalosporins and aminoglycosides. The present study shows, in agreement with literature.<sup>14,15</sup> That cholesteatoma otitis media is characterised by presence of polymicrobial flora and approximately 50 percent of infected cases a mixture of aerobic and anaerobic organisms can be identified. The most common organism found are *P. aeruginosa* and *Proteus* species and *S. aureus*. In our study *P. aeruginosa* was isolated in 66.66% of the cases followed by *K. pneumoniae* in 19.44% of cases. These data are in agreement for pseudomonas species with those of Ricciardiello et al, Poorey and Iyer, Aslam et al.<sup>15-17</sup> But in disagreement with those of Rama, Rao and Reddy, and Ggewal and Shobha in which staphylococcus aureus was the most common bacteria isolated.<sup>18-20</sup> Many studies focus on pathogenic importance of anaerobic bacterial growth in infected cholesteatoma cases. Study done by Ricciardiello et al, found anaerobic bacterial growths in 38.2% of cholesteatoma patients.<sup>15</sup> He concluded that in case of negative culture and the discharge is purulent malodorous secretion and patient is not responding to empirical antibiotic, then lead one to suspect a super infection caused by anaerobic bacteria. Brook I in their studies conclude that in cases of cholesteatoma complications, like mastoiditis, cerebral abscess,

anaerobic bacteria may be considered as pathogenic organism.<sup>21,22</sup> For the antibiotics commonly available as topical ear drops, gentamycin, and ciprofloxacin showed good activity for most of the commonly isolated organism and can be used as effective first line topical antibiotic in the treatment of CSOM and piperacillin-tazobactam, Amikacin, for systemic administration. Isolation of various aerobic, anaerobic, and fungal isolates shows that different conditions of CSOM could be differentiated on microbiological grounds. Thus, for better management of CSOM, microbial classification of infection as well as drug sensitivity test of organism recovered are essential for making appropriate decision of antimicrobials that will effectively eradicate the pathogens.

## CONCLUSION

Infective cholesteatoma like other chronic disease can limit an individual's employability and quality of life. With the development and widespread use of antibiotics, the types of pathogenic micro-organisms and their resistance to antibiotics have changed. And we found that *Pseudomonas* species and *K. pneumonia*, and *S. aureus* are continue to be the major offending pathogens and for better result of treatment, the ear swab culture and antibiotic sensitivity must be considered before taking surgical intervention for cholesteatoma.

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