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**Research Article**

# Clinico social profile of patients of attico-antral disease in middle ear cleft attending tertiary care center of North India

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## ABSTRACT

**Background:** Infections of the middle ear and complications associated with it are still a major public health problem in the developing countries. It becomes important to review the changing trends in natural history of the disease in order to understand and instils the most appropriate management for the same.
**Methods:** This was a cross sectional study. Patients with evidence of attico-antral disease in middle ear cleft were selected from the OPD. All the patients were subjected to thorough clinical, audiological, and radiological investigations.
**Results:** In the present study 40 patients were involved (65% male and 35% females), with The youngest patient was eight year old and oldest patient was 60 years of age. The main symptoms included discharge from ear (100%) and hearing impairment (75%) patients. It was seen that pre-operative PTA values had a weak positive correlation. ($r=0.366$, p-value $<0.05$) with age, whereas no or very little positive correlation was seen with the duration of the disease. ($r=0.092$, p-value$>0.05$) after using Pearson's correlation test. From ROC analysis, PTA values at 51 dB were able to predict the status of Incus with sensitivity 48% and specificity 84.6%, followed by malleus and stapes.
**Conclusions:** From the study, it can be concluded that though the prevalence of attico antral diseases has decreased in the post antibiotic era, but it continues to remain a public health problem on India as well as other developing countries. Still, there is a lack of awareness amongst the masses about the natural history/course of the disease and complications related to it and low priority given to the disease.

**Keywords:** Socio-demography, Attico-atral disease, Middle ear

## INTRODUCTION

Infections of the middle ear and complications associated with it are still a major public health problem in the developing countries.[1] The proximity of the middle ear cleft and mastoid air cells to the extracranial and intracranial compartments places structures located in these areas at increased risk of infectious complications. Unhygienic environmental conditions are mainly responsible for the causation of the disease.[2] The complications are more due to attico antral type otitis media than in patients with tubo-tympanic type of otitis media and increase the burden in terms of DALY (Disability adjusted life years) mostly affecting the weaker sections of the society. Despite the fact that incidence of chronic suppurative otitis media related complications has significantly decreased since the introduction of antibiotics, this clinical problem has not been eliminated yet.[3]

However, these complications continue to occur, and can be lethal if they are not identified and treated properly. Furthermore, with the continuous evolution of multi–drug-resistant pathogens and immuno-compromised diseases, these complications may again become more prevalent as our current antibiotics lose their efficacy. In

such an engaging clinical environment, it becomes important to review the changing trends in natural history of the disease and its complications in order to understand and instil the most appropriate management for the same.

Extensive literature review has made it clear that there is no paucity of the studies done worldwide to analyse the incidence, presentations and the management associated with chronic otitis media. Of these innumerable studies, those that closely resemble the social, anthropological and cultural characteristics of our study participants have been reviewed to refresh our concepts related to the pattern of this disease.[4-7]

The aim of this cross sectional study was to acknowledge the changing trends in the presentations and of attico-antral type of chronic suppurative otitis media with or without complications.

## METHODS

This was a cross sectional study conducted in the Department of ENT, Ram Lal Eye and ENT Hospital, Amritsar, Punjab, India. 40 patients with evidence of attico-antral disease in middle ear cleft were selected from the OPD and admitted to the ENT ward. All the patients were subjected to thorough clinical, audiological, and radiological investigations. All these patients were scheduled for Modified radical mastoidectomy. The cases selection involved a strict compliance to the inclusion and the exclusion criteria. The patients for the study were selected on the basis of the following criteria:

- Patients of either sex less than 60 years of age.
- Patients having good general physical condition.
- Patients having recent pre-anaesthetic clearance from the Department of Ram Lal Eye and ENT Hospital, Amritsar.
- Patients not having any evidence of active infection in nose, throat or para-nasal sinuses.
- Patients with otogenic intra-cranial complications in the past were excluded from the study.

The pattern of the examination included detailed history of the patient, general physical and systemic examination and examination of the nose, throat and paranasal sinuses, especially for any source of chronic infection or allergy followed by Otological examination, along with examination under microscope and hearing evaluation by tuning forks, pure-tone audiogram for both air and bone conduction and radiological investigations including X-ray mastoids, bilateral lateral oblique views.

The observations were carefully recorded on interview based pre-tested structured questionnaire and the data so obtained was collated and analysed using appropriate statistical analysis. The level of significance was determined and p value of $<0.05$ was taken as statistically significant. Written consent was taken from each patients in local language and was read to those who were illiterate and were not accompanied by anybody. Ethical clearance was obtained from institutional ethical committee, Baba Faridkot University of health sciences, Faridkot, Punjab, India.

## RESULTS

In the present study 40 patients were involved (65% male and 35% females), with about 30 patients coming from rural areas, 57.5% patients were twenty years or less in age. Of these 52.5% patients were in the 11-20 years age group and 5% patients were under 10 years of age. 42.5% patients were above 20 years of age.

The youngest patient was eight year old and oldest patient was 60 years of age. About one third (34.4%) of the study participants were illiterate, closely followed by the study participants who were educated up to the high school(33.5%), middle school (16.2%), graduation and above (8.7%) and primary school (4.7%).

**Table 1: Characteristics of ear discharge of the study participants.**

| Symptoms | Present | Absent | Total |
|---|---|---|---|
| Fouls smelling odour | 39 (97.5) | 1 (2.5) | 40 (100.0) |
| Blood staining | 2 (5.0) | 38 (95.0) | 40 (100.0) |
| Bleeding from ear | 2 (5.0) | 38 (95.0) | 40 (100.0) |
| Unilaterality | 37 (92.5) | 3 (7.5) | 40 (100.0) |

(Figures in parentheses indicate percentages)

More number of the females study participants was illiterate as compared to the males. It was observed that nearly 61.4% of the study participants belonged to the lower middle and lower socioeconomic status followed by middle and upper middle (38.0%). Only 0.6% of the study participants were from the upper socioeconomic status as per B.G. Prasad scale. Overcrowding according to per persons per room criteria was associated with 43.4% cases. The main symptoms included discharge from ear (100%) and hearing impairment (75%) patients. The other symptoms included earache (17.5%), tinnitus (20.0%) and sensation of imbalance (17.5%). One patient had a post-auricular fistula (Figure 1.)

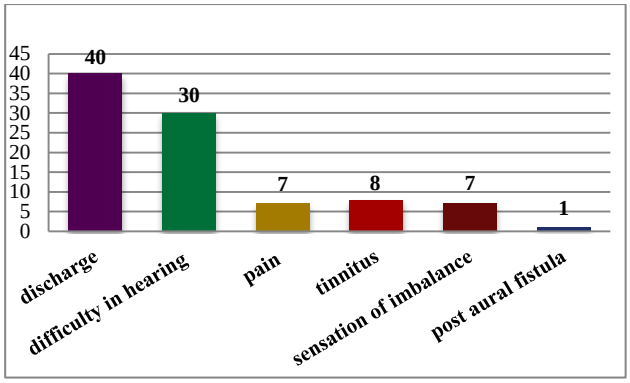


**Figure 1: Symptoms at the time of presentation.**

In almost half of the patients (47.5%), the age of onset of symptoms was 15 years or less. Another 25% patients had onset of their symptoms between the ages of 16-20 years. The duration of symptoms was five years in 42.5% patients. We also noticed a significant delay between onset of symptoms and seeking treatment. 83% patients waited for more than five years despite having symptom of ear discharge or hearing impairment. There was a perilous delay of more than twenty years in 5% patients. The ear discharge was characterised (Table 1) as muco-purulent in most of the patients (87.5%) and moderate in amount (70%). Almost all the patients (97.5%) described their ear discharge as foul smelling. Few patients reported blood stained discharge (5.0%). Most of the patients had a unilateral disease (92.5%).

**Table 2: Type of pathology in the Middle ear cleft region seen per-operatively.**

| Type of pathology | Mastoid antrum | Aditus | Epi tympanum | Meso tympanum | Hypo tympanum | Mastoid tip | Sinus plate |
|---|---|---|---|---|---|---|---|
| Cholesteatoma | 55.0% | 67.5% | 55.0% | 15.0% | --- | 25.0% | 25.0% |
| Granulations | 35.0% | 27.5% | 27.5% | 35.0% | 2.5% | 37.5% | 35.0% |
| Both | 10.0% | 05.0% | 17.5% | 12.5% | --- | --- | --- |
| None | --- | --- | --- | 37.5% | 97.5% | 37.5% | 40.0% |

**Table 3: Status of middle ear ossicles seen per operatively.**

| Ossicle | Malleus | Incus | Stapes |
|---|---|---|---|
| Intact | 45.0% | 35.0% | 80.0% |
| Eroded | 52.5% | 35.0% | 17.5% |
| Absent | 2.5% | 30.0% | 2.5% |

Most of the patients had more than one otoscopic finding. Two most common findings were retraction pocket (42.5%) and erosion of outer attic wall (40%). Central perforation and marginal perforation were seen in 22.5% and 15% cases respectively. The additional findings recorded were cholesteatoma flakes (42.50%), granulation tissue (10%), aural polyp (10%) and debris (5.0%). Erosion of the postero-superior meatal wall (5.0%) and a mastoid cavity from previous surgery (2.5%) were some other findings in present study. Most of the patients showed sclerotic mastoids on x-ray (92.5%). Lytic areas were seen only in three patients (7.5%).

**Table 4: Roc curve analysis for predicting the status of ossicles from Pre-operative PTA values.**

| Ossicles | Area under curve | 95% CI | P value |
|---|---|---|---|
| Malleus | 0.667 | 0.481-0.852 | >0.05 (non-significant) |
| Incus | 0.685 | 0.490-0.879 | <0.05 (significant) |
| Stapes | 0.485 | 0.249-0.668 | >0.05 (non-significant) |

The patients were subjected to pure-tone audiometry in order to assess the degree of hearing loss in the ear to be operated, to know the nature of the hearing loss, assess the cochlear reserve and to evaluate the hearing status of the opposite ear. Most of them (82.5%) had a conductive hearing loss in the ear to be operated. Mixed hearing loss was recorded in 12.5% patients while 5% patients had no hearing impairment. Analysis of the grade of hearing

impairment (as per the criteria proposed by World Health Organisation[8]) revealed that half of them had a moderate impairment of hearing (41-60 dB) in the ear to be operated. 22.5% patients had slight (26-40 dB) and another 22.5% (>60 dB) had severe impairment of hearing, 5% patients in this study had no hearing impairment (0-25 dB) (Figure 2).

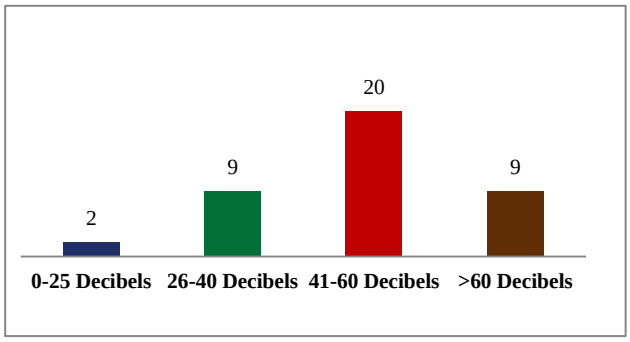


**Figure 2: Pre-operative PTA values of the study participants.**

There was a varied involvement of various regions of middle ear cleft (MEC) by two main entities i.e. cholesteatomas and granulations. Cholesteatoma was the predominant pathology in epitympanum, aditus and mastoid antrum either alone or in conjunction with granulations. Both in epitympanum and aditus, it was present in conjunction with granulations in 72.5% patients, whereas in mastoid antrum and mesotympanum, this ominous combination was present in 65% and 37.5% cases respectively.

In 25% cases each the cholesteatoma reached up to mastoid tip and sinus plate. In nearly one-third patients, granulations alone were present in mastoid antrum and mesotympanum each. In nearly one-fourth cases, they filled aditus and epitympanum and in more than one-third cases, they extended up to mastoid tip or sinus plate. Hypo tympanum was largely free of disease except granulations in 1 patient (Table 2).

Per-operative findings depicted that incus was the most vulnerable ossicle as there was partial or complete destruction of incus in 65% cases. It was followed by malleus which was eroded in 52.5% patients. The stapes withstood the vagaries of the disease the most and was intact in 80% patients. Its supra-structure was partially eroded in 17.5% and totally eroded in one patient (2.5%) (Table 3).

Pearson's correlation analysis was applied to establish any statistical relationship between duration of disease, pre-operative PTA values and age of the patients. It was seen that Pre-operative PTA values had a statistically significant but weak positive correlation. ($r=0.366$, p-value $<0.05$) with age, whereas no or very little positive correlation was seen with the duration of the disease that was also statistically non- significant. ($r=0.092$, p-value$>0.05$).

**Table 5: Comparison of the presenting symptoms with other studies.**

| Study and Symptoms | Ear Discharge | Hearing Impairment | Sensation of Imbalance | Tinnitus | Earache |
|---|---|---|---|---|---|
| Present Study | 100% | 75% | 17.5% | 20% | 17.5% |
| Wadhwa et al[5] | 80% | 82% | --- | 8% | --- |
| Jothiramalingam et al[6] | 100% | 32% | 4% | ---- | 20% |
| Varshney et al[7] | 100% | 88.6% | --- | --- | --- |

ROC analysis was applied to determine if we can predict the ossicular disruption just from the results obtained from PTA (Table 4). It was seen that the PTA values at 51 Db were able to predict the disruption of Incus (Figure 3b) with sensitivity 48% and specificity 84.6%, followed by malleus (Figure 3a) and stapes (Figure 3c) as seen in figures 3a-c.

## DISCUSSION

The study comprised of forty patients of either sex in the age group of 0-60 years. The gender and age pattern of the patients who were studied was similar to a study with 1146 cases that enquired into epidemiology of middle ear and mastoid cholesteatomas recorded that the age of adult patients ranged from 16 to 68 years. In the 0-15 year's age group, 65% children were above 10 years of age.[9]

A male predominance (55.7%) over females (44.3%) for this disease has been reported by yet another study.[10] However an Indian study reported a marginal predominance of female patients (51.4%) amongst patients who had cholesteatoma with a central perforation of tympanic membrane. This may be attributed to current prevalent socio-economic dynamics of this region.[4] Otorrhoea was universally present as the main clinical symptom with which patient presented in the OPD.

The presenting symptoms were similar to the observations of many other studies as seen in table 5 and

reveals that results are in consonance with these. The age of onset of disease did not highlight any particular age group that was prone to develop the disease. The early onset of disease (<6 months) may suggest a prenatal predisposition.[11] In the present study, 17.5% patients developed the symptom of ear discharge when they were less than five years of age. This may be attributed to low socioeconomic class, malnutrition, congestion from overcrowding in the household and bottle feeding constitute significant risk factor aggravated by poor health awareness.

Many Indian studies related to CSOM in adults found a varied duration of symptom of ear discharge ranging from 6 months to 50 years similar to our results. The possible reasons of this ominous postponement by patients in seeking medical help could be rural background of majority of patients, lack of resources and awareness, silent nature of disease and lack of scaring symptoms like bleeding from ear, sensation of imbalance or pain. These particular symptoms were present in less than 20% patients of the present study. It also highlights the reason that patients often attribute little importance to otological symptoms except when there is pain, dizziness, or bleeding; Cholesteatomas may be well known to ENT specialists, but is less familiar to paediatricians and general practitioners.[9]

The predominance of unilateral disease in patients of this study cannot be ascribed to any specific reason and might be an incidental finding. However a Clinico-pathological study of CSOM (both safe and unsafe types) reported bilateral disease in 58% patients.[12] Chronic middle ear infection seems to have a definite influence on the pneumatization process as evidenced by the smaller size of the mastoid air cell system in this study. The duration of the infection does not seem to have a direct correlation with the degree of pneumatization.[13] Thus the lack of pneumatization seen in the x-rays of our patients in the present study can be attributed to persistent infection in their middle ear cleft.

Another study examined audiometric data of 100 cases of unilateral CSOM using the other (normal) ear as a control. A 24% incidence of SNHL in CSOM was observed along with the fact that the incidence of SNHL increased with the increasing duration of disease.[14]

It is hypothesised that in CSOM, toxins enter through semipermeable round window membrane causing damage to organ of Corti. It has been proposed that temporary threshold shifts occurred from serous labyrinthitis while permanent threshold shifts occurred from permanent dysfunction of the organ of Corti. The anatomical characteristics of the round window are such that it encourages the accumulation, stagnation and absorption of purulent secretions into the perilymph.[15]

Thus mixed hearing loss observed in 12.5% patients of the present study couples up with similar studies reported in scientific literature. Similar to our results, Jothiramalingam SB et al also observed similar pattern of hearing loss in patients with attico-antral disease confirming its association with conductive hearing loss.[6] It results from blockage of the external auditory canal by pus and perforation of the tympanic membrane or due to infiltration of infectious or inflammatory agents through the round window to produce a serous labyrinthitis. The ototoxic effects of some antibiotics used to treat the infection may add to these effects.[16]

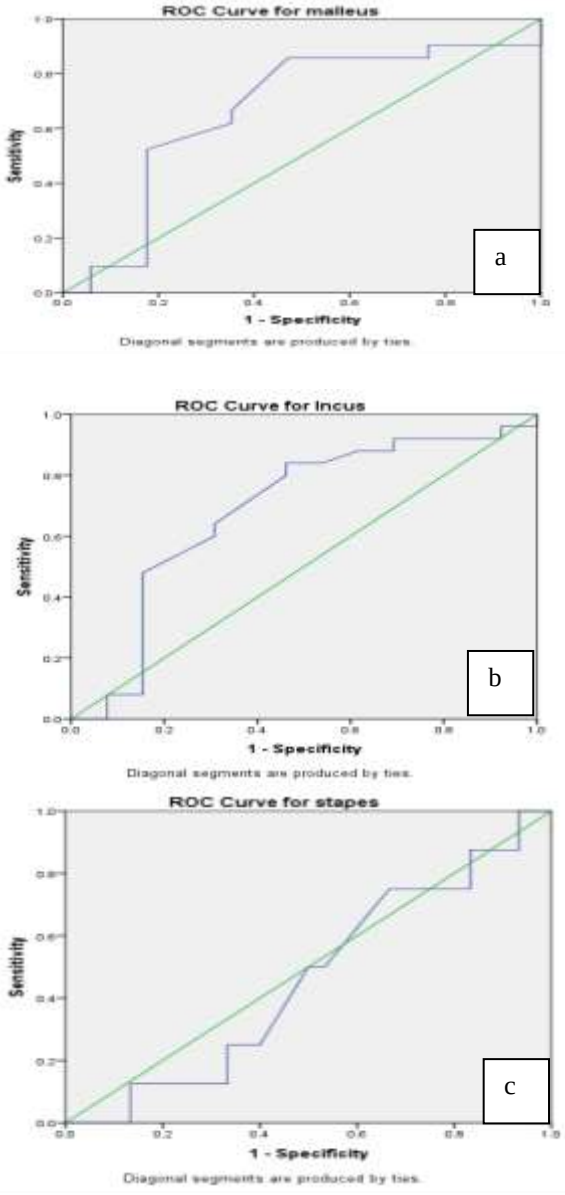


**Figure 3a-c: ROC to predict the ossicular disruption from the PTA values.**

The destruction pattern of the ossicles was similar to the intraoperative findings of and Wadhwa V et al and Jothiramalingam SB et al.[5,6] The incus being the most common ossicle involved followed by stapes. This is seen as the most common complication of cholesteatomas; the type of destruction depends on the original site and

expansion of the cholesteatoma. Cholesteatomas in the portion under tension have a 90% erosion rate. The incidence of ossicular erosion is much greater in unsafe CSOM than in safe CSOM.[7]

Pearson's correlation analysis revealed that Pre-operative PTA values had a statistically significant but weak positive correlation. (r=0.366, p-value <0.05) with age which can attributed to the senile changes, whereas no or very little positive correlation was seen with the duration of the disease(r=0.092, p-value>0.05). This finding is in contradiction to that depicted by Srinivas C et al.[17]

Our findings can be justified as severity and duration of disease cannot always go parallel to each other. For instance, masking may occur in a patient while it may remain absent in other with same duration of disease and may results in different PTA values. Further studies are recommended that should be done with a larger sample size and taking equal proportions of patients from different age groups to reach a definite conclusion Also, pre-operative PTA values at 51 dB can most accurately predict the Incus disruption (Figure 3b) with sensitivity 48% and specificity 84.6%, followed by malleus (Figure 3a) and stapes (Figure 3c) as seen in figures. These findings can be associated with the fact that Incus is the most common ossicle to be involved and the stapes is the least common.

## CONCLUSION

From the study, it can be concluded that though the prevalence of attico antral diseases has decreased in the post antibiotic era, but it continues to remain a public health problem on India as well as other developing countries. Still, there is a lack of awareness amongst the masses about the natural history/course of the disease and complications related to it and low priority given to the disease.

People rush to ENT clinics when it is already too late and this increases the morbidity and mortality related to the disease and its complications. This in turn increases the out of pocket expenditure and loss of productivity. Therefore, it is recommended to increase the IEC material related to CSOM in the hospitals to increase awareness about the disease and cater the unmet need of society.

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