



Prevalence of Otomycosis in a Tertiary Care Hospital

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Abstract

Introduction: Otomycosis is fungal infection of external and middle ear. These are prevalent in warm and humid climate which may even lead to Hearing loss and perforation of ear drum. This study was done to assess the etiological agent(s) and their antifungal sensitivity.

Aims and Objectives: 1. To identify the causative organisms of Otomycosis. 2. Study of antifungal susceptibility pattern.

Methodology: 50 patients were studied in a period of one year. 1. Examination of Potassium hydroxide mount (10%) of the sample. 2. Culture on Sabouraud's Dextrose Agar and Sabouraud's Dextrose Chloramphenicol Agar. 3. Examination of Lactophenol Cotton Blue mount and appropriate biochemical test.

Result: In one year duration study was conducted on 50 suspected samples of otomycosis patient. 46 samples showed positive result, *Aspergillus fumigatus* (n = 17,34%) was commonest followed by *Candida albicans* (n = 11,22%), *Aspergillus niger* (n = 10, 20%), and *Penicillium* species (n = 6, 12%). *Candida* species was found sensitive to Itraconazole, Nystatin and resistant to Amphotericin-B, Fluconazole. Females (64%) were affected more than Males (36%) and disease was commonly reported in middle age group.

Discussion: In this study on 50 patients of otomycosis, 46 were positive and *Aspergillus fumigatus* was commonest isolate followed by *Candida* species and *Aspergillus niger*.

Conclusion: 1. *Aspergillus fumigatus* affecting otomycosis followed by *Candida* species and *Aspergillus niger*. 2. Antifungal sensitivity was performed.

Keywords: Hearing Loss; Otomycosis; *Aspergillus fumigatus*; Antifungal Sensitivity Test

Abbreviations

SDA: Sabouraud's Dextrose Agar; KOH: Potassium Hydroxide; CSOM: Chronic Suppurative Otitis Media; AOM: Acute Otitis Media; ET: Eustachian Tube; SNHL: Sensory Neural Hearing Loss; CHL: Conductive Hearing Loss; DW: Distilled Water; BHI: Brain Heart Infusion Agar; BaSO₄: Barium Sulphate; LCB: Lactophenol Cotton Blue

Introduction

Fungal infection in External auditory canal, known as Otomycosis which is a superficial, sub acute or chronic infection of the outer ear canal, mostly unilateral infection, characterized by pain, inflammation, pruritis, hearing loss and tympanic membrane perforation with complication involving the middle ear. It is most prevalent in warm and humid climates [1].

In Indian subcontinent, Otomycosis is very common presenting cases in External auditory canal (EAC) infection with discharging ears. Predisposing factors such as self-inflicted trauma (commonly following use of q-tip to clean itching in ear), failure in the defense mechanism in EAC (epithelial coating changes, changes in PH, quantitative and qualitative changes in ear wax), long term use of hearing aid/ prosthesis, swimming with water trapped in EAC leads to fungal infection, abuse of nonspecific broad spectrum antibiotics, steroids all of which render the host prone to development of Otorrhea in External auditory canal [1-4].

Following clinical exam (otoscopy) it is possible to confirm diagnosis via fungal examination. *Aspergillus* and *Candida* spp. are most commonly detected fungi in EAC infections, are opportunistic and usually of varied pathogenicity, being part of the normal microbiota from different body parts [5,6].

Treatment regimens vary from termination of infection and/or controlling predisposing factors, to local debridement (micro aspiration) and/or the use of antimicrobial agents (topic/systemic) [7,8].

Although otomycosis is a clinical entity throughout the world, there are only a few major studies regarding its true impact and frequency in Brazil [9]. The present paper is an attempt at assessing the frequency of predominant symptoms and patients suffering previously from fungal infection of Otomycosis by clinical and mycological diagnosis.

Materials and Methods

Study settings

The study was carried out in collaboration with the following department of KPC MC&H, Kolkata

- Department of Microbiology (KPC MC&H)
- Department of Otorhinolaryngology (KPC MC&H)

Study duration

Sample collection and processing was done for 1year (between Jan21- June22) following approval by Ethical Committee. Data Analysis and submission was done within the next 6 months after completion of data collection.

Study design

It is a Descriptive, cross- sectional (prevalence) study of the population. Patients with history of chronic discharge, irritation and pain in ear were selected from Otorhinolaryngology OPD. Samples from external auditory canal were collected by sterile swab, 3samples were collected (one for direct KOH mount and examination, rest 2 samples for culture in Sabouraud's Dextrose Agar (SDA), Sabouraud's dextrose Chloramphenicol Agar (SDCA) &Brain- Heart Infusion Agar). Similarly, swabs were collected from the external auditory canal and/or any secretions in the ear had been processed. Any correlation with dandruff also been studied. Antifungal susceptibility testing was performed by disk diffusion technique.

Antifungal susceptibility test

- Antifungal susceptibility test was performed according to: CLSI M44-A2, CLSI M51-A, method uses Muller-Hilton agar supplemented with 2% glucose and 0.5µg methylene blue/ml with Amphotericin- B 100 unit per, Fluconazole 10mcg per disk, Itraconazole 30mcg per disk, Nystatin 100mcg per disk from Himedia.
- Fungal isolates in normal saline solution was poured over the plate and anti-fungal disk placed at a distance of 15mm. Plate was incubated at 37°C for 7 days and result noted.

Definition of the problem

Fungi are ubiquitous and human infections are not uncommon, causing significant impact on public health. The causative agents are saprophytic fungi found prevalent in the environment. The true fungi (dimorphic) are found to be very rarely involved. The commonest group of fungi belongs to genus *Aspergillus* particularly *A. niger*. They are caused due to physical injury or excessively accumulation of cerumen in EAC, corneal trauma by vegetative matter, also found in contact lens wearer like that of Acanthameoba infection. These are prevalent in tropics/subtropics due to high temperature and humidity conducive to the growth of fungi. They are mostly acquired following traumatic injuries with most patients failed to recall their injuries. Thus, diagnosis is considerably delayed. The disease may either remain localized or involve adjacent tissues. Widespread dissemination may occur in immunocompromised host. Treatment is often disappointing leading to protracted clinical course causing significant morbidity.

Defination of population

Fungal infection in Ootomycosis cases, as per inclusion and exclusion criteria, attending in the Department of Otorhinolaryngology of KPC MC&H were processed at Mycology division of Microbiology department at KPC Medical College and Hospital.

Study variables

Independent variables

Different independent variables were taken into account like Age, Sex, Occupation, Hygienic Status, and Duration of presentation complaints, prolong use of antibiotic and corticosteroid drugs history, associated itching, history of systemic illness, family history of similar complaints, past history of similar complaints.

Dependent variables

The different variables were studied in presence of fungus in the samples of ear cases and its identification by microscopy and culture up to species level.

Inclusion criteria

- Secretion in External Auditory Canal
- History of Otitis Media with secretion.
- Prolonged 15 days use of Antibiotic Ear drops.

Exclusion criteria

- In Covid-19 positive patients.
- Drug history of antifungal ear drop treatment taken for 15 days.

Sample size

50 patients Fungal Infection in Ootomycosis from Otorhinolaryngology Dept. were collected.

Number of samples (n) is determined by formula

$$n = \frac{Z^2 (1-\alpha/2)^2 \times p \times (1-p)}{d^2}$$

When the confidence level is 95%, then the value of $Z\alpha = 1.96$.

Z = Error of margin

p = 15% (prevalence of fungal infection in Ootomycosis)

q = (1-p) = 0.85

d = 10% = 0.1, where d = absolute error

n = 3.84 x 0.15x 0.8

(0.1)²

= 48.96

= 49

Controls required or not

Controls were not required.

Study design

It is a descriptive, cross sectional study.

Experiment design

Not applicable, as it is a cross sectional study.

Additional resources and sources

- **Human resources:** Not required
- **Financial resources:** Not required as the OPD and laboratory facilities of our hospital have been used.

Parameters to be studied

Following associated relevant findings were noted during clinical and laboratory examination of patients:

- Age
- Sex
- Occupation
- Socioeconomic status
- Family history
- Associated systemic diseases
- Duration of disease
- Associated features
 - Discharges
 - Itching
 - Pain
 - Redness

- History of trauma
- Other sites involvement
- 10% KOH mount finding
- Gram staining from culture
- Growth at 25°C and 37°C in BOD and Aerobic Incubator
- Growth on SDA and SDCA media
- LPCB mount from culture
- Slide culture from growth
- Urease test
- Sugar fermentation test

Methods of data collection

Approval from The Institutional Ethical Committee was taken before undertaking the study. A case report form (pre-tested, semi-structured) with informed consent was used for data collection.

Relevant history was taken from cases and important clinical examination findings were noted. Samples (Swabs from external auditory canal) collected by sterile swab aseptically from the site of discharge (EAC). Samples were processed in the Mycology Laboratory of KPC Medical College and Hospital according to standard protocols for mycological examination and the findings were noted.

Study tools

A case record from (pre-tested, semi-structured schedule) with informed consent was used for data collection. Clinical examination was based on history obtained from the patient and clinical examination done by clinician as per the parameters of the case record form.

Most frequent specimens for isolation of fungal agents causing Otomycosis - Ear swabs from ear discharge. Equipments used for sample analysis were sterile test tube, normal saline, sterile forceps, sterile scalpel, inoculating straight wire, glass slides, glass marker, 10% KOH, sterile media, sterile cover slip and hooded Bunsen burner, LPCB, primary and counter stain, decolouriser and gram's iodine (for Gram's stain).

Other equipment required included Magnus binocular compound light microscope with inbuilt light source, Digilab

aerobic incubator, SAR BOD cooling incubator, Yorco biosafety cabinet, autoclave, hot air oven, refrigerator, information sheet, consent form etc.

The different staining reagents and culture media utilized for

Microbiological processing are:

- Sabouraud's Dextrose agar (SDA) media
- Sabouraud's Dextrose Chloramphenicol agar (SDCA) media
- Blood agar
- Brain-heart Infusion Agar(BHI)
- Christensen's urea agar
- Sugar Fermentation test
- Corn Meal agar
- 10% KOH (Potassium hydroxide) Wet mount
- Gram's stain
- Lactophenol cotton blue stain (LPCB)

Procedures

After approval from the institutional ethical committee, the study was initiated. After taking an informed consent from the selected cases, case investigation and analysis was carried out as per the predetermined case record form.

Clinical examination

History

Detailed history included information of the patient's name, age, sex, occupation, and socioeconomic status. This was followed by enquiry on duration, history of drugs, associated systemic diseases, risk factors and clinical manifestations suggestive of fungal Otomycosis in ear.

Examination

- Site of discharge/absence of discharges, colour of discharges, associated with itching, pain, redness, any other site involved or not was noted.
- Microscopical examination (direct)
- **10% Potassium Hydroxide (KOH) Examination:** This primary screening tool used in mycology. The aqueous

potassium hydroxide (KOH) to soften and digests protein debris as well as dissolves cement substance. The fungal elements become quite clear and are easily visualized in specimens. The slide was examined under a bright-field microscope, using low-power followed by high-power objectives for evidence of any characteristic hyphae along with Chlamydospore at margin or elongated yeast cells or sclerotic bodies or pigmented hyphae or narrow based budding lemon shaped yeast cells or sporangium.^[10]

- **Gram's stain examination:** Gram's stain is also effective for detection of some of the fungal pathogens. The fungi are usually gram positive and seen as violet coloured in the stained smear. The yeast cells usually show up well stained morphology but filamentous fungi in the smears become desiccated and their morphological characteristics are usually lost. After swab containing ear discharge placed in a clean sterile glass slide, the smear on the slide was allowed to air-dry completely and was affixed to the slide. The smear then proceeded with gram stain. The slide was then examined under bright-field microscope; using oil immersion objective with cedar wood oil for evidence of small gram positive irregularly stained yeast cells or gram positive branching filamentous bacteria.
- **Culture:** Each sample was inoculated in two SDA and SDCA media and Blood agar, BHIA according to suspected causative agents and inoculated for aerobic fungal culture at 25°C and 37°C (for dimorphic fungi). The cultures were examined for growth daily for seven days to thrice weekly up to three weeks for identification of growth on culture was based on its gross colony morphology on culture media and on its microscopic morphology.
- **Lactophenol Cotton Blue (LPCB) :** It is used to study the morphological features of the fungal isolates. Growth from the culture tubes were examined microscopically placing a small portion of the growth on a glass slide, teasing it with two sterile needles after adding lactophenol cotton blue and then a cover slip.

Under microscope the following features were noted— Mycelium, Hyphae(Whether septate or non septate), Whether pigmentation present or absent, Spore.

- **Germ Tube Test:** Germ tube test is used for presumptive identification of *Candida albicans*. It is a rapid screening test where the production of germ tubes within two hours in contact with the serum is considered as indicative of *Candida albicans*. This test has to be validated with Corn Meal Agar(CMA) test [10].
- **Corn Meal Agar (Dalmu plate):** In a Cornmeal agar divide the plate into 4 quadrants and label each quadrant. Using a sterile needle or straight wire, lightly touch the yeast colony and then make 2-3 streaks of approximately 3.5-4cm long and 1-2 cm apart. Place a flame sterilized and cooled 22mm square cover glass over the control part of the streak. This will provide partially anaerobic environment at the margins of the cover slip. Incubate the plates at 25°C for 3-5 days. Observe under microscopically, morphological features like hyphae, Pseudohyphae, blastospores, ascospore, Chlamydospore, Basidiospores or sporangia are noted. **CHRO Magar Candida Medium:** This medium is used for rapid identification of various *Candida* species. The *Candida* is selective and differential type of chromogenic medium, which is useful for identification of various *Candida* species and other yeast- like organism like Prototheca. Due to the chromogenic substrate in the medium, the colony morphology and color have been well defined when it is used to isolate the yeasts directly from clinical material. *Candida* shows following colour of colonies after incubation at 30°C for period of 48 to 72 hrs.
- **Slide Culture:** This method might appear to be the most suitable for making the microscopic identification of an organism because it allows one to observe microscopically the fungus growing directly underneath the cover slip. This technique was used to study the undisturbed relationship between reproductive structures and mycelium and also the sporulation characteristics of the organism. Corn meal agar was used for this purpose. Small block of CMA medium was cut in 4x4mm thickness. Then placed the agar block over a sterile glass slide in a petridish. With a right angled wire, the four quadrants of the agar block. After that small amount of sterile distilled water was added and incubated at 25°C.

Biochemical tests

- **Urea hydrolysis test:** Colonies were subjected to urea hydrolysis test by streaking it using a flame sterilized straight wire, over the surface of the slant of Christensen’s urea agar containing 2% urea. Then it was incubated at 35° - 37°C for 18-24 hours. Urea hydrolysis was denoted by change of colour of media to bright pink.
- **Sugar Fermentation test:** Production of gas in the tube is taken as fermentation positive while only acid production may simply indicate that carbohydrate is assimilated [10].

Reagents for the disk diffusion test

Mueller- Hinton Agar + 2% Glucose and 0.5 ug/mL Methylene Blue Dye (GMB) Medium

Of the many agar media available, supplemented Muller-Hinton agar to be a good choice for routine susceptibility testing of yeast (*Candida* species).

To standardize the inoculum density for a susceptibility test, a BaSO₄ suspension with turbidity, equivalent to a 0.5 McFarland standard or its optical equivalent should be used.

Statistical analysis

For the statistical analysis of the present study following test was taken help of:

- Chi- square test
- Z- Test

Results

Among 50 cases, the mean age was 43.33 years. The most common age group affected was 41-50 years with 17 cases (34%) and the least common age group affected was above71-80 years with only 2 cases (4%).

The value of z is 1.8238. The value of p is .06876. The result is not significant at p < .05. Table 1 below shown.

Among 50 cases of fungal infection in external auditory canal and otorrhea in ear, Females(64%) were more affected in 41-50 years of age group than males (36%).

Age (yrs)	Frequency (Number)	Percentage (%)
1-10	3	6%
11-20	5	10%
21-30	9	18%
31-40	9	18%
41-50	17	34%
51-60	5	10%
61-70	0	0%
71-80	2	4%
	TOTAL = 50	TOTAL = 100

Table 1: Age Wise Distribution (Fungal infection of EAC and Otorrhea) - (n = 50).

The value of z is 2.8. The value of p is .00512. The result is significant at p < .05. Table 2 below shown.

Sex	Number	Percentage (%)	P-value
Female	32	64%	0.00512
Male	18	36%	
	TOTAL = 50	TOTAL = 100	

Table 2: Sex wise distribution - (n = 50).

Among 50 cases of fungal infection in external auditory canal and otorrhea in ear, the above chart showing the present of itching in 43 cases (86%) and absent of itching in 7 cases (14%). The present of itching has been found to be associated with CSOM with otorrhea, CSOM without otorrhea, AOM, CSOM, follow up cases of tympanoplasty.

The value of z is 7.2. The value of p is < .00001. The result is significant at p < .05. Figure 1 shown below.

Total number of fungal infection in external auditory canal and otorrhea cases were 50,among them it has been observed that there was equal number of patient’s showing fungal hyphae in KOH Mount findings in 25 patients (50%) and remaining 25 patient’s (50%) were not showing fungal hyphae in KOH Mount finding. In this study it has been observed that growth in culture media is always not associated with positive KOH mount findings.

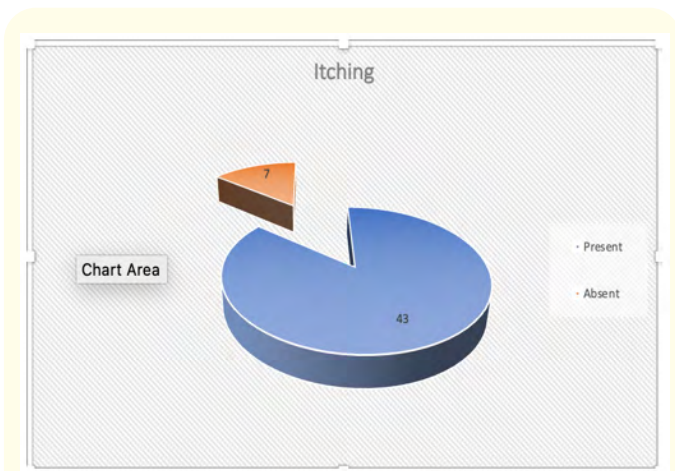


Figure 1: Symptoms Associated with Itching.

The value of z is 0. The value of p is 1. The result is not significant at $p < .05$. Figure 2 shown below.

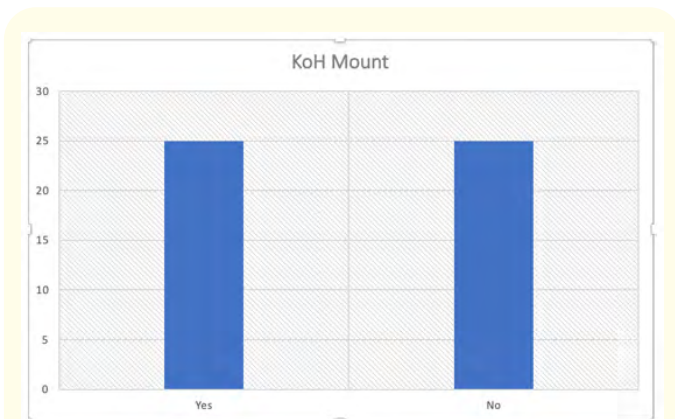


Figure 2

The total cases of fungal infection in Otomycosis were analysed. As the chart showing the most commonest species identified were *Aspergillus fumigatus* seen in 17 patient's (34%) followed by *Candida Albicans* seen in 11 patient's (22%) followed by *Aspergillus niger* seen in 10 patient's (20%) followed by *Penicillium marneffii* seen in 6 patient's (12%) and *Aspergillus* species seen in 4 patient's (2%), 4 patient's (8%) has shown no growth.

The value of z is 1.3363. The value of p is .18024. The result is not significant at $p < .05$. Table 3 shown below.

Species	Number	Percentage (%)
<i>C. albicans</i>	11	22%
<i>A. fumigatus</i>	17	34%
<i>A. Niger</i>	10	20%
<i>Penicillium</i> species	6	12%
<i>Aspergillus</i> sp.	2	4%
NG	4	8%
	TOTAL = 50	TOTAL = 100

Table 3: Species Isolates - (n = 50).

Out of 50 cases, the most commonest history of trauma was found by swimming which is seen 14 (28%) number of cases then followed by pricking by sharp object 11 (22%) cases then followed by trauma caused by nail pricking 10 (20%) cases as per above shown figure. It has been seen in the following study that 15 (30%) cases were having no history of trauma, but found fungal infection in EAC.

The value of z is 0.2204. The value of p is .82588. The result is not significant at $p < .05$. Table 4 shown below.

History of Trauma	Number	Percentage (%)
Swimming	14	28%
Pricking sharp object	11	22%
Nail Pricking	10	20%
No h/o of trauma	15	30%
	TOTAL = 50	TOTAL = 100

Table 4: Symptoms Associated with history of Trauma -(n = 50).

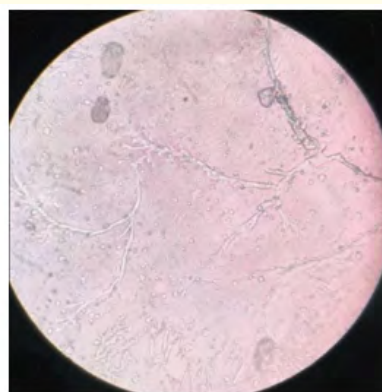


Figure 3: KOH (potassium hydroxide) wet mount showing fungal hyphae (septate) and conidia.

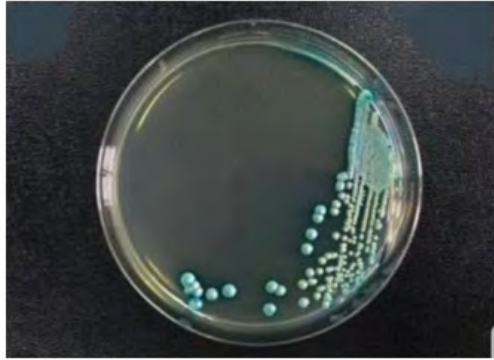


Figure 4: CMA (corn meal agar) colony morphology showing growth of *Candida albicans*: Green, large, smooth colonies.



Figure 7: Antifungal susceptibility test by disk diffusion method for *Candida* species.

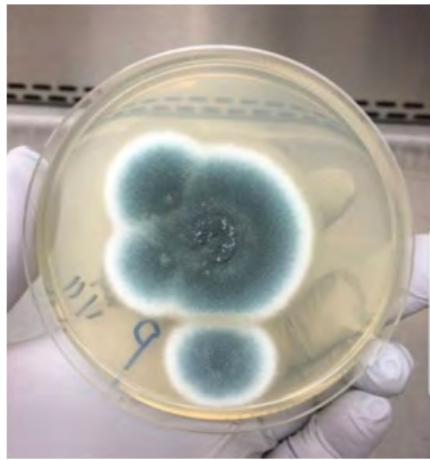


Figure 5: SDCA media:- Colony morphology showing growth of *Aspergillus fumigatus*.

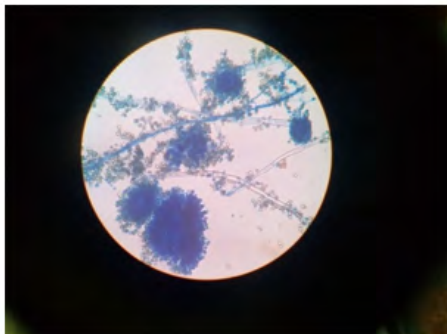


Figure 6: LCB (Lactophenol cotton Blue) stain: showing microscopic picture of *Aspergillus fumigatus* showing - phialides uniseriate and arranged parallel to conidiophore, vesicles are flask-shaped.

Discussion

In our study, out of 50 suspected fungal infection in Otomycosis cases, distribution shows that age group of 41-50 yrs. with 17 cases (34%) were affected more, followed by 31-40 yrs. age group with 9 cases (18%) and 21-30 yrs. with 9 cases (18%) and the least common affected age group was 71-80 yrs. with 2 cases (4%) similarity to other studies by various authors Mohanty JC., *et al.* [11] Chander J., *et al.* [12] Paulose KO, [13] and Kaur R [14].

In this study, Females with 32 cases (64%) were more affected in 41-50 years of age group than males with 18 cases (36%) for otomycosis. In CSOM without otomycosis was 43 (86%), out of which males were suffer more with 20 cases (42.6%) compared to females 12 (22.6%). In other studies, males predominantly suffer more than females as far as fungal infection in CSOM are concerned. Observation of various authors Laxmipati, Baskaran 55.80%, EO Nwankwo, AD salisu 57.5%, Rachna., *et al.* 55.55%, Gulati., *et al.* 67.50% shows more male affected with otomycosis. In contrast, the findings of present study correlate well with the observation of Reena Roy., *et al.* [15] who found females 57% were most commonly affected. In one "Mycological study of otomycosis" by Rajeshwari Rao., *et al.* in Karnataka, among 94 specimens of fungal isolates, males were 41(43.6%) whereas 53 (56.4%) were females.

The most common clinical presentation of fungal infection in Otomycosis were itching with 43 cases (86%) associated with

otorrhea, AOM, COM and complaint was not present in remaining 7 cases (14%). However, there was significant association found between the presenting complaints and culture outcome of the sample. None of the cases had responded to conservative medical management and had to be taken up for mycological assessment. The above complaints and their incidence as mentioned earlier were in accordance with KO Paulose, AL Khalifa, P. shenoy, RK Sharma, *et al.* [16]. The most common complaint in fungal infection in EAC and Otorrhea is severe itching sensation deep inside the canal ; patients frequently report an irresistible urge to scratch the ear canal with the fingertip and of any sharp instrument like hair pins [17].

Simple culture and microscopic examinations under sterile conditions are sufficient to confirm fungal infection of EAC and Otorrhea [18]. Direct microscopy is a rapid and inexpensive technique to confirm the diagnosis in a clinical setting [19]. In expert hands, a positive KOH with clinical suspicion of fungal infection in EAC and Otorrhea is adequate evidence for diagnosis [20]. In present study, out of 50 suspected cases, equal distribution (25 cases each) of positive (50%) and negative cases (50%) were observed. There was no statistical significant correlation found in association between KOH finding and culture outcome among samples. The said observations are similar with the studies by Swarup JR, *et al.* [19] Vishwanatha B, *et al.* [20] who have reported above 90% culture positivity with KOH positive finding.

In the present study, out of 50 suspected cases most common species were identified as *Aspergillus fumigatus* in 17 patient's (34%), *Candida albicans* in 11 patient's (22%), *Aspergillus niger* in 10 patient's (20%), *Penicillium* species in 6 patients (12%) and *Aspergillus* species in 4 patient's (2%) and remaining 4 patient's (8%) were found no growth.

In one of the study in Tropical Medicine journal in Africa by Deepak Juyal, *et al.* shown *Aspergillus* species accounted for 47% of the cases, while 41% of the tests show *Candida* species. Almost similar findings are recorded in Indian subcontinent. Few case series however do report incidence of *Candida* has been reported to be higher than *Aspergillus*. High incidence of otomycosis in Indian subcontinent has been reported in past studies. Delay in proper diagnosis and severity of the disease prolong recovery. There is usually good recovery in immunocompetent patients on institution of topical antifungals.

Management

Aspergillus and *Candida* species are the most frequently isolated fungi in patients with otomycosis. Topical antifungals, such as Itraconazole, fluconazole with other azoles are found to be safer like Clotrimazole, miconazole, bifonazole, ciclopiroxolamine, and tolnaftate, are potentially safe choices for the treatment of Otomycosis, especially in patients with a perforated eardrum.

The oral triazole drugs, Itraconazole, Fluconazole and Nystatin and Amphotericin B are effective against *Candida* and *Aspergillus*, with good penetration of bone and the central nervous system. In some patient's fluconazole found to be resistance in oral consumption in present study but Itraconazole, Nystatin and Amphotericin B was found to be effective in *Candida* species.

Recommendation in refractory otomycosis due to its mostly lack of ototoxicity antifungal preparation Bifonazole was in common used during 80s. Bifonazole 1% solution has similar potency in comparison to miconazole or clotrimazole. It has retarded fungal growth in most cases with efficacy of up to 100% [21].

Boric acid maybe used to treat fungal and yeast infections caused by *Candida* sp. Tolnaftate 1% solution can also be easily instilled into the ear 5-Fluorocytocine (Flucytosine) penetrates fungal cells, fluorouracil is formed as active drug, which competes with uracil and hence fungal RNA formation [22].

In our setting, all patients were given topical Clotrimazole, Neomycin with steroid combination and followed up weekly for at least 4 wks. or when patient did not turn up for review whichever was later. In follow up re -examination was done for alleviation of symptoms and most of them showed positive response.

Bassiouny, *et al.* had reviewed the efficacy of topical antifungal agents to conclude that Clotrimazole and Econazole were mostly effective.

Conclusion

- Incidence of Otomycosis superimposed on COM& AOM with hearing loss in our study is 10% in both cases of all cases tested.
- Incidence was higher in middle age and young adults than both extremes of age groups.
- Ear discharge, itching in EAC, ear pain were the most significant complaints in all cases.

- *Aspergillus* is the primary fungi species effecting otomycosis in our study closely followed by *Aspergillus* species with *Candida*, and subsequently major cause being *Candida*.
- KOH mount is effective as a primary means of screening for fungi giving in present context sensitivity of 50% but specificity for true negative cases was equal to 50%.

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