

# Fungal Profiling in Patients with Chronic Suppurative Otitis Media: A Microbiological Study

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## ABSTRACT

**Introduction:** One of the complications of acute otitis media is chronic suppurative otitis media although the risk factors responsible for this are unclear. Development of chronic suppurative otitis media may be related to the frequent infection of the upper respiratory tract and poor socioeconomic conditions. Long term antibiotic and steroidal therapy for its treatment are assumed to suppress the resident bacterial flora with a resultant increase in fungal growth. Hence; this study was undertaken to assess the fungal growth in patients with chronic suppurative otitis media.

**Material and Methods:** 214 clinically diagnosed patients of chronic suppurative otitis media who reported in the hospital from June 2012 to July 2014 were included in the present study. Patients presenting with tympanic perforation and ear discharge of more than 2 months were included in the study. Inoculation of the swabs of the patients was done on two sets of Sabouraud's dextrose agar slants with 0.05 mg/ml of chloramphenicol followed by incubation at 35°C and 28°C, respectively. Criteria of Lodder and Kreger-Van Rij and Rippon were used to identify the isolates based on colonial appearance, microscopic morphology in lactophenol cotton blue mount, slide culture preparation, and biochemical characters.

**Results:** Approximately 77% of the patient showed positive culture results for fungal growth. Remaining of the subjects showed absence of any fungal growth. Majority of the patients in which fungal growth was present belonged to age group of 21 to 30 years. More than 50 % of the patients received topical ear drops while remaining 48 % were on oral anti-microbial therapy. Out of all the patients receiving topical therapy, maximum of them were receiving ciprofloxacin followed by gentamicin. *Candida albicans* was the most frequently found fungal spp. followed by *aspergillus* spp.

**Conclusion:** Bacteria flora of the ear may get suppress by the prolonged use of antibiotics or steroidal drops which subsequently might lead to fungal growth.

**Keywords:** Fungal infection, Otitis media

South Asia. It may often be accompanied by complications<sup>9-12</sup> including septicaemia, meningitis, brain abscess, facial paralysis and mental retardation<sup>13</sup> and it is believed to be responsible for more than two-thirds of deafness in children. Unfortunately, the treatment protocol of the chronic discharging ear is still limited to the symptomatic treatment. i.e. regular clearing and dressing the ear until unless the lesion becomes completely dry<sup>14</sup> and in case complications occur, mastoidectomy is done.<sup>15,16</sup> Hence; this study was undertaken to assess the fungal growth in patients with chronic suppurative otitis media.

## MATERIALS AND METHODS

The present study included 214 clinically diagnosed CSOM patients who reported in the hospital from June 2012 to July 2014. From the institutional ethical committee, ethical clearance was taken. Patients presenting with tympanic perforation and ear discharge of more 2 months were included in the study. Subjects included were only those subjects who were on any antibiotics (oral, topical or systemic) and/or steroid ear drops for >14 days and still persisted with symptoms. Patients were not exposed to any kind of risk by following innocuous method of sample collection procedure. Exudates from the tympanic membrane were thoroughly soaked with sterile cotton swabs and were for further microbiological examination, were sent to the pathologic and microbiologic laboratory. Microscopic examination of the specimens was done in the laboratory in 10% KOH preparations and Giemsa stained smears and were evaluated to check the for the presence of pus cells, budding yeast cells, fungal hyphae (septate or aseptate) and spores, etc. Whenever and wherever required, use of special stains such as periodic acid-Schiff and Gomori's methanamine silver was done. Inoculation of the swabs was done on two sets of Sabouraud's dextrose agar slants with 0.05 mg/ml of chloramphenicol followed by incubation at 35°C and 28°C, respectively.

For checking the any kind of mycotic growth in the cultural plates, thorough examination was done initially daily for seven days followed by examination after every three days for 4 weeks. The specimens were considered positive for fungus under following conditions:

## INTRODUCTION

Although the risk factors are unclear, chronic suppurative otitis media (CSOM) is assumed to be a complication of acute otitis media (AOM). Development of chronic suppurative otitis media may be related to the frequent infection of the upper respiratory tract and poor socioeconomic conditions (overcrowded housing and poor hygiene and nutrition).<sup>1-4</sup> However, a systematic review found no clear evidence that antibiotics are effective in preventing the progression of AOM to CSOM even among children who are at high risk for the disease.<sup>5</sup> An ear with perforated tympanic membrane and persistent drainage from the middle ear is the chronic discharging ear. Unlike otitis media with effusion which is common in the West,<sup>6-8</sup> chronic discharging ears are highly prevalent in the tropical regions including

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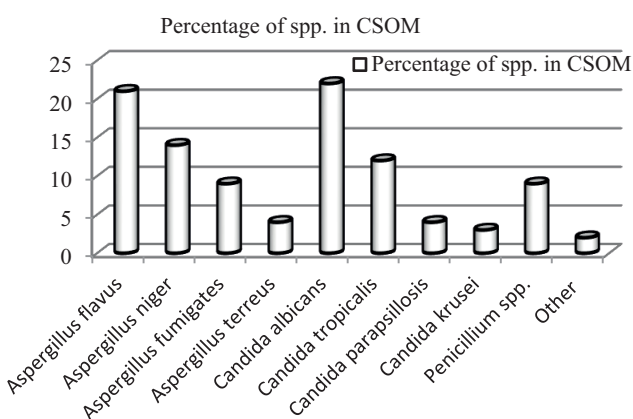
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| Number of isolates                 | Sex    | Age group in years       |          |          |          |              |
|------------------------------------|--------|--------------------------|----------|----------|----------|--------------|
|                                    |        | Less than or equal to 10 | 11 to 20 | 21 to 30 | 31 to 40 | More than 40 |
| Culture positive for fungal growth | Male   | 16                       | 22       | 34       | 18       | 8            |
|                                    | Female | 10                       | 18       | 30       | 8        | 2            |
| Culture positive for fungal growth | Male   | 6                        | 12       | 6        | 4        | 2            |
|                                    | Female | 4                        | 2        | 10       | 2        | 0            |

**Table-1:** Distribution of patients according to age and sex.

| Treatment         | Percentage of patients |    |
|-------------------|------------------------|----|
| Topical ointments | Ciprofloxacin          | 17 |
|                   | Gentamicin             | 15 |
|                   | Ofloxacin              | 8  |
|                   | Steroidal formulation  | 8  |
|                   | Unknown                | 4  |
| Oral formulations | 48                     |    |

**Table-2:** Various treatments received by patients



**Figure-1:** Distribution of various fungal isolates in the patients

- When both the smear and the culture were positive,
  - When the smear was negative but culture was significant or repeatedly positive for same fungus, and
  - When smear was positive although culture were sterile.
- Criteria of Lodder and Kreger-Van Rij and Rippon were used to identify the isolates based on colonial appearance, microscopic morphology in lactophenol cotton blue mount, slide culture preparation, and biochemical characters.<sup>17,18</sup>

## STATISTICAL ANALYSIS

Microsoft office 2007 was used to make tables and graphs. Results of the study are based on descriptive statistics. Mean and percentages were calculated to infer data.

## RESULTS

Table-1 shows the demographic data of the study population. Approximately 77% of the patient showed positive culture results for fungal growth. Remaining of the subjects showed absence of any fungal growth. Majority of the patients in which fungal growth was present belonged to age group of 21 to 30 years. Table-2 shows various treatment modalities received by patients. More than 50 % of the patients received topical ear drops while remaining 48 % were on oral anti-microbial therapy. Out of all the patients receiving topical therapy, maximum of them were receiving ciprofloxacin followed by gentamicin. Figure-1 shows the distribution of various fungal isolates in the patients. *Candida albicans* was the most frequently found fungal

spp. followed by *aspergillus* spp.

## DISCUSSION

Chronic otitis media and CSOM are few of the common conditions encountered in a general otolaryngology clinic setting and its prevalence has been quoted to range from 9% to 27.2%<sup>20,21</sup> among patients who present with signs and symptoms of otitis externa and up to 30%<sup>22,23</sup> in patients with discharging ears. Chronic Otitis Media (COM) is the term used to describe a variety of signs, symptoms, and physical findings that result from the long-term damage to the middle ear by infection and inflammation. CSOM is the inflammation of the ear that causes recurrent ear discharge through a perforation of the ear drum.<sup>19</sup> It is worldwide in distribution with a higher prevalence in the hot, humid, and dusty areas of the tropics and subtropics.<sup>21-23</sup> Although rarely life threatening, the disease is a challenging and frustrating entity for both the patients and otolaryngologists as it frequently requires long-term treatment and follow up. Despite this, there could be recurrences.

In the present study the highest incidence of fungal CSOM was noted in second and third decades of life (more than 60%), and this observation was concurrent to the studies conducted by various other authors.<sup>24,25</sup> High exposure of the youngsters to the fungal spores might be responsible for high incidence of fungal infections in this specific age group.<sup>26</sup> Among the fungal etiology in CSOM, the most commonly isolated organisms are *Aspergillus* species and *Candida* species.<sup>27</sup> In the present study, *Aspergillus* species comprised of more than 45% of the total fungal isolates, whereas approximately 40% of the total microorganisms were species of *Candida*. *A. Flavus* and *A. Niger* were the most common *Aspergillus* species. Among the *Candida* species, the most common isolates were *C. albicans* and *C. tropicalis*. Earlier study from India,<sup>24</sup> reported higher isolation rate of *Aspergillus* species as compared to *Candida* species. A recent study by Aneja et al.<sup>28</sup> from India reported *Aspergillus* in more than 85% of patients with *A. niger* and *A. Flavus* as the most prevalent species. While some studies report *Candida* to be the most common species.<sup>29</sup> Strauss and Fine reported two cases of *Aspergillus* otomastoiditis caused by *A. fumigatus*.<sup>30</sup> This mold has been considered more pathogenic than *A. niger* as *A. fumigatus* produces a hemolytic exotoxin which has the ability to alter skin resistance.<sup>31</sup> In artificial substrates, *Aspergillus* is one of the main organisms inhabiting the media.<sup>28</sup> Acidic pH of the ear canal is responsible for the growth of *Aspergillus* in these areas.<sup>32</sup> *Pseudallescheria boydii* is a saprophytic fungus capable of causing invasive fungal infections in humans. This fungus is morphologically similar to *Aspergillus* but is resistant to conventional systemic antifungal therapy with amphotericin B.<sup>33</sup> Because of appearance of lack of specific clinical characteristics of some of the fungal organisms like *aspergillus*, mycotic infections have become

more tedious to identify clinically and therefore, further these infections don't respond with traditional antimicrobial therapy and mycotic culture is used to identify such organisms in ear infections.<sup>34</sup> This substantiates the essentiality of fungal cultures for diagnosis. *Penicillium* species was isolated in eight cases. A study by Talwar et al.<sup>24</sup> found *Penicillium* in more than 10% of the cases whereas a study by Aneja et al.<sup>28</sup> reported the same in less than 3% of cases. *Mucor* species was isolated in two cases, and both the patients were known diabetics. *Mucor* has a propensity to invade arterial walls in immunocompromised patients, especially in uncontrolled diabetes mellitus patients. Haruna et al.<sup>35</sup> reported a meningoencephalitis case caused by mycotic infection invading through temporal bone. They observed that fungal organisms with minimal of virulence like non-albicans *Candida* are also actively found in the ear infections. Fungal organisms apart from showing geographical distribution also show seasonal and time dependent variation in distribution. Prevalence of fungal infections of the ear during moist and humid conditions has been reported previously by several authors.<sup>36,37</sup> Dayasena et al studied the aetiological organisms for CSOM and also identified the effect of demographic factors on disease manifestation. They included a case series of 234 patients who had been admitted to National Hospital of Sri Lanka, with the complaint of ear discharge and from whom the specimens were sent for microscopy and culture at Department of Microbiology 1 January 2009 to 31 December 2009. From the results, they concluded that demographic does not seem to significantly alter the manifestation of the disease, though CSOM was more commonly seen among males and adults.<sup>38</sup>

## CONCLUSION

From the above results, it can be concluded that bacterial flora of the ear may get suppressed by the prolonged use of topical antibiotics or antibiotics-steroids ear drops which subsequently might lead to fungal growth. Further studies are advocated to control the discomfort caused by this condition.

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