

# *A STUDY OF OTOMYCOSIS*

DISSERTATION SUBMITTED FOR

**MASTER OF SURGERY Branch IV**

**(OTO RHINO LARYNGOLOGY)**



**THE TAMILNADU  
DR.M.G.R. MEDICAL UNIVERSITY  
CHENNAI, TAMILNADU**

**MARCH 2007**

## **CERTIFICATE**

This is to certify that this dissertation entitled “A STUDY OF OTOMYCOSIS” submitted by DR.A. MOHIDEEN ABDUL KADAR, to the faculty of OTORHINO LARYNGOLOGY, The TamilNadu Dr. M.G.R. Medical University, Chennai, in partial fulfilment of the requirement in the award of degree of M.S.Degree, Branch – IV (OTO - RHINO LARYNGOLOGY), for the March 2007 examination is a bonafide research work carried out by him under our direct supervision and guidance.

**PROF. DR.M. ARUNACHALAM. M.S. D.L.O,**

Prof. and Head of the Department  
Department of E.N.T. Diseases,  
Govt. Rajaji Hospital &  
Madurai Medical College,  
Madurai.

## **DECLARATION**

I, Dr. A. MOHIDEEN ABDUL KADAR declare that the dissertation titled “A STUDY OF OTOMYCOSIS” has been prepared by me.

This is submitted to The Tamil Nadu Dr. M.G.R. Medical University, Chennai, in partial fulfilment of the requirement for the award of M.S.Degree,Branch IV(OTO - RHINO LARYNGOLOGY) degree Examination to be held in March 2007.

**Place : Madurai**

**Date :**

**Dr. A. MOHIDEEN ABDUL KADAR**

## **ACKNOWLEDGEMENT**

I have great pleasure in expressing my deep sense of gratitude to **Prof. Dr. M. ARUNACHALAM. M.S. D.L.O.**, Professor and Head of the Dept. of ENT diseases, Government Rajaji Hospital and Madurai Medical College, Madurai for his kind encouragement and valuable guidance during the period of this study, with which this dissertation would not have materialized.

I would like to place on record my indebtedness to my teachers of the Dept. of ENT diseases, Madurai Medical College, Madurai for their whole hearted help and support in doing this study.

I express my sincere thanks to the Director, Department of Microbiology for allowing me to do culture study.

I express my sincere thanks to The DEAN, Madurai Medical College and Government Rajaji Hospital for permitting me to utilize clinical material of this hospital.

Lastly, I am conscious of my indebtedness to all my patients for their kind co-operation during the course of study.

# CONTENTS

<i>Section – A</i>	<i>Page No.</i>
1. INTRODUCTION	1
2. AIM & OBJECTIVES	5
3. REVIEW OF LITERATURE	6
4. MATERIALS & METHODS	36
5. RESULTS AND OBSERVATIONS	45
6. DISCUSSION	58
7. LIMITATIONS	68
8. CONCLUSION	71
BIBLIOGRAPHY	
PROFORMA	
MASTER CHART	

## **INTRODUCTION**

Fungi constitute a large diverse group of heterotrophic organisms, most of which are found as saprophytes in the soil and decaying plant material. They are eukaryotes with nearly 50,000 species. They are essential in breaking down and recycling of organic matter. Some species contribute to the production of food, spirits, antibiotics and an array of enzymes.

Incidence of fungal infections has been grossly underestimated. Fungal infections are on the increase due to improved survival of immuno suppressed patients and better diagnostic facilities. Only 100 to 150 species are generally recognized as a cause of disease in humans.

Fungal infections are not communicable in the usual sense, but humans become an accidental host by inhalation of spores or by their introduction into tissue by trauma. The virulence factors favouring colonization of fungus in a human host are yet to be identified. Ability of the fungus to grow at 37°C and elaboration of a variety of enzymes and toxins are speculated to contribute to virulence.

The ear is continually subjected to challenge by a variety of Fungi, bacteria, yeasts and other micro organisms that are present in the external environment. Through evolution the organ has developed several ways

of preventing potential invaders. Accumulation of debris, particularly in damp tropical environment allows colonization and infection of the ear.

Otomycosis is world wide in distribution and in various recorded series has accounted for 5 to 20% of all cases of infective otitis externa it is one of the commonest manifestations in India during rainy seasons. It occurs mostly in humid atmosphere otitis externa due to fungal infection may resemble the desquamative form of diffuse infective otitis externa.

The abundant flora characteristic of the tropics do cause a variety of diseases and the fungi as a whole top the list of the pathogenic organisms of the plant kingdom. In the tropical countries otomycosis as an entity is seen in very many cases in the out patient departments and could often be mistaken for other conditions. The disease gets unnoticed and unattended until it causes severe pain and recurrence is very common.

Infections are usually limited to external auditory canal and may vary from mild to severe infection. In severe cases it is complicated by secondary bacterial infection. Mycotic infection of the external auditory meatus is prevalent in subtropical climates also. The incidence in temperate climates has increased in proportion to the use of topical

antibiotics which have a medium sterilized of other organisms in which the fungus may flourish.

Their suspicion were aroused through consideration of the problem of intractable otorrhoea due either to otitis externa (or) infection of radical mastoidectomy and fenestration cavitis, and its relation to the increased use of topical antibiotics known to favour over growth of fungus confirmation of these suspicions in almost 50 percent of cases indicates the real nature of the disease. A secondary invasion of primary bacterial infection leading to chronicity and apparent resistance to treatment.

Many fungi are present as commensals in ear. It is often debatable whether or not these organisms are the cause of condition under investigation. The immediate attention being directed to a relatively narrow range of bacteria. Moreover therapy directed toward fungi yields dramatic response.

The majority of fungal organisms involved are soil saphrophytes whose air borne conidia find the injured tissue a suitable environment for growth. Therefore the mycology involved in ear is quite different from that encountered in systemic cutaneous infections. Almost all fungi in earth can cause infection in the ear. However a few species seem to be



more aggressive opportunistic and account for the majority of infections recorded.

With above views in mind this study was undertaken to find out common fungi that cause otomycosis, the predisposing factors and associated bacterial infection and antifungal susceptibility of isolates.

## **AIM & OBJECTIVES**

1. To study the pattern of fungal infections in patients suspected of having otomycosis.
2. To identify the pre disposing factors involved in the causation of mycotic ear infections.
3. To evaluate the different symptomatology with which a patient with fungal lesion of ear is presenting.
4. To identify different isolates & the common among isolates from patients with otomycosis.
5. To see the association of bacteria in otomycosis
6. To find out the antifungal susceptibility and clinical response of the Isolates to clotrimazole (topical clotrimazole) in patients with otomycosis.

## REVIEW OF LITERATURE

1. The study of fungi is called mycology which derives from Greek word Mycos meaning mushroom. It came into existence before bacteriology.

2. The first important discovery of fungus disease in man was made by Lagenback in 1839.

3. Aspergillosis was one of the first fungal diseases of man or animals recognized. The name aspergillus had been coined much earlier by the Florentine botanist Michelli in his “Nova Plantarium Genera” of 1729.

4. **Meyer** first described fungal infections of the external ear in 1844. He also sparked a long lasting debate about whether fungi are the primary infectious agents or are secondary pathogens that affect the skin of the external auditory canal after it has been exposed to bacterial toxins. There is overwhelming evidence to confirm the notion that fungi can be primary pathogens <sup>12</sup>.

**Beaney and Broughton** in their article “Tropical Otomycosis” have attributed the greater frequency of otomycosis in the tropical countries to changes in the composition of cerumen induced by sweating<sup>3</sup>.(1967)

**Senturia** et al in their book “Diseases of the external ear” has described many contributory factors to otitis externa. They are heat, humidity, trauma, absence of the protective coating of cerumen by repeated washing, cleaning or swimming<sup>34</sup>.

**Mocatela Ruiz E** and **Lopez Martinez R** in their article “Clinical diagnosis of Otomycosis” found that out of 163 cases with clinical diagnosis of otomycosis only 72 were confirmed by positive mycological culture. They also noted no differences regarding the age and sex of the patient. They also found that the period of evolution was one year<sup>24</sup> (1980)

**Yassin A, Maher A, Moawad M K** in their study “Otomycosis – a survey in the eastern province of Saudi Arabia” – subjected 148 clinically suspected cases of otomycosis for culture. The patients were from 13 different countries mostly laborers and people of low socio-economic

standard. They got 120 positive fungal cultures. Males were affected more than females and age ranged from 2 to 58 years <sup>43</sup> (1978).

5. In 1961, until **Gregson and La Touche** found fungus infection in 80 out of 180 patients suspected of Otomycosis, the disease was not considered of great importance in temperate climates. They suspected Otomycosis in cases of intractable otorrhoea either due to otitis externa or infection of radical mastoidectomy and fenestration cavities. They proposed it to the increased use of topical antibiotics known to favour growth of fungus <sup>9</sup>.

**Than K.M.** of Burma found that Otomycosis was common in the rainy season <sup>37</sup>.(1980)

**Oliveri S, Capello G** et al in a study of 82 Sicilian patients, in their article “Otomycosis aetiology and analysis of predisposing factors” found working in garden and wearing mechanical hearing devices were the common predisposing factors for Otomycosis. Bathing in salt or fresh water was not a significant risk factor <sup>28</sup>. (1984)

## 6. **Symptoms:**

The patient complaints of a feeling of fullness and intensive itching in the ears. The canal is oedematous, erythematous and there are

numerous crusts. The inflammation is accompanied by exfoliation of the superficial epithelium and hearing may be impaired by obstruction of the canal with large masses of epithelial debris and mycelial strands. Associated bacterial infection causes marked pain and suppuration. In prolonged infections eczematoid changes and lichenification may occur. The course is chronic with acute episodes especially in summer and intermittent remissions. The same symptoms occur in many other conditions affecting the external auditory canal including neoplasms. As a result careful physical examination and appropriate cultures are frequently needed to make a definitive diagnosis <sup>12</sup>.

When present among debris it is sometimes possible to identify the black headed conidiophores of *Aspergillus niger*. The conidiophores of *Aspergillus fumigatus* on the other hand convey an impression of pale blue or green conidiophores. *Candida albicans* may be seen as deposits, but are difficult to differentiate from squamous debris.

**Mocatela Ruiz E** of Mexico in their article “Clinical diagnosis of Otomycosis” found secretion of fungal filaments and break in tympanic membrane were the common symptoms <sup>24</sup>.(1976)

**Gregoriou** et al found the most common symptoms were itching, absence of pain, discharge and no response to antibiotic treatment <sup>14</sup>. (1979)

**Thank K.M.** et al found itching as the commonest symptom (70%) followed by discomfort (54%) tinnitus (50%) hearing impairment and discharge (35%) <sup>37</sup>. (1980)

### **Aetiological agents**

Pathogens causing Otomycosis vary from temperate to tropical climates. Studies conducted in temperate countries like Sweden and England showed a preponderance of *Candida* species. Studies conducted in tropical and sub tropical countries like Italy, Nigeria, Egypt and Burma all found *Aspergillus niger* to be the most common isolate and *Candida* causing 1-16% of the infections <sup>12</sup>.

**Yassin A** et al of Saudi Arabia found that in 128 fungal isolates *Aspergillus niger* accounted for 51.15%, *Aspergillus flavus* for 18.32%, *Penicillium notatum* for 5.34%, *Candida albicans* for 4.58% and *Aspergillus terreus* for 4.58% <sup>43</sup>. (1978)

**Oliveri S** et al of Italy in a study of 82 cases found *Aspergillus niger* in 67.1% of cases, *Aspergillus flavus* in 13.4% of cases,

Aspergillus fumigatus in 1.2% of cases and Candida albicans in 11% of cases<sup>28</sup>.(1984)

**Definition :**

Otomycosis is a chronic or subacute, recurrent, non – contagious, persistent superficial fungal infection of the ear, usually located in the external ear (pinna and external Auditory canal or both). It can also be found in the middle ear or in mastoidectomy or fenestration cavity. Deep fungal infections involving the ear are extremely uncommon.

Synonyms :

1. Otitis externa mycotica
2. Fungus ear
3. Swimming ear
4. Panama ear
5. Tropical otitis
6. Mildew ear
7. Singapore ear
8. Abode ear
9. Mermaids ear



## ANATOMY

Understanding the principles of diagnosis and treatment of otomycosis is predicted on understanding the gross and microscopic anatomy and physiology of the external ear, the pathogenesis of diffuse bacterial external otitis and its variants, and the unique behaviour of fungi that affect the external ear.

The auricle is basically composed of fibroelastic cartilage to which the skin and a small portion of subcutaneous tissue are closely attached. This cartilage continues inward to form the outer portion (40%) of the external auditory canal. The entire canal, measuring approximately 2.5 cm in length, extends from the concha to the tympanic membrane. The epithelial lining of the canal is continuous with the epithelial covering of the auricle and the outer layer of the tympanic membrane. There is a very thin layer of subcutaneous tissue between the skin and cartilage of the lateral aspect of the canal, but almost no subcutaneous tissue between the skin and bone of the inner or osseous portion (60%) of the canal. The dehiscences in the anterior wall of the cartilaginous portion of the canal are known as the fissures of Santorini. They may allow spread of infection of any kind from the canal lumen into the preauricular soft tissues, parotid gland and temporo-mandibular joint. The superior

portion and some of the posterior portion of the cartilaginous canal are formed by dense connective tissue that is continuous with the periosteum of the bony canal. Just medial to the bony cartilaginous junction, in a region called the isthmus, the canal narrows owing to the convexity of the anterior and inferior walls. Medial to the isthmus, the canal courses inferiorly and ends in the inferior tympanic recess, which is immediately lateral to the tympanic membrane. This recess is commonly important in the pathogenesis of otomycosis, because it tends to be a region of accumulation of cerumen or keratinous debris and is often difficult to clean thoroughly and comfortably.

The skin of the cartilaginous portion of the external auditory canal contains numerous hairs located within hair follicles. Into the follicular canal drain the secretions of the sebaceous glands and apocrine glands, which are located beneath the epithelial surface. The glandular secretions mix with the sloughed epithelial elements to form a water repellent, acidic, waxy substance that protects the canal skin. Together the hair follicle, sebaceous gland, and apocrine gland are termed the apopilosebaceous unit.

Microscopic anatomy of the skin appendages plays a major role in the etiology of bacterial and fungal infections, it deserves a few

comments. The invagination of the canal epidermis that forms the lateral wall of the follicular canal does not directly abut the hair shaft. Rather, there is a space into which the sebaceous and apocrine gland secretions are received as noted previously. Obstruction of the drainage of the glands into the follicular canal and subsequently of the follicular canal contents into the external auditory canal proper is the primary factor in the pathogenesis of external otitis.

This sets the stage for acute diffuse external otitis, which is generally bacterial in nature. Fungus infections may be superimposed on bacterial infections or result from their treatment.

### **Incidence :**

Pathogens vary from temperate to tropical climates, but candida and Aspergillus species are common in both climates.

Studies conducted in London and Sweden showed a slight preponderance of Candida Species. Studies conducted in subtropical and tropical countries and areas such as Sicily, Nigeria, Egypt, and Burma all found Aspergillus niger to be the most common fungal isolate with Candida involving only 1% to 16% of cases of otomycosis. Other fungi isolated in significant proportion are Pencillium (upto 17% in Egypt) and Candida parapsilosis. Many cases of otomycosis are actually mixed

bacterial and fungal infections, the most common bacterial isolates being *Staphylococcus aureus*, *Pseudomonas* species, and *Proteus* species.

Beaney and Broughton have attributed the greater frequency of otomycosis in the tropical countries to changes in the composition of cerumen induced by sweating. Ferguson and associates have shown that cerumen can actually promote the growth of fungi in vitro.

Incidence is not geographically uniform. Some are confined to specific geographic regions whereas other (eg. *Aspergillus fungatus*) are ubiquitous.

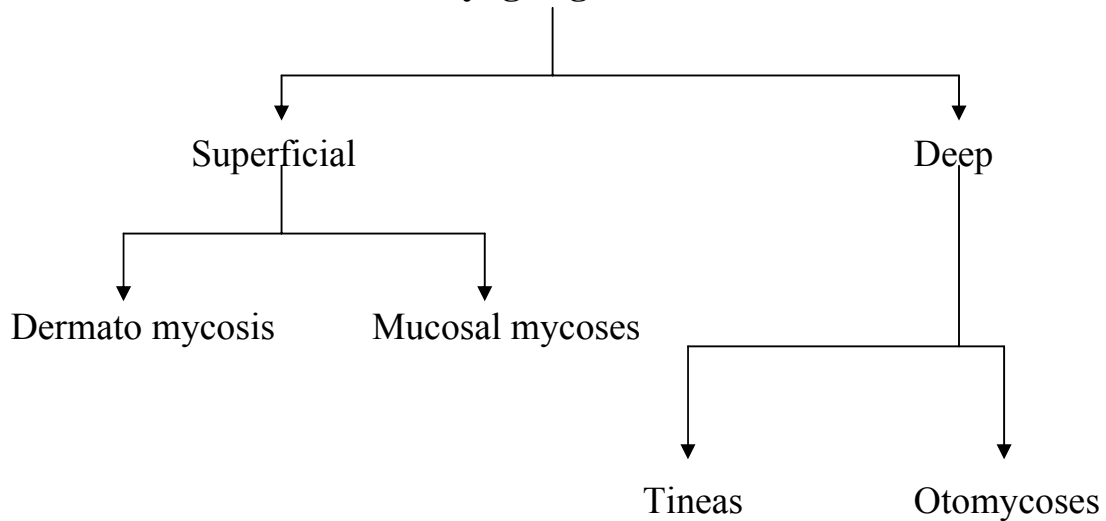
### **Aetiology : Clinical types and mycology :**

The great majority of fungi are saprobic ie. They subsist on dead organic matter. The rest of fungi are parasitic, ie. They live on other living organisms without rendering a service in return.

Fungi may also be broadly classified as moulds (filamentous fungi) yeasts (unicellular fungi) or dimorphic fungi (having both mould and yeast forms).

## Classification of mycosis

### Otolaryngological Interest



### Organisms causing otomycosis

#### A Budding forms

- a) Saccharo mycetes
- b) Toruulae
- c) Monilia
- d) Oidia – Candida Albicans

#### B Filamentous Forms

- a) Aspergilli
  - i) Aspergillus Niger
  - ii) Aspergillus Fumigatus
  - iii) Aspergillus Flavus

- iv) Aspergillus Nidulans
  - b) Penicillia
  - c) The mucors and the Rhizopus
- C) Higher Bacterial Forms : Actinomyces
- D) Others
- a) Pityrosporum
  - b) Dermatophytes
    - i) Trichophyton violaceum
    - ii) T. Schoenleinii
    - iii) T. Mentagrophytes
  - c) Scopulariopsis
  - d) Fusarium Sp

Budding Forms :

They are divided into

- a) Saccharomycetes
- b) Torulae
- c) Monilia
- d) Coccidioides

Candida – Albicans

Macroscopic Characteristics :

Colony is rapidly growing, smooth, soft, shiny and cream in colour

Microscopic Appearance :

Incubation of the unknown yeast in Serum at 37°C for two hours only candida albicans shows sprout mycelium also called GERM TUBES (Reynolds Braude phenomenon)

a) Aspergilli :

The aspergilli comprise a large family with members and many strains. They are widely distributed in nature and are frequently encountered in mycotic ear infection.

Exhibit hyphae which branch and intertwine to form a dense mat of growth the mycelium produced from the mycelium are sporulating hyphae or conidiophores bearing the reproductive bodies or spores.

Macroscopic Appearance :

In growing they produces a white, cotton like Mass of filaments which will be covered with black granules with varying degree when the

stage of sporulation is reached, for the spores of this organism are coal black and resemble fine carbon particles.

The most common aspergilli implicated in otomycosis are

1. *Aspergillus niger*
2. *Aspergillus fumigatus*
3. *Aspergillus flavus*
4. *Aspergillus nidulans*

1. *Aspergillus Niger* :

Colony Morphology :

The compact basal mycelium is white to yellow and bears abundant conidial structures which are brownish to a definitive coal black.

2. *Aspergillus fumigatus* :

Colony is rapidly growing and velvet in texture. Colour is initially white and later green to dark green. Reverse is colour less or yellow.

3. *Aspergillus flavus*.

Colony is rapidly growing, widely spread and floccose in texture. Colour varies from yellow green to dark green.

4. *Aspergillus nidulans* :



are similar in shape to the niger but smaller, and in culture are white to yellow green.

5. Pencillium :

Pencillia are another of the filamentous moulds which produce otomycosis. There are many members of this family. One of them, the pencillia Notatum, produced antibacterial substance, pencillin. Certain other members of this group grow luxuriatingly effect on the growth of such organisms often it appears that the pyogenic organisms have a suppressing effect on the moulds as they tend to disappear after a short time in mixed infections of the external auditory canal. Appearance of the colony is blue green on white mycelium. Microscopically conidiophores are borne at the ends of branched filaments in an arrangement suggestive of a tiny point brush.

6. Mucors :

Mucors produce lesions similar to those attributable to the aspergilli and penicillia with the formation of debris in the external auditory canal. They are less frequently encountered in otomycosis than the other filamentous forms. That the ears may serve as a

portal of entry for mucor mycosis in the diabetic has also been documented.

Macroscopic Colony appearance :

Mucor grows rapidly within a few days as a fluffy or floccose – cotton – candy like colony which is dull yellow in colour having branching substrate and derail mycelium. Microscopically the fungus show broad coenocytic (aseptate) hyphae that often appear twisted or tipped by ribbon like sporangium containing a sexual sporangiophores.

### **Definitions :**

Yeasts : are unicellular Fungi which occurs spherical or ellipsoidal cells and reproduce by simple budding.

Yeast like Fungi : Grow partly as yeast and partly as elongated culs resembling hyphae. The latter form a pseudomycelium (eg) candida albicans.

Moulds or Filamentous fungi : Form a true mycelia and reproduce by the formation of various types of spores.

Hyphae (Pl. Hyphae)

Is a tubular thread like structure produced by elongation of the cell.

Hyphae may be septate or non septate.

Mycelium : is a tangled mass of hyphae.

Conidium (pl. conidia) : a reproductive propagule produced on the absence of nuclear recombination.

Budding :

A sexual process of reproduction involving the formation of lateral outgrowth from a cell or hyphae.

Coenocytic :

Having non septate hyphae

Floccose :

Wooly or cottony

Fluffy:

Having a dense, deep mass of short aerial hyphae

Germ Tube :

A tube like outgrowth from a germinating spore that develops in a hyphae

Saprobe :

An organism that obtains nourishment from dead organic matter.

Saprophyte : Saprobe

Septate : Divided by cross walls

Species : Taxonomic division of agents that may contain related varieties

Spore : The reproductive unit of the fungi.

**Pre disposing factors :**

1. Environmental factors such as climate, contagious and polluting hygiene, more frequently during rainy season as the humidity increases
2. Maceration in water, showering or swimming in infected water
3. Traumatism
4. Infection – Bacterial
5. Individual susceptibility – General Immunological, status of the individual. Eg. HIV infection, Radiotherapy, chemotherapy, Diabetes mellitus
6. Wide spread use of topical antibiotic / steroid preparations which leave a medium sterilized of other organisms in which the fungus may flourish.
7. Widespread use of systemic antibiotic / steroid preparations for long duration , eg lung abscess, Eczema, collagen vascular diseases

Portal of Entry :

Directly through the skin, if it has been abraded, burned, macerated or its integrity otherwise compromised. May enter ear as air borne particles or may be introduced into ear by the patient's finger.

## **PATHOPHYSIOLOGY**

The life cycle of the average mould encountered in the ear may be reckoned as two weeks and flare ups may be anticipated at such intervals. Swimming is held responsible for infection in many cases. Probably the only relationship in most instances is the supplying of the necessary moisture that enables moulds to grow profusely or the lowering of skin resistance through maceration, thus providing a better medium for mould growth. The cerumen covering the squamous epithelial lining has an acid reaction. (Fabricant and persistein 1949) it collects in the outer third of the ear canal providing a chemical barrier to infection.

Many local factors may interfere with the normal defenses against infection. Fastidious individuals who feels the presence of cerumen in the ear as a sign of uncleanliness, carefully clean wax from their own and their children external auditory canals. Removing the wax eliminates an important barrier to infection, since its lipid content, tends to prevent

moisture within the external canal from entering the pilosebaceous units and causing maceration of the squamous epithelium of the external auditory canal. In addition to removing cerumen, cleaning the external auditory canal whether performed with cotton tipped Swabs, bobby pins, finger nails or tip of a pencil or pen, match stick or hair grip. Capable of damaging the protective horny layer may allow entry of organisms. The acid pit of cerumen inhibits the growth of bacteria and fungi. Because of the gutter beyond the isthmus, it is difficult to dry the canal, which will then become macerated, creating a dark medium ideal for the growth of bacteria and fungi. A narrow canal or excessive cerumen may cause the accumulation of water within the external canal during swimming and lead to recurrent, Otitis externa (peterkin 1974). Washing the ear canal with soapy water is a predisposing factor because it often leaves a film of alkali along the canal wall. The bacterial and fungal contamination of swimming area is another important causative factor in ear infections. Many patients in times of emotional stress, have a habit of scratching their ears with finger nails or other objects. The feeling of fullness caused by serous otitis media may cause a patient to scratch and dig at the ears and lead to otitis externa (Morrison and Mackay 1976). The mild

inflammation caused by scratching produces itching that leads to further scratching with this cycle continuing until the skin is infected.

Many systemic conditions such as anaemia, vitamin deficiency, endocrine disorders and various forms of dermatitis, lower host resistance to infection. Seborrhic areas of the body tend to have a lower pH than normal skin and predispose patients to infection in these areas (Fabricant and Peristein 1949).

The heat, humidity and increased swimming in warmer climates tends to increase the moisture within the external auditory canal, leading to the growth of bacteria and fungi. However infection whether fungal or bacterial is probably secondary in most cases (Rasmussen 1974).

Mycologic studies suggest that fungi have limited etiologic significance in otitis externa (Singer et al, 1952 ; Jones 1971) Singer found a diverse mycologic flora in both normal and infected ears.

Moulds grow in the upper layers of epithelium and their growth produces itching and discomfort in the ear. The local reaction may at times become a severe atopic reaction if the patient is extremely susceptible to a given mould. Vesiculation and ulceration may take place. The infection rarely extends to the cartilage of the ear. Perforation of the ear drum may occur but is infrequent. Moulds may be mixed with

pyogenic organisms in chronically infected ears, but the pyogens tend to crowd out the moulds. This occurs even with certain of the penicillia but probably does not occur in association with the penicillium notatum from which penicillium is derived.

The sequence of pathogenic changes produced by moulds in the external ear is as follows.

1. Implantation of the organisms in the external ear
2. Growth of the organisms follows the rate depending on conditions of temperature, moisture or pre existing irritation.
3. Invasion of epithelium occurs with attendant itching and discomfort which may be quite severe.
4. Exfoliation of epithelium ensues as nature attempts to overcome the infection by casting off upper most cells.
5. Denudation occurs from exfoliation as the top layers of epithelium are cast off and the canal becomes filled with debris.
6. Superficial ulceration and lizematoid dermatitis result if the pathologic process goes for enough. The changes do not always proceed through the entire sequence, some times the moulds produce changes of the mildest imaginable character which may be over looked.



Mycotic infections of the Inner ear can result from an extension of an organism colonized in the auditory canal by extension of a process in surrounding tissues.

### **CLINICAL FEATURES**

#### **A. Symptoms :**

1. Irritation and pruritus of the external canal, often intense and worse at night. Irritation is mostly found when the infective organism is *Aspergillus niger*. There is a sensation of discomfort which is more diffuse in the ear canal than localized in the deeper part. *Candida* infection causes marked itching.
2. Persistent, Scanty, Colourless discharge from the ear. Mucus being a fungal metabolic product appears as discharge. Excessive discharge is associated with mixed infection.
3. Discomfort and mild to severe pain in the ear occasionally. Mostly seen in cases, where ear is infected with *Aspergillus flavus*, mixed infection with Gram negative organisms or mixed infection with *Candida* and *Aspergillus*. Headache is some times associated with pain.
4. A sensation of pressure or fullness in the ear.
5. Varying degrees of deafness

6. Tinnitus

7. Vertigo

B. Signs :

i) Auricle is normal in most cases. In severe cases small ulcerations with crust formation may be present on lateral surface.

ii) The external acoustic meatus may contain a mass formed of epithelial debris, exudates, cerumen and the fungus.

Fungal appearance :

The colour of the mass which is usually grey or black is mainly determined by the type of fungus concerned. (Wet newspaper or blotting paper or a cotton wool like appearance) and has a peculiar musty odour. In infection with *aspergillus niger* fruiting heads may be seen as black specks in the debris. *Mucors* produce soggy debris which resembles putty in appearance.

Occasionally an inactive dry form occurs in which the canal is lined by mould giving a fluffy appearance due to the presence of tiny mycelia (dry mycelial mat)

*Candida* infections generally show as white deposits on Magenta coloured skin when the debris is removed it rapidly recovers in 24 hours.

Otoscope Appearance :

1. Conidiophores of *Aspergillus Niger* : black headed
2. Conidiophores of *Aspergillus Fumigators* : pale blue or green
3. *Candida albicans* : Seen as white or cream coloured deposits.

The underlying canal skin is often inflamed and granular, due to invasion by fungal mycelia and be seen in all cases. In rare cases excoriation and ulceration with marked extensive shedding of the epithelium and deep ulceration can be seen usually associated with a flavus and with pathogenic bacteria.

iii) Tympanic membrane :

In most cases, it is normal with normal mobility and normal hearing. In a few cases the surface of the tympanic membrane is reddened and scaly, and there is erosion or ulceration of the external epithelial layer and the membrane itself may be oedematous.

Further Investigations :

In many patients the typical appearance of otomycosis is masked by debris and the correct diagnosis can only be reached by laboratory techniques mainly culture. This is especially true for *Candida albicans* which has no special visual diagnostic features. A swab should therefore be sent for fungal culture.

Diagnosis :

1. Above mentioned symptoms signs
2. In the mist stage, at which patients with otitis externa usually first present themselves, mycelial threads, conidiophores not visible to naked eye may some times be identified with the microscope.
3. Confirmed by culture.

## MANAGEMENT

1. Antibiotic and or steroid drops should be discontinued if they are being instilled.
2. Removal of fungal mass epithelial debris and discharge from the external canal or mastoid cavity – Repeatedly and thoroughly by forceps or suction or syringing or cautiously blow a stream of air into the canal through a fine cannula and dry thoroughly by swabbing liquid petroleum on the swab used in cleaning the ear lessens the burning sensation when metacresyl acetate is to be employed in the subsequent treatment.

If furuncle complicate extreme gentleness in cleaning must be observed or cleansing may have to be delayed until local sensitiveness is lessened, which can usually be accomplished within twenty four hours. If there is excessive epithelial debris along with otomycosis then metacresyl acetate (cresatin) which is a keratolytic is introduced into the external auditory canal on a cotton wick and is allowed to remain for twenty four hours. After twenty four hours the cotton wick is removed at which time the canal can usually be cleansed with little discomfort as the medication is also anaesthetic. The epithelium of the canal will be white from contact

with the drug. The top layer will be detached and this epithelial debris can be easily wiped away. The wick is reinserted and wet with metacresyl acetate.

The treatment is employed for three to four days in succession and then a bland application is substituted. Icthyol iodine is of value at this stage.

Iodine ointment (2%) in combination with Tannic acid (2%) is also an excellent local application following cresatin treatment.

Next one of the following fungicides may be applied :

1. Nystatin :

Effective for candida infections but less active against Aspergillus group. Nystatin in boric powder, consisting of 1,00,000 units of Nystatin gm of powder 3 times week x 3 weeks.

2. Clotrimazole : Available as 1.1 cream or drops or lotions. Phenyl (z-chlorophenyl) 1 – imidazole – methane is a chlorinated trityl imidazol 1, effective against candida and dermatophytes and also for aspergilli infection.

3. Amphotericin B : Available as cream and as 3% solution and 0.15% drops for topical application. Very effective for candidal infection can be fungistatic or fungicidal.

4. Econazole : Available as solution (Econazole nitrate) and as cream (1%) Broad spectrum – more effective for Aspergillus. Also active against some gram positive bacteria. (Staphylococci and Streptococci and Dermatophytes).
5. Miconazole : Highly effective against dermatophytes and candida infections used as a 2.1 cream applied once or twice a day for 10 days.
6. Gentian violet 2.1 Available as drops (recently some evidence of carcinogenicity). Discolours the ear canal and this interfere with clinical examination.

Other topical antifungal agents are ketoconazole, Natamycin, Tolciclat, Bifonazole, Fenticonazole, Oxiconazole, Tioconazole, ciclopiroxolomine, Tolnafate, Haloprogin, Flucytosine, Acetic acid, Whitfield ointment, selenium sulfide, undecylenic acid, triacetin etc.

Minimal length of treatment :

A month of drug treatment is usually required because the antifungal agents used are not sporicidal and it is necessary that the period of treatment covers germination time. It may be advisable to give short gaps in the period of treatment to ensure all spores have germinated before deciding to terminate therapy.

Prevention :

Accomplished by strict attention to the predisposing causes.

1. Water should be prevented from entering the ear
2. Avoidance of external ear trauma
3. Use of alcohol, medicated or plain in the ears after swimming  
mercuric cyanide (1:5000) in ethyl alcohol (70%) is a satisfactory liquid to use.

Ear stoppers do no good unless their use is followed by some antiseptic in the canal. Divers exposed to water for long periods of time may also use acidic alcohol.

4. During Summer months with their high humidity special efforts are needed to maintain ear dry.
5. Indiscriminate use of topical antibiotics / steroid preparations should be avoided.



## **MATERIALS AND METHODS**

This study was conducted at the Government Rajaji Hospital attached to Madurai Medical College for a period of one and half year from 2005 to 2006. Patients presenting with symptoms and signs of Otomycosis were selected as the study population.

The Otomycosis study group consisted of 150 patients ( 80 males and 70 females ) aged between 7 and 80 years who had been clinically diagnosed as Otomycosis. Their infection was diagnosed clinically on the basis of symptoms, pruritis, otalgia, blockage, hearing impairment and the presence of fungal debris in the external ear.

The following patients were included in the study

1. Patients with otitis externa and otoscopic evidence of otomycosis.
2. Patients with CSOM and with otoscopic evidence of Otomycosis.
3. Post mastoidectomy patients with otoscopic evidence of otomycosis

Exclusion criteria

1. Patients with otitis externa and without otoscopic evidence of fungi.

For patients presenting with Otomycosis with strict aseptic precautions, after swabbing the pinna and adjacent area of the ear with antiseptic (Dettol), the debris in the external auditory canal was collected by moist sterile swabs or by sterile forceps. The collected specimen was promptly transported to the lab and processed on the same day

### **10% POTTASIMUM HYDROXIDE MOUNT**

Direct microscopy with 10% Potassium hydroxide was done on the specimen.

Procedure:

- a. The material to be examined was placed on a clean glass slide.
- b. A drop of 10% KOH, was added to the material and mixed.
- c. A cover slip was placed over the preparation with out any air bubbles
- d. The KOH preparation was kept at room temperature until the material was cleared. The slide was warmed at times to speed the clearing process.
- e. The preparation was examined by bright field microscopy.

The presence of fungal elements (hyphal elements, Conidiophore, spores) was looked for.

The specimen was subjected to both fungal and bacterial culture.

## **Fungal culture**

The specimen was inoculated on Sabourauds dextrose agar & Czapek's agar on the same day. Cycloheximide / Actidione was not added to the Sabouraud's dextrose medium, as they inhibit a large number of saprophytes. However Gentamicin 80mg was added to one litre of the medium to minimize bacterial contamination. Czapek's medium with Gentamicin was also prepared as it was the standard medium based on which all Aspergilli are speciated.

All inoculated media were incubated both at 25°C and 37°C and were observed daily for a week and twice weekly for another one week. The use of a variety of culture media at incubation temperatures 25°C and 37°C increased the chance of recovery of fungal pathogens.

## **GROSS MORPHOLOGY**

The following factors were noted in the growth of the fungus

### **1. RATE OF GROWTH OF THE FUNGUS**

- a. rapid grower grew within 2-5 days
- b. intermediate grower grew within 6 – 10 days
- c. slow grower grew within 2 – 3 weeks

## **2. SURFACE**

- a. flat
- b. hemispherical
- c. raised
- d. folded
- e. verrucose
- f. cerebriform

## **3. TEXTURE**

- a. yeast like
- b. glabrous
- c. powdery
- d. granular
- e. velvety
- f. cottony

## **4. PIGMENTATION**

The pigmentation on the surface of the colony was dependent on the color of the spores and did not appear until significant spore formation.

The pigmentation on the reverse of the colony was formed by soluble pigments in the medium.

The surface of the colony was looked for blue-green, black, cinnamon brown, yellow green, blue gray or white pigmentation.

The reverse was looked for white, golden, red brown, olive, yellow or purplish red pigmentation

### **Lactophenol cotton blue mount (Wet mount )**

On a clean glass slide, a drop of lacto phenol cotton blue was kept. A small piece of the fungal growth was kept on it and teased using teasing needle. A cover slip was applied over it without any air bubbles. It was then viewed under light microscope for microscopic morphological features, first under low power objective and then under high power objective.

### **MICROSCOPY**

The basic microscopic morphology of **Aspergillus** species were looked for.

The following features common to all Aspergilli were noted.

1. Presence of septate and hyaline hyphae.
2. Presence of spherical conidia arising from the phialides forming radial chain.

## **Penicillium**

When the growth on SDA showed shades of green or blue green with velvety to powdery surface, wet mount was put by teasing the growth. Penicillium was confirmed by the following microscopic features:-

- 1 .Septate hyaline hyphae
- 2 .Brush like conidiophore

## **Candida**

If the growth was creamy white with curdy odour, Grams staining was done, if gram positive budding cells were seen Candida was confirmed. It was further speciated by germ tube test, Chlamyospore formation test, sugar fermentation test and sugar assimilation test.

## **BACTERIAL CULTURE**

Similarly bacterial culture was put up from the aural swabs in Nutrient agar, Mac conkey and Blood agar plate. The inoculated plates were incubated at 37°C for 18 – 24 hours. The next day it

was examined for growth of the organisms. Colony morphology was noted. Grams staining, motility and biochemical reactions were put up. The bio chemical reactions used for identification were:

- Catalase production,
- Oxidase production,
- Triple sugar iron fermentation,
- Indole production,
- Citrate utilization,
- Urease production,
- Coagulase production.

If no growth had occurred by 72 hours the samples were considered negative for bacterial culture. Anaerobic culture was not put up.

## **ANTI FUNGAL SUSCEPTIBILITY TESTING**

**Broth microdilution method was used for the determination of minimum inhibitory concentration (MIC) for Clo-trimazole against Aspergillus species.**

### **PROCEDURE:**

**“Roswell Park Memorial Institute Medium” (RPMI 1640)** with glutamine and without sodium bicarbonate to which 2% glucose was added was used for doing anti fungal susceptibility testing. It was buffered with **Morpholinopropanesulfonic acid (MOPS)** as it was did not inhibit the action of anti fungal drugs.

### **Inoculation of assay plates:**

1. One micro titre plates one having doubling dilutions of clotrimazole were taken
2. 100µl of the fungal spore in PBS with Tween was added into all wells in the appropriate row for clotrimazole. The final inoculum was  $5 \times 10^5$  conidia/ml.
3. The microtitre plate was covered with a sterile lid and incubated for 48 hours at 37°C in a moist chamber.



## **Interpretations**

The MIC was read visually. The concentration of drug in the first well in which there was no growth gave the MIC value.

### **MIC for Clo – trimazole**

**MIC - 0.1 - 4 micro gram / - sensitive**

## **AURAL TOILETTING & APPLICATION OF CLO-TRIMAZOLE**

Aural toileting by dry mopping suction clearance & syringing and by forceps was done to remove fungus every week for 3-4 weeks.

Irrespective of culture results 1.1 clotrimazole ear drops four drops every 8 hours for four week was tried. Patients were examined at weekly intervals where fungal infection persisted the treatment was repeated patients presenting with severe ear ache due to canal wall odema were treated initially with Icthammol glycerine packing daily for 4 days and anti inflammatory drugs orally. In some cases syringing done to remove fungal mass once pain oedema reduced. Clo trimazole drops was applied.

## RESULTS

A total of 150 cases of Otomycosis were selected for this study, from the ENT department of Government Rajaji Hospital, Madurai for a period of one and half year from 2005 to 2006.

Month wise distribution of the 150 Otomycosis cases was made. It was found that there were 10 cases in January (6.67%), 5 cases in February (3.33%), 7 cases in March (4.67%), 9 cases in April (6%), 9 cases in May (6%), 14 cases in June (9.33%), 13 cases in July (8.67%), 16 cases in August (10.67%), 18 cases in September (12%), 19 cases in October (12.67%), 18 cases in November (12%) and 12 cases in December (8%). Table No. 1.

Table - 1

### Monthwise Prevalence of Otomycosis

Sl.No.	Month	Number
1	January	10 (6.67%)
2	February	5 (3.33%)
3	March	7 (4.67%)
4	April	9 (6%)
5	May	9 (6%)
6	June	14 (9.33%)
7	July	13 (8.67%)

<b>8</b>	<b>August</b>	<b>16 (10.67%)</b>
<b>9</b>	<b>September</b>	<b>18 (12%)</b>
<b>10</b>	<b>October</b>	<b>19 (12.67%)</b>
<b>11</b>	<b>November</b>	<b>18 (12%)</b>
<b>12</b>	<b>December</b>	<b>12 (8%)</b>

Table - 2

**Agewise and Sexwise Prevalence of Otomycosis**

<b>Sl.No.</b>	<b>Age Group</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
<b>1</b>	<b>0-15</b>	3(2%)	2 (1.33%)	5 (3.33%)
<b>2</b>	<b>16-30</b>	<b>33(22%)</b>	<b>22</b> <b>(14.67)</b>	<b>55 (36.67%)</b>
<b>3</b>	<b>31-45</b>	24(16%)	26 (17.3%)	50 (33.3%)
<b>4</b>	<b>46-60</b>	17(11.3%)	14 (9.3%)	31 (20.6%)
<b>5</b>	<b>Above 60</b>	3(2%)	6 (4%)	9 (6%)
	<b>Total</b>	80 (53.3%)	70 (46.7%)	150 (100%)

More patients were in second to fourth decade.

## Laterality

Vast majority of study group patients with otomycosis presented with unilateral disease irrespective of predisposing factors.

Laterality	No.of patients	Percentage
Unilateral	145	96%
Bilateral	5	3%

Among the 150 Otomycosis patients, 39 were house wives and house maids (26%), 38 were persons doing miscellaneous work mainly indoors (25.33%) like retired persons, weavers, electricians etc., 29 were agriculturists (19.3%), 23 were students. (15.3%) and 21 were labourers mainly doing outdoor work (14%). Table No. 4

Table No - 4

### Occupation wise distribution of cases

Sl.No.	Occupation	Number
<b>1</b>	<b>Housewife and house maid</b>	<b>39 ( 26% )</b>
<b>2</b>	<b>Miscellaneous indoor worker</b>	38 (25.3%)
<b>3</b>	<b>Agriculturist</b>	29 (19.3%)
<b>4</b>	<b>Student</b>	23 (15.33%)
<b>5</b>	<b>Labourer</b>	21 (14%)
	<b>Total</b>	150 (100%)

The various pre disposing factors to otomycosis were analyzed and were illustrated in table below

### Distribution of pre disposing factors

S.No.	Predisposing factor	Total Number
1.	Chronic suppurative otitis media with & without ear drops	45 (30%)
2.	No predisposing factor	28 (18%)
3.	Swimming and taking bath in ponds	23 (15%)
4.	Ear drops only	17 (11%0
5.	Previous H/o Ear Infection	14 (9%)
6.	Diabetes mellitus	11 (7%)
7.	Post mastoidectomy	8 (5%)
8.	Hearing aid users	2 (2%)
9.	Ear syringing	1 (0.6%)
10.	HIV	1 (0.6%)

The patients presenting with Otomycosis were analyzed symptom wise and it showed that 105 cases presented with itching. (70%), 95 presented with pain (63.3%), 67 with ear block (44.67%) and 45 with discharge (30%). Table No. 6.

Table - 6  
**Symptom wise distribution of cases**

<b>Sl. No.</b>	<b>Symptom</b>	<b>Number</b>
<b>1</b>	<b>Itching</b>	<b>105 (70%)</b>
<b>2</b>	<b>Pain</b>	95 (63.3%)
<b>3</b>	<b>Ear block</b>	67 (44.67%)
<b>4</b>	<b>Discharge</b>	45 (30%)

The 150 Otomycosis samples were processed for fungal culture and it was found that 141 out of 150 samples gave positive results. (94%). Among the 141 positive fungal isolates 62 were *Aspergillus flavus* (43.9%), 48 were *A.niger* (34%), 13 were *A. terreus* (9.2%), 5 were *A. fumigatus* (3.54%), 1 was *A. glaucus* (0.07%), 3 were *Candida albicans*(2.12%),1 was *Candida parapsilosis* (0.07%) and 8 were *Penicillium* (5.7%). Table Nos. 7 & 8.

Table No - 7

**Fungal Culture Positivity in Otomycosis**

<b>Sl. No.</b>	<b>Number Tested</b>	<b>Positive Culture</b>	<b>Negative Culture</b>
1	150	141(94%)	9 (6%)

Table - 8

**Fungal Isolates in Otomycosis**

<b>Sl. No.</b>	<b>Fungal Isolate</b>	<b>Number</b>
1	<b>Aspergillus flavus</b>	<b>62 (43.9%)</b>
2	<b>Aspergillus niger</b>	48 (34%)
3	<b>Aspergillus terreus</b>	13 (9.2%)
4	<b>Aspergillus fumigatus</b>	5 (3.54%)
5	<b>Aspergillus glaucus</b>	1 (0.7%)
6	<b>Candida albicans</b>	3 (2.12%)
7	<b>Candida parapsilosis</b>	1(0.7%)
8	<b>Penicillium</b>	8 (5.7%)

The fungal isolates were analysed according to occupation. It was found that among the 39 house wives and maids 38 had fungal isolates. Among this 9 were *A. flavus* (25.71%), 14 were *A.niger* (40%), 8 were *A. terreus* (17.14%), 2 were *A. fumigatus* (5.71%), 3 were *Candida*

albicans (8.57%) and 1 was penicillium and 1 candida parapsilosis (2.85%).

Among the 38 indoor workers 33 were positive for fungal culture. Out of this 33 isolates there were 13 isolates of *A. flavus* ( 35.14 %), 15 isolates of *A. niger* (40.54 %), 2 isolates of *A. terreus* (10.81 %), 1 isolate of *A.fumigatus* (2.7%) and 2 isolates of *Penicillium* ( 10.81 %). Among the 29 agriculturist fungal isolates. Among this 18 were positive for *A. flavus* (62.07 %), 10 for *A. niger* (34.48 %).

Among the 23 students, 20 were positive by culture. Among these 9 were *A. flavus* (47.37%), 3 were *A. niger* (15.79 %), 2 were *A. terreus* (10.53%), 3 were *A. fumigatus* (10.53%), 1 was *A. glaucus* (5.26%) and 2 were *Penicillium* (10.53 %). Among the 21 labourers all were positive for fungal culture. Among this 13 had *A. flavus* (61.90 %), 6 had *A. niger* ( 28.57 %) and 2 had *Penicillium* (9.52%).Table11.



**TABLE NO. 11**

Occupationwise distribution of Fungal Isolates										
Occupation	No. Tested	A. flavus	A. niger	A. terreus	A. fumigatus	A. glaucus	C. albicans	C. parapsilosis	Penicillium	Total
Housewife and Maid	39	9 (25.17%)	14 (40.0%)	8 (17.14%)	2 (5.71%)	0	3 (8.57%)	1 (2.85%)	1	38 (100%)
Miscellaneous indoor workers	38	13 (35.14%)	15 (40.54%)	2 (10.81%)	1 (2.70%)	0	0	0	2 (10.81%)	33 (100%)
Agriculturist	29	18 (62.07%)	10 (34.48%)	0	0	0	0	0	0	28 (100%)
Students	23	9 (47.37%)	3 (15.79%)	2 (10.53%)	2 (10.53%)	1 (5.26%)	0	0	3 (10.53%)	20 (100%)
Labourers	21	13 (61.90%)	6 (28.57%)	1	0	0	0	0	2 (9.52%)	21 (100%)

### Pre disposing factor wise Analysis of Fungal lesion

Predisposing factor	Number	A.Flavus	A.Niger	Candida	Others
Chronic supportive otitis media	45	30	12	-	3
No disposing factor	28	7	6	-	15
Ear drops	17	12	3	-	2
Diabetes mellitus	11	2	5	2	1
HIV	1	0	1	0	0

The Bacterial isolates isolated from Otomycosis cases were as follows:

Out of 150 specimens only 135 gave positive bacterial culture. There were 40 (29.63%) isolates of coagulase negative Staphylococcus (CONS), 32 (23.70%) of Micrococci, 13 (9.63%) of Staph aureus, 16 (11.85%) of Pseudomonas aeruginosa, 13 (9.63%) of Proteus mirabilis, 8 (5.93%) of E. coli, 9 (6.67%) of Klebsiella, 3 (2.72%) of Proteus vulgaris and 1 (1.11%) of Coliforms. Table 13.

Table No. 13

**Bacterial Isolates in Otomycosis**

Sl. No.	Bacterial Isolates	Number
1	<b>CONS</b>	<b>40 (29.63%)</b>
2	<b>Micrococci</b>	32 (23.7%)
3	<b>Staph aureus</b>	13(9.63%)
4	<b>Pseudomonas aeruginosa</b>	16(11.85%)
5	<b>Proteus mirabilis</b>	13 (9.63%)
6	<b>Escherichia coli</b>	8 (5.93%)
7	<b>Klebsiella aerogenes</b>	9 (6.67%)
8	<b>Proteus vulgaris</b>	3 (2.22%)
9	<b>Coliforms</b>	1 (0.74%)
10	<b>Total</b>	135 (100%)

Out of the 80 males 68 were positive for both bacterial and fungal culture (45.33%), 7 were positive only for fungal culture (4.67%) and 8 were positive only for bacterial culture (3.33%). Out of the 70 females 58 were positive for both bacterial and fungal culture (38.67%). 8 were positive only for fungal culture (5.33%) and 1 were positive only for bacterial culture (2.6%). Table No. 14.

Table 14

**Culture positivity in Otomycosis**

<b>Sl.No.</b>	<b>Culture</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
<b>1</b>	<b>Both</b>	68 (45.33%)	58 (38.67%)	126 (84%)
<b>2</b>	<b>Fungus only</b>	7 (4.67%)	8 (5.33%)	15 (10%)
<b>3</b>	<b>Bacteria only</b>	8 (3.33%)	1 (2.67%)	9 (6%)

Clinical response to clo trimazole – predisposing factorwise.

Predisposing factor	Responded	Recurrence
Chronic supportive otitis media	44	1
No disposing factor	27	1
Swimming and taking bath in ponds	23	-
Ear drops	7	-
Previous ear infection	14	-
Diabetes mellitus	7	4
Post mastoidectomy	8	-
Hearing adverse	2	-
HIV	1	

#### **Sensitivity to Clo-trimazole :**

Out of the 62 isolates of *A. flavus*, 61 (98.4%) were sensitive and 1 (1.6%) was resistant, out of 48 *A. niger* isolates, 45 (91.6%) were sensitive and 3 (8.3%) were resistant. All the 13 (100%) isolates of *A. terreus* were sensitive. Out of the 5 *A. fumigatus* isolates, 4 (80%) were sensitive and 1 (20%) resistant. The single *A. glaucus* isolate was sensitive (100%). Of **Candida** 3 isolates 2 were sensitive and one was resistant. **All the 8 Penicillium** isolates were sensitive.

Table 17  
**Sensitivity to Clo-trimazole**

Sl. No.	Isolate	No. of Isolate	Sensitive	Resistance
1	<i>A. flavus</i>	62	61 (98.4%)	1 (1.6%)
2.	<i>A. niger</i>	48	45 (91.6%)	3 (8.3%)
3.	<i>A. terreus</i>	13	13 (100%)	0
4.	<i>A. fumigatus</i>	5	4 (80%)	1 (20%)
5.	<i>A. glaucus</i>	1	1 (100%)	0
6.	<i>Candida albicans</i>	3	2 (100%)	1
7	<i>Candida parapsilosis</i>	1	1 (100%)	0
8	<i>Penicillium</i>	8	8 (100%)	0

## DISCUSSION

150 cases of clinically diagnosed Otomycosis were selected as the study population.

Otomycosis is a common pathology of the external ear. It is common in India. The high incidence can be attributed to the increased heat and humidity, the dusty environment and the fact that a large proportion of the population is constituted by outdoor labourers and persons of low socio economic status.

The study was conducted for a period of one year. The incidence was more during the **North East monsoon** from October to January 59 (39.3%) and **South West monsoon** from June to September 61 (40.7%). This correlates with the study of Than K M. et al who found increased incidence of Otomycosis during the rainy seasons <sup>37</sup>. Agrawal S K et al also proved that high humidity during the monsoon months favoured the development of Otomycosis <sup>1</sup>.

In this study, it was observed that **males were more commonly affected** than females, 80 (53.3%) males had Otomycosis against 70

females (46.6%). This is in accordance with the study of Ravinder Kaur et al who had shown a high incidence in males <sup>30</sup>. Our study is in accordance with the study of Yassin A et al who showed higher incidence in males mainly because of occupation and cleaning the ear with matchsticks <sup>43</sup>. This is in contrast to the study of Yehia et al, who showed that Otomycosis was common among females in Northern Iraq (65.44%) <sup>45</sup>.

The present study revealed higher incidence of disease among the age group of 16 -30 years 55 (36.67%) compared to other age groups. This is in favour of the study of Yehia M M et al, showing that young adult of the age group 16 – 30 years were commonly affected <sup>45</sup>. The study of Ravinder Kaur et al is in support of our study, showing 41.1% of incidence in the age group 16 – 30 years <sup>30</sup>. But Garcia Martos et al in their study showed that Otomycosis was seen predominantly in the age groups of 31 – 40 years and over 50 years <sup>13</sup>. In contrast Mocatela Ruiz et al in their study showed no difference regarding age and sex of the patients <sup>24</sup>.

Our observation showed that Otomycosis was unilateral in 145 (93.3%) cases in spite of various predisposing factors. This Observation is supported by the study of Yehia et al and Ravinder Kaur et al <sup>45,30</sup>. The



unilateral occurrence of disease support the fact that the disease is not highly infectious and other local factors play important role in the occurrence of Otomycosis.. In our study there was no predominance between the either sides of the ear. But Agrawal et al showed that the right ear was found to be more prone to Otomycosis than the left ear <sup>1</sup>.

### **Predisposing factors**

Chronic suppurative otitis media :

In this study, presence of CSOM was the main predisposing factor for the occurrence of Otomycosis. Our study is favoured by Vennewald I et al who showed 89.84% of his patients with Otomycosis had CSOM as the predisposing factor <sup>40</sup>. Talwar P et al showed that 49% of their CSOM cases had positive fungal culture <sup>35</sup>. Our study is also supported by Agrawal et al <sup>1</sup>.

### **No predisposing factors :**

It was observed that there was no predisposing factors in 28 (30.1%) of cases of clinically diagnosed Otomycosis. This is supported by the study of Agrawal et al, who had done a study on Otomycosis in 70 cases showed no predisposing factor and showed 42% of fungal isolates

### **Antibiotic / Steroid ear drops**

In our study other predisposing factor for Otomycosis was repeated usage of Antibiotic / Steroid drops. This correlates with the study of Chander et al showing 56.25% for ear drops <sup>4</sup>. Jackman et al showed that all 26 patients with acute onset Otomycosis when enquired gave history of using Ofloxacin ear drops for otorrhoea (100%) <sup>18</sup>. Garcia et al showed that Antibiotic / Steroid drop usage was the causative factor for 40% of Otomycosis <sup>13</sup>.

### **Symptoms**

In our study the commonest symptom was itching 105 (70%) followed by pain 95 (63.3%), ear block 67 (44.67%) and ear discharge 45 (30%). Paulose et al found that itching was the most common symptom (88%) followed by ear block (87.5%), discharge (30%) and tinnitus (22%) <sup>29</sup>. Oliveri S et al also found itching as the characteristic symptom of Otomycosis followed by pain and loss of hearing <sup>28</sup>. In contrast Ravinder et al found ear block as the commonest symptom (93.7%) followed by itching (71.5%) <sup>30</sup>.

## **Fungal isolation**

In this study, 141 out of a total 150 cases were positive by fungal culture giving an isolation rate of 94%. Similarly Ravinder Kaur et al had 74.74% positive fungal culture<sup>30</sup>. Yassin et al also had 81.08% culture positivity from clinically diagnosed cases<sup>43</sup>.

In this study there was no fungal growth in 6% of clinically diagnosed cases of Otomycosis. This may be due to previous treatment or acute exacerbation of chronic disease.

In this study among 141 patients positive for fungal growth, **Aspergillus** was the most common isolate 129 (91.48%) followed by **Penicillium** 8 (5.7%), and **Candida** 3 (2.91%). This is supported by Yehia M M et al who had 92.1% Aspergillus isolates in his study<sup>45</sup>. Our study correlates with the findings of Than K M et al who also found Aspergillus as the commonest species isolated in their study<sup>37</sup>.

Among the 129 Aspergillus isolates, 62 (43.9%) were **A. flavus**, 48 (34.04%) were **A. niger**, 13 (9.2%) were **A. terreus**, 5 (3.54%) were **A. fumigatus** and 1(0.7%) was **A. glaucus**. **Aspergillus flavus** being the most common isolate 62(43.9%) in our study. This is supported by Yavo

W et al showing *A. flavus* 20.4%<sup>44</sup>, Oliveri et al showing 13.4% of *A. flavus*<sup>28</sup> and Chander et al showing 33.7% *A. flavus*<sup>4</sup>.

The increased incidence of *A. flavus* and *A. niger* may be due to the spores, that are found profusely in the atmosphere during the rainy season, because of the abundance of the dead organic matter on which they grow. They thrive on fallen leaves and in compost heaps and may be found throughout vegetation materials<sup>6</sup>.

When the fungal isolates were analyzed sex wise it was found that **A. flavus** was the commonest isolate among **males** 44 (28.37%) and **A. niger** the commonest isolate in **females** 29 (17.73%). This can be due to the fact that *A. niger* could be cultured from house dust and females spend more time indoors<sup>12</sup>.

When fungal isolates were analysed occupation wise it was found that **A. flavus** was the most common fungus isolated in **agriculturists** and **labourers** (62%) followed by students (47.37%). This is in accordance with the study of Ravinder Kaur et al that fungal spores are more abundant in the outdoor atmosphere and these people spend more time outdoors<sup>30</sup>.

**A.niger** was the most common isolate among **housewives** (40%) and **indoor workers** (40.54%). They spend more time indoors and are more exposed to house dust. This is in favour of Frank E. Lucente's statement that *A. niger* could be cultured from house dust <sup>12</sup>.

**A. flavus** was the commonest isolate among the groups using ear drops. But Talwar P et al isolated mainly **Penicillium** and *A. niger* as the important isolates in Otomycosis occurring after using antibiotic drops <sup>35</sup>.

### **Bacterial Isolates from Otomycosis**

In this present study coagulase negative Staphylococci was isolated in 40 (29.63%), Micrococci in 32 (23%). Staph aureus 13 (9.63%), Pseudomonas 16 (11.85%), Proteus species 16 (11.85%) and Klebsiella 9 (6.67%). Similar bacterial isolates were seen in the study of Darko E et al for coagulase negative Staphylococci (CONS) and Staph aureus <sup>7</sup>. But in contrast Arshad M et al have shown 38% isolation rate for Staph aureus, 38% for Pseudomonas aeruginosa and the 24% Proteus, Klebsiella, E. coli and Enterococci <sup>2</sup>.

When both bacterial and fungal cultures were done for 150 cases of Otomycosis only fungi was isolated from 10% of cases, only bacteria was isolated from 6% of cases and mixed growth of both bacterial and fungi was seen in 84% of cases. More number of **mixed organisms** 84% grown in Otomycosis is supported by Frank E. Lucente <sup>12</sup> who observed that most cases of Otomycosis were actually mixed bacterial and fungal infections. Our study is further supported by Darko E et al who showed mixed isolates in 77% of Otomycosis cases. Isolation of fungi alone was more in cases using ear drops (25%). This is supported by Garcia et al showing 40% <sup>13</sup>, Chander et al showing 54% <sup>4</sup> and Yavo et al showing 40% <sup>44</sup>.

Mixed growth of both bacteria and fungi was seen in 100% cases in trauma, and bathing in ponds 90.16% in CSOM cases. This is supported by Frank E Lucente's observation that most cases of Otomycosis are mixed infections. It is also supported by Hawke et al who showed "ear mould induced otitis externa" was caused by both bacterial and fungal organisms <sup>17</sup>.

In the present study, among 62 *A. flavus* isolated 61 (98.4%) were susceptible to clo-trimaazole and 1 (1.6%) was resistant. This supports

the study of Karaarslan A et al <sup>20</sup> and David W Denning et al <sup>8</sup> who showed 100% sensitivity and no resistance to clo-trimazole by *A. flavus*.

In our study among the 48 isolates of *A. niger* 45 (91.6%) were sensitive and 3 were resistant (8.3%) to clo trimazole. This is in accordance to David W Denning who showed 31% resistance to clo trimazole in *A. niger* <sup>8</sup>.

### **Clinical response to Clotrimazole :**

Patients were followed up at weekly intervals and their response to treatment with 1% clo trimazole was assessed after aural toileting. All patients except six responded well to clo-trimazole ear drops. The patients' symptoms repressed and they became asymptomatic within two to three weeks. They were followed up for recurrence for a period of three weeks. Their external canal did not show any colonization of fungus. Among 6 patients who had recurrent or residual otomycosis even after aural toilet and antifungal treatment 4 were suffering from uncontrolled diabetes 2 had no predisposing factor. Maher A, Bassioug A, Moauad UK, Hendawy DS in their experimental evaluation of six antimycotic agents on otomycosis had concluded that clo-trimazole 1-1 was effective in almost all cases which well correlates with our study. Of the two who had no predisposing factor who presented with recurrent.

One had narrow canal and fungus could not be cleaned out adequately and other was un cooperative and antifungal. Medication was given without adequate aural toilettig.

In our series one patient with HIV referred for Ear discharge had otomycosis the fungus was aspergillus. Niger martinez and chemora Study of Otomycosis showed Aspergillus Niger as most common fungus in HIV and it was invasive in nature. In our case it was non invasive and responded to 1.1 clo-trimazole.



## SUMMARY

The present study was aimed at finding out the common fungus, predisposing factors for Otomycosis and doing drug susceptibility of the fungi isolated for Clo-trimazole. This was done at Government Rajaji Hospital attached to Madurai Medical College for a period of one and half year from 2005 to 2006.

150 patients clinically diagnosed as Otomycosis were selected for this study and the different predisposing factors were analysed.

- The incidence was more during the monsoon period (74.6%) and this was due to increased humidity in the atmosphere.
- Males were more affected (53.3%) than females. This may be due to the fact, that men are more exposed to fungal spores, as they spend more time outdoors than females.
- The outdoor air is an important vehicle for locally prevalent fungal flora.
- Most of the cases were **unilateral (93.3%)**.
- The most common predisposing factor was **CSOM (49%)**.

- **Itching** was the most common symptom (70%).
- **Pain** was the second commonest symptom (63.3%).
- **Aspergillus flavus** was the most common fungal isolate (43.9%).  
Common among labourers and agriculture workers ie. Out door workers. Since aspergillus flavus is abundant in out door atmosphere.
- **Aspergillus flavus** was the commonest isolate in patients with CSOM as the predisposing factor (51.39%).
- **Aspergillus flavus** was the commonest isolate in patients with Otomycosis using ear drops (65.52%).
- **Aspergillus niger** was the second common fungal isolate (34%).
- **Aspergillus niger** was the commonest isolate in females (17.73%) and miscellaneous indoor workers as they spend more time indoor and exposed to house dust. Aspergillus nigers can be cultured from house dust.
- **Aspergillus terreus, Aspergillus fumigatus, Aspergillus glaucus** were also isolated.
- Different species of **Aspergillus** may be the dominant organism in different climates.

- **Aspergillus** needs dead organic matter as a substrate for their growth.
- **Penicillium** was isolated in 8 cases (5.7%).
- **Candida** was isolated in 3 cases (2.82%).
- **Coagulase negative Staphylococci** was the most common bacterial isolate (29.68%).
- Proteus, Pseudomonas and Klebsiella were the other common isolates.

A. Flatus - 98% were sensitive to clo-trimazole

A. Niger 91.6% were sensitive to Clo-trimazole

Clinically most cases responded to clo-trimazole 144 - 96%

In patients who presented with recurrence, Most had systemic disease is out of 11 cases of Diabetes with otomycosis 6 responded and in 4 the disease recurred and all four had un controlled diabetes. Suggesting that systemic disease played a role in recurrence.

Of the other 2 cases who presented with recurrence. In adequate aural Toilet played a role in recurrence.

## CONCLUSION

- \* The incidence of Otomycosis is more during monsoon period.
- \* Males are more affected.
- \* Unilateral incidence of disease is common.
- \* CSOM is the most common predisposing factor.
- \* *Aspergillus flavus* is the most common fungal isolate.
- \* *Aspergillus flavus* is the most common isolate in agriculturists and labourers. (outdoor workers)
- \* *Aspergillus niger* is the common fungal isolate in females.
- \* *A. flavus*, *A. niger*, *A. fumigatus* and *A. glaucus* and *Candida* are sensitive to Clo-trimazole drops.

The frequency of recovery of certain fungal species such as *A. flavus*, *A. niger*, *A. terreus* and *Candida albicans* from Otomycosis reflects the great ubiquity of the distribution of their spores and hence exposure to them.

- ❖ Systemic illness play an important role in the recurrence of otomycosis
- ❖ Inadequate aural toilet plays a role in recurrence

## **BIBLIOGRAPHY**

- 1 **Agrawal S R, Jain A K, Goyal R B** – A clinical mycological study of Otomycosis with special reference to silent tympanic membrane perforation. Indian Journal of Otology – 2001, June, 7(2): 49-52
- 2 **Arshad M, Khan NU, Ali N, Afridi NM** , Sensitivity and spectrum of bacterial isolates in infectious otitis externa ; Journal of the college of Physicians and Surgeons Pakistan – 2004 March (14) 3146-3149
- 3 **Beaney G P E, Broughton A.**Tropical otomycosis ;Journal of Laryngology Otology 81;987-997,1967
- 4 **Chander J, Maini S, Subrahmanyam S, Handa A** – Otomycosis – A clinico mycological study ;Mycopathologia 1996 – 135 (1) 9 -12
- 5 **Colour atlas and Textbook of Diagnostic Microbiology**, by Koneman, Fifth Edition, Volume II, Lippincot, 1997
- 6 **Crofton and Douglas** – Respiratory diseases V Edition – 2000, Blackwell science. Page 586

- 7 **Darko E, Jenca A, Orenca K M;** Otomycosis of Candidal origin in Eastern Slovakia ; Folia Microbiologica ;(Praha) 2004,44(4).277-283.
- 8 **David W Denning,** Professor of Medicine and Medical Mycology, University of Manchester, UK , Resistance in Aspergillus presented at the National Workshop of Mycology – 2006, National Institute of Medical Sciences, Hyderabad.
- 9 **Diseases of the ear. A Text book of otology by Mawson.** Fourth Edition. Edward Arnold Publications - 1986
- 10 **Edward J Bottone Ph.D., Tao Hong M.D., Ph.D., and David Y Zhang M.D., Ph.D.,** “Basic mycology underscoring medically important fungi” The Otolaryngology clinics of North America. Vol.26, 6, December 1993.
- 11 **Egami T, Noguchi M, Ueda S,** Japanese Journal of Medical Mycology 2003 44(4) 277-283
- 12 **Frank E Lucente M D, FACS;** Fungal infections of the external ear; The otolaryngologic clinics of North America, Volume 26, Number 6, December 1993.

- 13 **Garcia-Martos P, Delgado D, Marin P, Mira J** , Analysis of 40 cases of Otomycosis, *Enferm Infec. Microbiol. Clinica.* – 1993, Nov 11 (9), 487-489
- 14 **Grigoru D. Bambule J, Dela creta Z, Savary M.** Otomycosis in *Dermatologica* 1979: 159(175-9)
- 15 **Gugnami Okafor B.C., Nzelibe F, Njokku-obi A.N,** Aetiological agents of otomycosis in Nigeria. *Mycosis* 1989 May 32(5) 224-9
- 16 **Gurr P.A., Evans S.K, Dewey K.M,** Otomycosis the detection of fungi in ears by immunofluorescence microscopy *clinical otolaryngology Allied Sciences* 1997 Jun 22(3) 275-83
- 17 **Hawke M, Wong J, Krajden,** Clinical and microbiological features of otitis externa, *Journal of Otolaryngology*;1984,Oct 13(5)289-295
- 18 **Jackman A, Ward R, April M. Bent J.** Topical antibiotic induced otomycosis. *International journal of Paediatric Otolaryngology* June 2005.
- 19 **Jadhav V.J. Pal M, Mishra G.S.,** Aetiological significance of candida albicans in otitis externa. *Mycopathologia* 2003, 156(4), 313-5

- 20 **Karaar slan A, Arikan S, Ozcan M** – Invitro activity of terbinafine and Itraconazole against Aspergillus species isolated from otomycosis. *Mycoses* 2004 August 47(7): 284-287.
- 21 **Kombila M.** Fungal otitis in Libreville a study of 83 cases; *Bulletin of the society of Pathology* 1989(82)(2)201-7
- 22 **Logan Turner’s Diseases of the Nose, Throat and Ear** – Tenth Edition, Wright Publications – 1988.
- 23 *Manual of the Aspergilli* by **Charles Thom and Kenneth Rapper,** Wilkins and Wilkins , 1945
- 24 **Mocatela Ruiz E. Lopez Martine Z.R.** Clinical diagnosis of otomycosis – in *La Prema Medica Mexicana* – 1976 November – December – 41.
- 25 **Mohanty J C, Mohanty S K, Sahoo R C, Ghosh S K** – Clinical microbial profile of otomycosis in Berhampur – *Indian Journal of Otology* – 1999 June, 5(2), 81-3.
- 26 **Mugliston T, O, Donoghue G,** Otomycosis a continuing problem – *J. Laryngology Otology* 1985
- 27 **Nong H, Li J Huang G, Nong D, Cheng P, Yao C** – The observation of mycology and clinical efficacy in 325 cases with



Otomycosis, Journal of Clinical Otolaryngology, 1999, Oct 13(10)  
438-440

28 **Oliveris S, Capello G, Napolitano Ma Trido C. Cullae** Study of otomycosis ( aetiology and analysis of predisposing factors – Boll Ist Sieroter Milan 63: 537-542, 1984

29 **Paulose K. O, Khalifa S.A., Shenoy P. Sharma R.K,** Mycotic infections of the ear. A prospective study Journal of Laryngology otology 103, 30-35: 1989

30 **Ravinder Kaur, Nalini Mittal, Manish Kakkar** – otomycosis – A clinicomycologic study Ear, Nose , Throat journal August 2000. 79: 606-609

31 **Rook's Textbook of Dermatology**, Seventh Edition, Blackwell Science – 2004.

32 **Ruchel R. Margraf S,** Rapid microscopial diagnosis of deep seated mycoses following maceration of fresh specimen and staining with optical brighteners. Mycoses 63: 239: 1993

33 **Scot Browns Otolaryngology**, Butterworth, Heinemann publication, Sixth Edition, 1997

34 **Senturia B.H, Marcus M D., Lucente F E,** Diseases of the External Ear, New York, Grune and Stratton (1980).

- 35 **Talwar P. Chakarabarti A, Kaur P. Pahwa R.K. Mittal A.** PGIMER Chandigarh. Fungal infectious of ear with special reference to CSOM ; Mycopathologia 1988 October 104(1) 47-50.
- 36 Text book of Medical Mycology by **Dr. Jagdish Chander**, Mehta publishers 1995.
- 37 **Than K.M, Naing K.S, Min M.** Otomycosis in Burma – The American journal of Tropical. Medicine and Hygiene – 1980 July 29 (4).
- 38 **Topley and Wilson** Microbiology and Microbial infections, Ninth Edition, Georgina Bentliff, 1998
- 39 **Tinser J. Millan J. Riva P. Adiego I** Acta otorinolaryngol Esp. 1995 – March – April 46(2) 85-90.
- 40 **Vennewald I, Schonlebe J, Klemm E,** Mycological and histological investigation in humans with middle ear infection. Mycoses 2003 Feb 46 (1-2) 12-8
- 41 **Venugopal P V, Venugopal T V** – Mycotic infections in children in Saudi Arabi. – Ind. J. of Dermatology: 1993, Jan- Mar, 38(1):3-7.

- 42 **Wadhvani K, Srivastav A.K.** “ Fungi from otitis media of agricultural field workers ”, *Mycopathologia* – 1984, Dec 30-88(2-3) 155-9
- 43 **Yassin A. Maher A, Moawad M.K.** –Otomycosis a survey in the eastern province of Saudi Arabia. *Journal of Laryngology otology* – 1978- October 869-876.
- 44 **Yavo. W. Kassi R.R., KiKiBarro.** Prevalence and risk factors for otomycosis. *Medicine Tropicale ( March 2004 )* 64(1) 39-42
- 45 **Yehia M.M, Al Habib H M, Shehab N M,** Otomycosis a common problem in North Iraq. *J. of Laryngology Otology* 104: 387-389 – 1990.

## Proforma for Otomycosis Study

Name : Age : Sex :

IP NO. : Unit : Date :

Address :

Socio Economic status : Poor / Average / affluent

Chief Complaints : Unilateal / Bilateral / Right ear / Left ear

1. Itching
2. Ear ache
3. Ear discharge
4. Hard of hearing
5. Ringing noise
6. Other complaints if any

Past H/o

1. Diabetes Mellitus
2. Tuberculosis
3. Irradiation
4. Ear infection
5. Surgery
6. Treatment with steroids / antibiotics
7. Local antibiotic drugs
8. Allergy

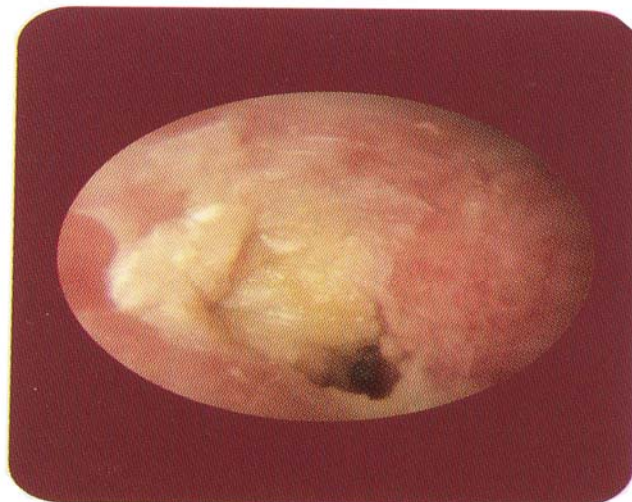
Habits

1. Swimming / taking bath in ponds
2. Ear probing

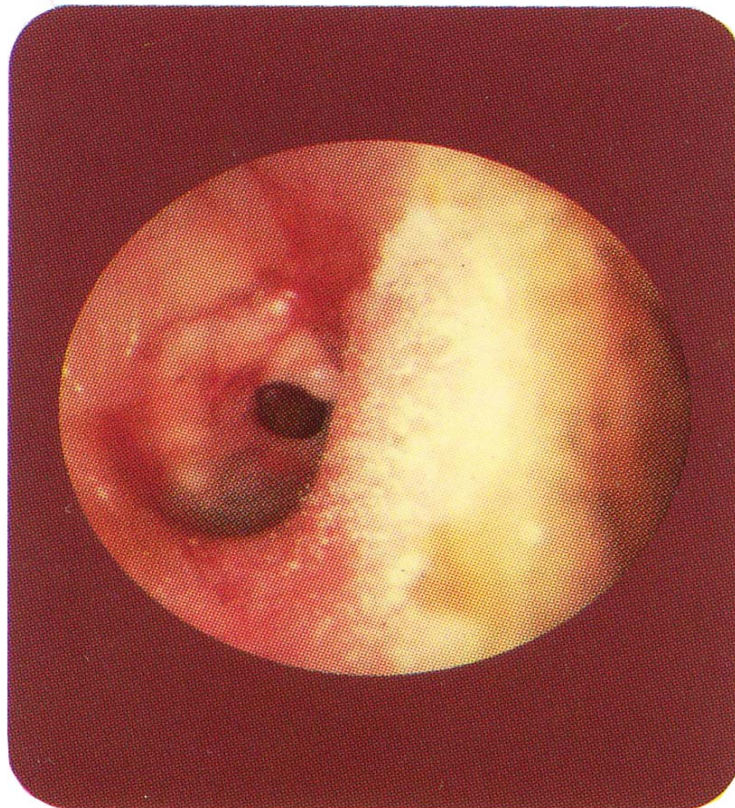
**OTOMYCOSIS IN A CASE OF CSOM - ASPERGILLUS NIGER**



**OTOMYCOSIS IN A DIABETIC PATIENT  
CANDIDA ALBICANS**

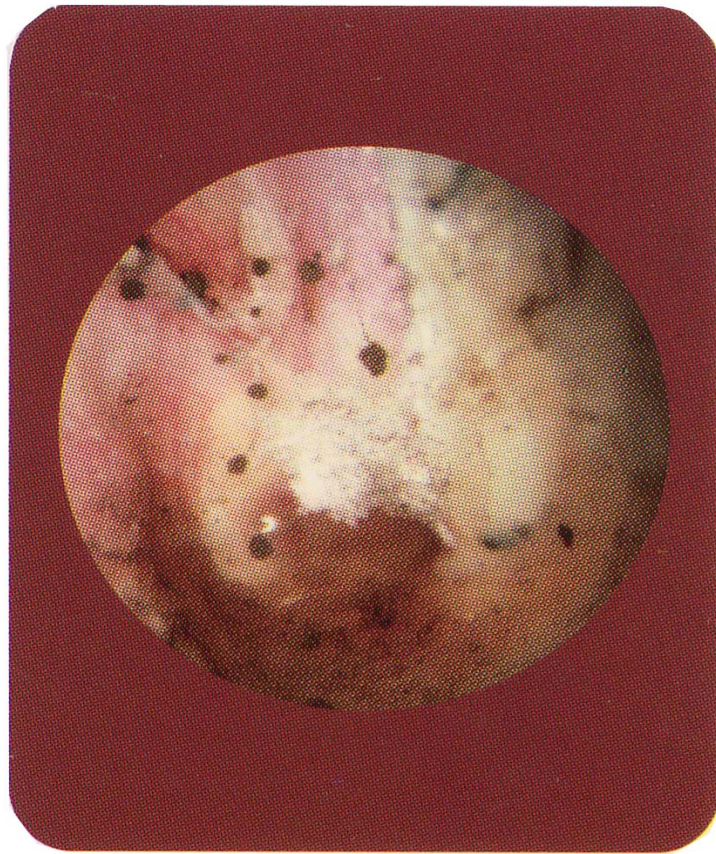


## **OTOMYCOSIS IN ANTIBIOTIC EAR DROP USAGE**





## **OTOMYCOSIS - ASPERGILLUS FUMIGATUS**



## **OTOMYCOSIS WITH GRANULAR MYRINGITIS**

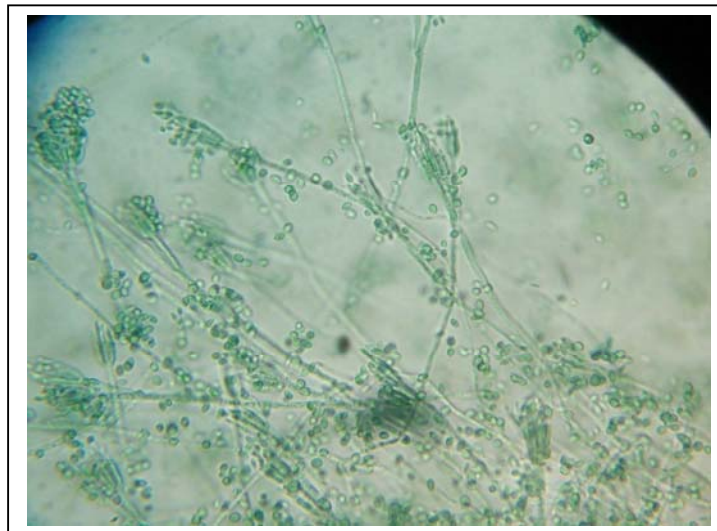




## PENICILLIUM ON CZAPEK



## LPCB MOUNT OF PENICILLIUM



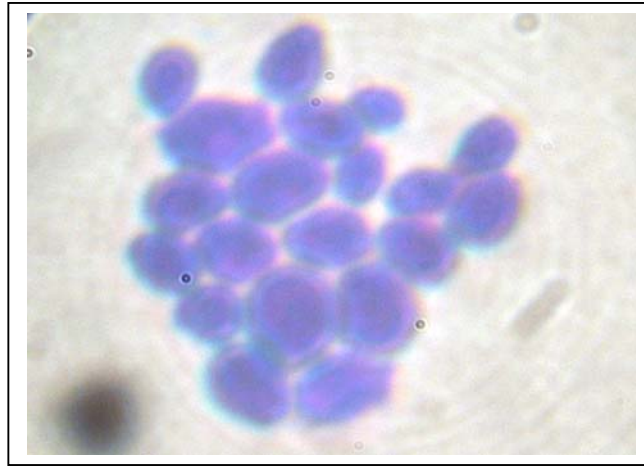
SUGAR ASSIMILATION CANDIDA PARAPSILOSIS  
LACTOSE NOT ASSIMILATED



SUGAR ASSIMILATION – CANDIDA ALBICANS  
LACTOSE, SUCROSE ASSIMILATED



## GRAMS STAINING – CANDIDA



## PENICILLIUM ON CZAPEK



## ANTIFUNGAL SUSCEPTIBILITY – MICRO DILUTION METHOD





## MASTER CHART

No	Name	Age/Sex	Occupation	Disease	Predisposing Factor	Fungus Grown	Bacteriel Isolate	Clinical Response to Clotrimozde	IPNO.
1.	Murugeswari	30/F	Agriculture labour	Otomycosis Rt Ear RE	Nil	As per gillus tereus	E.coli	Responded	45399
2.	Veeralakshmi	25/F	House Wife	Otomycosis LE	CSOM	AsP Niger	E.coli	Responded	26014
3.	Mayalammai	55/F	House Wife	Otomycosis Both Ear	Bilateral CSOM	Ca;icans	Klebsiella	Responded	27112
4.	Selvam	48/M	Labourer	Otomycosis Rt	Taking both In ponds	ASP Flavus	Pseudeomonas Aeruginosa	Responded	45211
5.	Dinesh	24/M	Electrician (MIW)	Chronic otitis (rt) externa	Nil	Pencillium	Pseudeomonas Aeruginosa	Responded	19801
6.	Yellammal	49/F	Agriculture Labour	Otomycosis Both Ear	Nil	ASP Niger	Klebsiella	Responded	121061
7.	Raja	27/M	Agriculture Labour	Otomycosis (Rt) Ear	Bilateral CSOM	ASP Flavus	Proteus Mirabilis	Responded	34191
8.	Ajay Vignesh	13/M	Student	Otomycosis (Lt) Ear	H/o Ear Syringing 6 months	ASP Flavus	Proteus Mirabilis	Responded	30303
9.	Sangesh	17/M	Student	Otomycosis (Rt) Ear	Csom Both ear	ASP Flavus	Coagulasc Negative staphylococlus	Responded	15015
10.	Iliayraja	39/M	Agriculture	Otomycosis (Rt) Ear	Taking bath in ponds	ASP Flavus	Micrococci	Responded	46087
11.	Mari	17/M	Mess Worker (MIW)	Otomycosis (Rt) Ear	Csom Both ear	No growth	CONS	Responded	422321
12.	Suguna	13/F	Student	Otomycosis (Lt) Ear	Csom Both ear	ASP Flavus	CONS	Responded	30220
13.	Vignesh	51/M	Carpenter (M/W)	Otomycosis (Rt) Ear	Diabetes Mellitus	ASP Flavus	Pseudomonas Aeruginosa	Recurrence	46980

14.	Rajesh	53/M	Agriculture	Otomycosis (Lt) Ear	Previous ear infection	ASP Flavus	Pseudomonas Aeruginosa	Responded	12406
15.	Dhanam	52/F	Sweeper (MIW)	Otomycosis (Lt) Ear	Nil	ASP Terreus	Ecol	Responded	19042
16.	Aruna	61/F	House maid	Otomycosis (Lt) Ear	Previous ear infection	ASP NIGER	Pseudomonas Aeruginosa	Responded	24918
17.	Anitha	40/F	House Wife	Otomycosis (Lt) Ear	Taking both in ponds	Asp terus	Micro cocci	Responded	21040
18.	Pitchaiyan	61/M	Agriculture labour	Otomycosis (Lt) Ear	Previous ear infection	ASP Niger	Pseudomonas Aeruginosa	Responded	22807
19.	Suganya	27/F	House Wife	Otomycosis (Lt) Ear	Previous ear infection	ASP fumigatus	Cons	Responded	14419
20.	Kathayee	42/F	House Wife	Otomycosis (Lt) Ear	Taking bath in river	Asp terreus	Staphylococcus aureus	Responded	17766
21.	Radha	51/F	Fruitmerchant (M/W)	Otomycosis (Rt) Ear	HIV	Asp niger	Pseudomonas Aeruginosa	Responded	15014
22.	Kannadasan	44/M	Agriculture labour	Otomycosis (Lt) Ear	Takes bath in river ponds	ASP Flavus	Micro cocci	Responded	30314
23.	Gani	22/M	Labourer	Otomycosis (Lt) Ear	CSOM (LT)	ASP Flavus	Cons	Responded	15706
24.	MuthuRaman	33/M	Shop Keeper MIW	Otomycosis (Lt) Ear	NIL	No growth	Micro cocci	Responded	45058
25.	Muthu Selvi	38/F	House Wife	Otomycosis (Lt) Ear	Takes bath in river ponds	Asp terreus	Micro cocci	Responded	21042
26.	Radha	40/F	Shopassistant (m/w)	Otomycosis (Lt) Ear	Postmastoidectomy	Asp niger	P. Mirabilis	Responded	40221
27.	Jegadesh	39/M	Labourer	Otomycosis (Lt) Ear	Application of ear drops	Asp flavus	Cons	Responded	37145
28.	Sathya	52/F	Sales women MIW	Otomycosis (Lt) Ear	Diabetes mellitus	Asp niger	Pseudomonas Aeruginosa	Responded	10910
29.	Guruvammal	49/F	House maid	Otomycosis (Lt) Ear	Takes bath in river ponds	ASP Niger	Pseudomonas Aeruginosa	Responded	1255
30.	Selvi	36/F	House Wife	Otomycosis	Csom both ear	ASP Flavus	Micro cocci	Responded	20277

				(Lt) Ear					
31.	Mariappan	25/M	Student	Otomycosis (Rt) Ear	Takes bath in river ponds	Pencilium	Cons	Responded	42106
32.	Logesh	36/M	Agriculture	Otomycosis (Lt) Ear	Takes bath in river ponds	ASP Flavus	Micro cocci	Responded	46214
33.	Subbulakshmi	43/F	House Wife	Otomycosis (Lt) Ear	Csom with ear drops	Asp niger	Micro cocci	Responded	5130
34.	Mohammed Arif	42/M	Labourer	Otomycosis (Rt) Ear	Nil	Asp niger	Micro cocci	Responded	33167
35.	Muthu	24/M	Student	Otomycosis (Lt) Ear	Csomt ear drops	Asp niger	Cons	Responded	42678
36.	Vinayagam	52/M	Agriculture	Otomycosis (Rt) Ear	Takes bath in river ponds	ASP Flavus	Staphylo coccus aureus	Responded	35418
37.	Sangeetha	30/F	House Wife	Otomycosis (Rt) Ear	Nil	Asp flavus	Cons	Responded	24336
38.	Maheswari	48/F	Sweeper (m/w)	Otomycosis (Lt) Ear	Csom (rt)	Asp niger	Ecoli	Responded	16450
39.	Suresh	34/M	Agriculture	Otomycosis (Lt) Ear	Application of ear drops	ASP Flavus	Micro cocci	Responded	16840
40.	Haja	49/M	Agriculture	Otomycosis (Lt) Ear	Takes bath in river ponds	ASP Flavus	Staphylococcus aureus	Responded	32230
41.	Sabresh	29/M	Student	Otomycosis (Lt) Ear	Nil	ASP Flavus	Cons	Responded	51317
42.	Manikandan	17/M	Student	Otomycosis (Lt) Ear	Application of ear drops	ASP Flavus	Cons	Responded	50361
43.	Peer	55/M	Agriculture	Otomycosis (rt)	Previous h/o (lt) ear drops	Asp niger	Pseudomonas Aeruginosa	Responded	21077
44.	Arayee	60/F	House Wife	Otomycosis (Lt) Ear	Diabetes mellitus	Asp niger	Pseudomonas Aeruginosa	Recurrence	44968
45.	Mallika	42/F	House Wife	Otomycosis (Lt) Ear	CSOM (lt)	ASP Flavus	Micro cocci	Responded	13156
46.	Kaliaperumal	59/M	Agriculture	Otomycosis (Lt) Ear	Previous h/o (lt) ear drops	ASP Flavus	Pseudomonas Aeruginosa	Responded	99676



47.	Pandeeswari	42/F	House Wife	Otomycosis (Lt) Ear	Previous h/o (lt)earinfection	Asp terus	Staphy lococuss aereus	Responded	2039
48.	Rasitha Beevi	39/F	Cook (m/w)	Otomycosis (Lt) Ear	Diabetes mellitus	Asp niger	Staphy lococuss aereus	Recurrnce	97067
49.	Nagappa	60/M	Cobbler (m/w)	Otomycosis (Lt) Ear	Takes bath in river ponds	No growth	Staphy lococuss aereus	Responded	493102
50.	Veerammal	63/F	Flower Sales women(m/w)	Otomycosis (Lt) Ear	Diabetes mellitus	ASP Niger	P. Mirablis	Recurrence	36750
51.	Ganesan	22/M	Student	Otomycosis (Rt) Ear	Nil	Pencillium	Cons	Responded	42063
52.	Saroja	65/F	Cook (m/w)	Otomycosis (Lt) Ear	Application of ear drops	ASP NIGER	P Mirablis	Responded	45935
53.	Palaniammal	35/F	House maid	Otomycosis (Lt) Ear	Previous h/o (lt)earinfection	ASP Niger	P. Aeruginosa	Responded	24743
54.	Chinnammal	35/F	House wife	Otomycosis (Lt) Ear	CSOM	ASP Flavus	Micro cocci	Responded	206621
55.	Jeeva	16/M	Student	Otomycosis (Lt) Ear	CSOM	Asp niger	CONS	Responded	24798
56.	Banu	32/F	House wife	Otomycosis (Rt) Ear	Takes bath in river ponds	ASP terrei	Staphyto cocus aereus	Responded	21716
57.	Karthika	18/F	Sales girl (m/w)	Otomycosis (Lt) Ear	` Application of ear drops	ASP Flavus	Cons	Responded	25002
58.	Saranya	36/F	House wife	Otomycosis (Lt) Ear	Nil	ASP Flavus	Staphyto coccus	Responded	21714
59.	Balachander	19/M	Student	Otomycosis (Rt) Ear	Nil	ASP fumigatus	Cons	Responded	71321
60.	Kannan	18/M	Student	Otomycosis (Lt) Ear	Application of ear drops	ASP Flavus	Cons	Responded	2921
61.	Vasuki	40/F	House wife	Otomycosis (Rt) Ear	CSOM (lt)	ASP Flavus	Micro cocci	Responded	20640
62.	Maheswari	55/F	Sweeper (MIW)	Otomycosis (Rt) Ear	CSOM (lt)	ASP Niger	P. Mirabilis	Responded	43018
63.	Latha	35/F	House wife	Otomycosis	CSOM	ASP Niger	Micro cocci	Responded	20317

				(Rt) Ear	(both ear)				
64.	Rakhu	25/F	Student	Otomycosis (Lt) Ear	CSOM (lt)	ASP Flavus	Cons	Responded	20218
65.	Karthik	24/M	Electrician (MIW)	Otomycosis (Rt)	CSOM (both ear drops)	Asp flavus	Cons	Responded	40513
66.	Mani kandan	42/M	Agriculture	Otomycosis (Rt)	Takes bath in river ponds	Asp flavus	Micro cocci	Responded	18475
67.	Muthu veran	58/M	Sales man(m/w)	Otomycosis (lt)	Takes bath in river ponds	No growth	Staphyto coccus	Responded	26163
68.	Sumaraj	40/M	Agriculture	Otomycosis (rt)	Csom (rt)	Asp flavus	Micro cocci	Responded	45780
69.	Batcha	51/M	Agriculture	Otomycosis (rt)	Takes bath in river ponds	Asp flavus	Staphyto coccus	Responded	29062
70.	Muthulakshmi	50/F	Sales women (m/w)	Otomycosis (rt)	Takes bath in river ponds	Asp flavus	P. Mirabilis	Responded	44783
71.	Jeganathan	32/M	labourer	Otomycosis (lt)	Previous h/o (lt) ear infection	No growth	Micro cocci	Responded	15314
72.	Murugan	49/M	Agriculture	Otomycosis (lt)	Takes bath in river ponds	Asp niger	Staphylo coccus	Responded	21141
73.	Hanifa	37/M	Agriculture	Otomycosis (rt)	Application of ear drops	Asp flavus	Micro cocci	Responded	25830
74.	Karupayee	55/F	House maid	Otomycosis (rt)	Diebetes mellitus	C. Albicans	Pseudomonas Aeroginosa	Responded	44428
75.	Lalitha	32/F	Teacher (MIW))	Otomycosis (rt)	Diebetes mellitus	Asp niger	Micro cocci	Responded	20638
76.	Vidya	28/F	Sales girl (MIW)	Otomycosis (lt)	Csom (lt)	Asp flavus	Cons	Responded	40228
77.	Sasetharan	50/M	Hospital worke (m/w)	Otomycosis (lt)	NIL	Asp flavus	P. Mirabilis	Responded	
78.	Krishnaswamy	18/M	Sales man (m/w)	Otomycosis (lt)	Csom (lt)	Asp niger	Klebsiella	Responded	
79.	Murugan	23/M	Labourer	Otomycosis	Csom (lt)	Asp niger	Klebsiella	Responded	

				(lt)					
80.	Sakunthala	21/F	Agriculture labourer	Otomycosis (rt)	Application of ear drops	Asp niger	No growth	Responded	
81.	Krishnaveni	40/F	House maid	Otomycosis (rt)	Application of ear drops	Asp niger	No growth	Responded	
82.	Sankar	15/M	Student	Otomycosis (rt)	Nil	Asp terreus	No growth	Recurrnce	23415
83.	Mousama	89/F	Sweeper (m/w)	Otomycosis (rt)	Nil	Asp fumigatus	No growth	Responded	45211
84.	Jeyanthi	56/F	Nursing assistant (m/w)	Otomycosis (both ear)	Diabetes mellitus	Asp terreus	Klebsiella	Responded	34112
85.	Senthil kumar	23/M	Apprentice (m/w)	Otomycosis (lt)	Application of ear drops	Asp flavus	P. Mirablis	Responded	41032
86.	Priya	7/F	Student	Otomycosis (lt)	Nil	Asp glaucus	P. Vulgaris	Responded	
87.	Muthu selvi	35/F	House wife	Otomycosis (lt)	Post mastoidectomy (lt)	Asp terreus	P. Vulgaris	Responded	
88.	Mari	41/M	Chappal manufacture(m/w)	Otomycosis (lt)	Post mastoidectomy (lt)	Pencillium	Ecoli	Responded	36121
89.	Nagammal	38/F	House wife	Otomycosis (Rt)	Nil	Asp terreus	Coliforms	Responded	
90.	Rakayee	42/F	Labourer	Otomycosis (lt)	CSOM left with ear drops	Asp flavus	No growth	Responded	46110
91.	Krishna Moorthy	75/M	Labourer	Otomycosis (lt)	Post mastoidectomy (lt)	Asp niger	E.coilli	Responded	1902
92.	Ashok	17/M	Student	Otomycosis (lt)	Application of ear drops	Asp flavus	E.coilli	Responded	11621
93.	Suhail	42/M	Sales man(m/w)	Otomycosis (rt)	NIL	Asp flavus	Klebsiella	Responded	
94.	Nagarathinam	52/F	Labourer	Otomycosis (rt)	CSOM (RT)	Asp flavus	Klebsiella	Responded	45319
95.	Chinnaswamy	60/M	Retired sedantry(m/w)	Otomycosis (rt)	CSOM of Both ear	Asp flavus	P.Mirablis	Responded	33144

96.	Shanthi	18/F	Saks assistant (m/w)	Otomycosis (lt)	NIL	Asp niger	Klebsiella	Responded	11621
97.	Guru	27/M	Labourer	Otomycosis (lt)	Post mastoidectomy (lt)	Asp niger	P.Mirablis	Responded	21312
98.	Kamalakannan	18/M	Student	Otomycosis (rt)	NIL	No growth	P.Mirablis	Responded	34972
99.	Murugesan	50/M	Labourer	Otomycosis (lt)	CSOM (LT)	Asp flavus	Klebsiella	Responded	40012
100.	Karthi	14/M	Student	Otomycosis (lt)	Operated for CSOM (lt)	Asp flavus	E.colli	Responded	36799
101.	Arockiammal	65/F	Labourer	Otomycosis (lt)	Application of ear drops	Asp flavus	No growth	Responded	23332
102.	Nagarajan	30/M	Labourer	Otomycosis (rt)	NIL	Pencillium	No growth	Responded	36921
103.	Selvaraj	65/M	Agriculture	Otomycosis (lt)	CSOM (LT)	Asp flavus	Proteus	Responded	24719
104.	Elango	44/M	Gardener (m/w)	Otomycosis (rt)	CSOM (RT)	Asp flavus	No growth	Responded	43712
105.	Dhasdakir	25/M	Labourer	Otomycosis (lt)	NIL	Asp niger	No growth	Responded	11774
106.	Mujesur rehman	26/M	Labourer	Otomycosis (lt)	NIL	Asp niger	No growth	Responded	
107.	Thangam	58/M	Labourer	Otomycosis (rt)	Hearing aid of user	Asp niger	No growth	Responded	
108.	Yellammal	27/F	Anganwadi worker (m/w)	Otomycosis (lt)	CSOM (LT) with ear drops	Asp niger	No growth	Responded	
109.	Mini	30/F	Cook (m/w)	Otomycosis (rt)	Application of ear drops	Asp niger	No growth	Responded	
110.	Mareeswari	22/F	House maid	Otomycosis (lt)	-	Asp niger	Cons	Responded	5104
111.	Mallika	20/F	Sales women	Otomycosis (rt)	CSOM (RT)	Asp flavus	Cons	Recurrnce	40516
112.	Venkatesh	26/M	Student	Otomycosis	Nil	Asp niger	Cons	Responded	

				(rt)					
113.	Banumathi	30/F	Typist (m/w)	Otomycosis (rt)	Application of ear drops	Asp niger	No growth	Responded	
114.	Subramanian	22/M	Student	Otomycosis (lt)	CSOM both ear	Asp flavus	No growth	Responded	3956
115.	Murugeshan	25/M	Student	Otomycosis (lt)	CSOM Right	Asp flavus	Cons	Responded	30030
116.	Deepa	41/F	House wife	Otomycosis (rt)	Takes bath n pond	Asp niger	Pseudomonas Aeroginosa	Responded	19582
117.	Bala Murugan	16/M	Student	Otomycosis (rt)	Nil	Fumigataus	cons	Responded	40211
118.	Meenakshi	51/F	House wife	Otomycosis (rt)	Diabetes melltus	Asp niger	Pseudomonas Aeroginosa	Responded	19072
119.	Saurirajan	30/M	Student	Otomycosis (lt)	Takes bath n pond	No growth	Cons	Responded	14922
120.	Parveen	35/F	House wife	Otomycosis (rt)	CSOM (lt) ear drops	Asp flavus	Micrococi	Responded	39073
121.	Gandhi mathi	21/F	House wife	Otomycosis (lt)	Application of ear drops	Pencillium	Cons	Responded	23564
122.	Arivzhaghan	17/M	Student	Otomycosis (lt)	Takes bath n pond	No growth	Cons	Responded	42214
123.	Muthu lakshmi	30/F	House wife	Otomycosis (lt)	Nil	Asp flavus	Cons	Responded	44499
124.	Girija	19/F	Sales women	Otomycosis (rt)	CSOM	Asp flavus	Cons	Responded	8237
125.	Matchakalai	41/M	Agriculture	Otomycosis (lt)	Previous h/o of infection	Asp niger	Micrococci	Responded	2139
126.	Murugeswari	41/F	House wife	Otomycosis (rt)	CSOM BE operated right	Asp niger	Micrococci	Responded	20317
127.	Priya	39/F	House wife	Otomycosis (rt)	CSOM	Asp niger	Micrococci	Responded	18844
128.	Jenifer	25/F	House wife	Otomycosis (lt)	Previous h/o of ear	Candida para	Cons	Responded	44426

					infecion	psillois			
129.	Padmini	30/F	Labourer	Otomycosis (rt)	Application of ear drops	Asp flavus	Cons	Responded	40513
130.	Jeya seelan	19/M	Labourer	Otomycosis (lt)	CSOM	Asp flavus	Cons	Responded	3414
131.	Pavitha	22/F	House wife	Otomycosis (rt)	Previous h/o (lt) ear infection	Fumitauis	Cons	Responded	36912
132.	Neelamegam	60/M	Carpenter (m/w)	Otomycosis (lt)	Diabetes mellitus with hearing aid	Asp flavus	Pseudomonas Aeroginosa	Responded	43611
133.	Arokiaraj	36/M	Agriculture	Otomycosis (rt)	CSOM (RT)	Asp flavus	Micrococci	Responded	8754
134.	Mustafa	42/M	Agriculture	Otomycosis (rt)	CSOM (RT)	Asp flavus	Micro cocci	Responded	5186
135.	Sangeetha	30/F	House wife	Otomycosis (lt)	Application of ear drops	Asp niger	Micro cocci	Responded	3552
136.	Selvam	54/M	Agriculture	Otomycosis (rt)	Takes bath n pond	Asp flavus	Staphylo colcus	Responded	6354
137.	Arumugam	39/M	Agriculture	Otomycosis (rt)	Previous h/o of ear infecion	Asp niger	Micrococci	Responded	21133
138.	Muthuselvi	31/F	House maid	Otomycosis (lt)	Takes bath n pond	Asp terreus	Staphylo coccus	Responded	21313
139.	Guna	30/M	Labourer	Otomycosis (lt)	Application of ear drops	Asp flavus	Cons	Responded	15412
140.	Siva sakthi	38/M	Agriculture	Otomycosis (both ear)	CSOM both	Asp flavus	Micrococci	Responded	35166
141.	Dharmaraj	38/M	Agriculture	Otomycosis (rt)	CSOM (RT)	Asp niger	Micrococci	Responded	45798
142.	Mahalingam	31/M	Student	Otomycosis (Both ear)	Nil	Asp niger	Micrococci	Responded	6459
143.	Lakshmi	24/F	House wife	Otomycosis (rt)	Previous h/o of ear infecion	No fungus	Cons	Responded	37314
144.	Shobana	38/F	Sales women	Otomycosis	Diabees mellicus	Asp niger	Cons	Responded	36315

			(m/w)	(lt)					
145.	Arockia raj	24/M	Labourer	Otomycosis (lt)	Post mastoidectomy Lt	Asp flavus	Cons	Responded	41426
146.	Murugadas	39/M	Agriculture	Otomycosis (lt)	CSOM (Both ear)	Asp niger	Micro cocci	Responded	18001
147.	Thangalakshmi	36/F	House wife	Otomycosis (lt)	Nil	Asp niger	Cons	Responded	4598
148.	Kadar	26/M	Labourer	Otomycosis Rt ear	CSOM Both ear	Asp flavus	Cons	Responded	2010
149.	Kadar hussein	31/M	Agriculture	Otomycosis (Rt)	Application of ear drops	Asp flavus	Micro cocci	Responded	7188
150.	Cotta Perumal	37/M	Labourer	Otomycosis (rt)	NIL	Asp flavus	Micro cocci	Responded	5036

MIW - Miscellaneous indoor worker

ASP - Aspergillus

C albicans- Candida albicans

P. Mirabilis- Proteus mirabilis