A STUDY ON ASSOCIATED OTOMYCOSIS IN CHRONIC SUPPURATIVE OTITIS MEDIA PATIENTS IN A TERTIARY CARE HOSPITAL

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CHENNAI, TAMILNADU

BONAFIDE CERTIFICATE

This is to certify that this dissertation entitled **"A STUDY ON ASSOCIATED OTOMYCOSIS IN CHRONIC SUPPURATIVE OTITIS MEDIA PATIENTS IN A TERTIARY CARE HOSPITAL"** submitted by **DR. ROBIN RICHARDS. M** to the Tamil Nadu Dr. M.G.R Medical University, Chennai in partial fulfillment of the requirement for the award of M.S Degree Branch- IV (OTO-RHINO-LARYNGOLOGY) is a bonafide research work carried out by him under my direct supervision and guidance during the tenure of his course in M.S. ENT from May 2015 to April 2018.

Prof. Dr. N. DHINAKARAN M.S.ENT.,

Professor and HOD,

Department of ENT & Head and Neck Surgery,

Madurai Medical College,

Madurai.

ENDORSEMENT BY THE DEAN.

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This is to certify that this dissertation entitled "**A STUDY ON ASSOCIATED OTOMYCOSIS IN CHRONIC SUPPURATIVE OTITIS MEDIA PATIENTS IN A TERTIARY CARE HOSPITAL**" is a bonafide and genuine research work done by **Dr.ROBIN RICHARDS M.** in partial fulfillment of the requirement for the degree of M.S Degree Branch- IV (OTO-RHINO-LARYNGOLOGY) under guidance of **PROF.DR. N. DHINAKARAN, M.S. ENT.,** Professor, Department of OTO-RHINO-LARYNGOLOGY .

Date:

Place: **Dr. MARUDHUPANDIYAN M.S**

DEAN,
Madurai Medical College
Madurai.

DECLARATION BY THE CANDIDATE

I, **DR. ROBIN RICHARDS. M** declare that, I carried out this work on, **"A STUDY ON ASSOCIATED OTOMYCOSIS IN CHRONIC SUPPURATIVE OTITIS MEDIA PATIENTS IN A TERTIARY CARE HOSPITAL"** at the Department of ENT, Madurai Medical College during the period from 2016 to 2017. I also declare that this bonafide work or a part of this work was not submitted by me or any others for any award degree or diploma to any other University, Board, either in India or abroad.

This is submitted to The Tamil Nadu Dr.M.G.R Medical University, Chennai in partial fulfillment of the rules and regulations for the MS DEGREE examination in OTO –RHINO-LARYGNGOLOGY.

Place: Madurai

Date : **Dr. ROBIN RICHARDS. M**

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INTRODUCTION

Fungi constitute a large diverse group of heterotrophic organisms. Most of them 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 the organic matter. Some species contribute to the production of food, antibiotics, spirits and an array of enzymes. Incidence of fungal infections has been grossly underestimated. Fungal infections are on an increase due to improved survival of immunosuppressed patients and better diagnostic facilities. Only 100 to 150 species are generally recognized as a cause of disease among humans.

Fungal infections are not communicable usually, but humans become an accidental host by inhalation of spores or by their introduction into tissue due to 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 speculate to contribute to virulence.

The ear is continuously 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 worldwide in distribution and in various recorded series, it has accounted for 5 to 20% of all cases of infective otitis externa. It is one of the commonest manifestations in India during rainy season. It occurs mostly in humid atmosphere. Otitis externa due to fungal infection may mimic the desquamative form of diffuse infective otitis externa.

The abundant flora characteristic of the tropics cause a variety of diseases and the fungi as a whole, top the list of the pathogenic organisms in the plant kingdom. In the tropical countries, otomycosis as an entity, is seen in many cases in the outpatient department and could often be mistaken for other conditions.

The disease gets unnoticed and unattended until it causes very severe pain and recurrence is very common.

Infections are usually limited to external auditory meatus and may vary from mild to severe infection. In severe cases, it is complicated by secondary bacterial infection. Fungal infection of the external auditory canal is prevalent in subtropical climates also. The incidence in temperate climates has increased in proportion due to the use of topical antibiotics, which have a medium sterilized of the other organisms in which the fungus may flourish.

Their suspicion were aroused through consideration of the problem of intractable ear discharge due either to otitis externa or infection of the mastoid open cavities, and its relation to the increased use of topical antibiotics, known to favour overgrowth of fungus. Confirmation of these suspicions in almost 50 percent of the cases indicates the real nature of the disease. A secondary invasion of the primary bacterial infection leading to chronicity and apparent resistance to the treatment.

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

Fungi are abundant in soil that contains decomposing vegetable matter. This material is desiccated rapidly in tropical sun and blown in the wind as small dust particles. These airborne fungal spores are carried by water vapours, a fact that correlates the higher rates of infection with the monsoon, during which relative humidity rises to 80%.

A fungal mass does not protrude from the external auditory canal, even in the most chronic cases. This is because fungus does not find its nutritional requirements outside the EAC

The majority of the fungal organisms involved are soil saprophytes whose air borne conidia find the injured tissue a suitable environment for growth. Therefore the mycology involved in ear is

quite different from that being encountered in systemic cutaneous infections.

Chronic Suppurative Otitis media (CSOM) is an inflammatory process in the middle ear cleft that results in long term, permanent changes in the tympanic membrane. Chronic suppurative otitis media causes recurrent ear discharge and perforation of the ear drum, requiring long term treatment and follow up. Otitis media is known to be one of most common childhood infections and a leading reason for the antibiotic prescriptions in the developed world. Fungal infections on chronic suppurative otitis media is suspected when the discharging ear does not respond to the local antibiotic ear drops.

The most important overall mechanism appears to be limitation of recruitment of inflammatory cells at the local site. Steroids are only palliative, do not remove the cause of inflammation, the underlying disease continues to progress while manifestations are being dampened. They favour spread of the infections, as capacity of defensive cells to kill the organism is impaired. They also interfere with the healing thus susceptibility to

infections with low grade pathogen and opportunistic pathogen like fungal infections increases.

The purpose of this study is to emphasize the importance of the usage of local antibiotic with antifungal ear drops in chronic suppurative otitis media patients

AIM AND OBJECTIVES

1) To identify mycological agents in the discharging ear of Chronic Suppurative otitis media patients

2) To find distribution of fungal aetiology in Chronic Suppurative Otitis Media

3) To analyse the relation of local antibiotics, antibiotics with steroids and antibiotics & antifungals with steroids in fungal growth occurring in Chronic Suppurative otitis media patients.

REVIEW OF LITERATURE

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

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

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

Meyer first described the fungal infections of the external ear in 1844. He also spoke a long lasting debate about whether fungi are the primary infectious agents or are secondary pathogens that affect the skin of the external auditory meatus after it has been exposed to the bacterial toxins. There is overwhelming evidence to confirm the notion that the fungi can be primary pathogens[13].

Beaney and Broughton in their article "Tropical Otomycosis" have attributed the greater frequency of otomycosis in the tropical countries to the changes in the composition of the cerumen induced by sweating[3]. (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 cleaning, washing or swimming[34].

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 of them were confirmed by positive fungal culture. They also noted there was no difference regarding the age and sex of the patient. They also found that the period of evolution was one year[23] (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 fungal

culture. The patients were from 13 different countries. Most of them were labourers and people of low socio-economic standard. They got 120 positive fungal cultures. Males were affected more than females. Age ranged from 2 to 58 years[43] (1978).

In 1961, until **Gregson and La Touche** found fungal 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 usage of topical antibiotics known to favour growth of fungus[9].

Than K.M. of Burma found that Otomycosis was common in the rainy season[37].

Oliveri S, Capello G et al in a study of 82 Sicilian patients, in their article "Otomycosis aetiology and analysis of predisposing factors" found that working in garden and wearing mechanical hearing devices were the common predisposing factors for

Otomycosis. Bathing in fresh or salt water was not a significant risk factor[27]. (1984)

Symptoms:

The patient complaints of a feeling of fullness and intensive itching in the ear. The canal is oedematous, erythematous and there are numerous crusts. The inflammation is accompanied by exfoliation of the superficial epithelium and hearing may be reduced by obstruction of the external auditory 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 can occur. The course of the disease is chronic with acute episodes especially in summer and intermittent remissions. The same symptoms occur in many other conditions affecting the external auditory meatus including neoplasms. As a result, careful physical examination and appropriate fungal cultures are frequently needed to make a definitive diagnosis[13].

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 white 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 ear itching were the common symptoms[23]. (1976)

Gregoriou et al found the most common symptoms were severe itching, absence of ear pain, ear discharge and no response to antibiotic treatment[15]. (1979)

Thank K.M. et al found itching as the commonest symptom (70%) followed by ear discomfort (54%), tinnitus (50%), hearing impairment and discharge (35%)[37]. (1980)

Aetiological agents

Pathogens causing Otomycosis vary from tropical to temperate climates. Studies conducted in temperate countries like England and Sweden showed a preponderance of Candida species .Studies conducted in tropical and subtropical countries like Nigeria, Italy, Egypt and Burma, found Aspergillus niger to be the most common isolate and Candida causing 1-16% of the infections[13].

Yassin A et al of Saudi Arabia found that among 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%[43] (1978).

Oliveri S et al of Italy in a study of 82 cases found Aspergillus niger in 67.1% of the cases, Aspergillus flavus in 13.4% of the cases, Aspergillus fumigatus in 1.2% of the cases and Candida albicans in 11% of the cases[27]. (1984)

Definition:

Otomycosis is a subacute or chronic, non-contagious, recurrent, 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 car or in mastoidectomy or fenestration cavity. Deep fungal infections involving the ear are extremely uncommon.

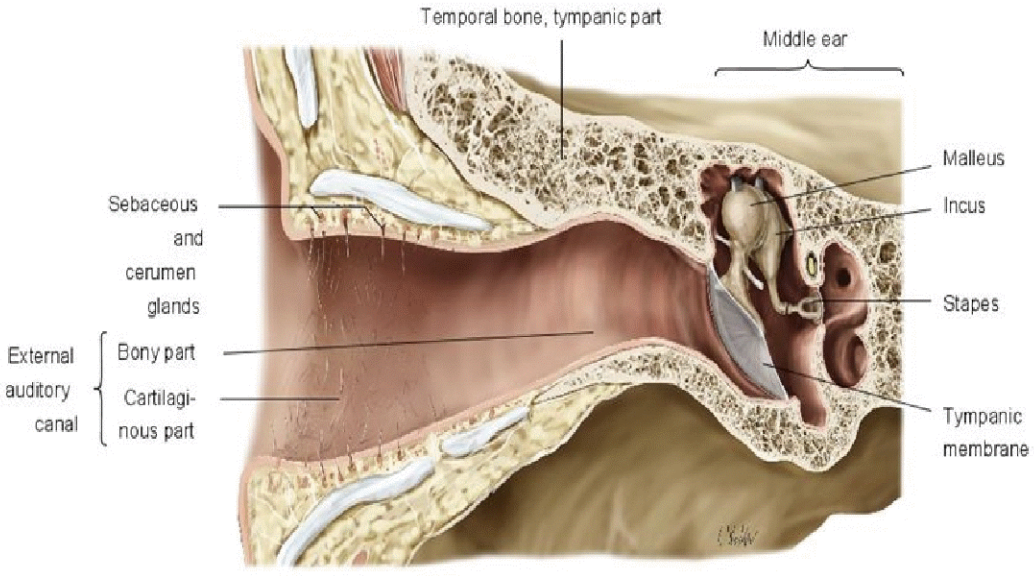
Synonyms:

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 the fungi that affect the external ear.

The auricle is basically composed of fibro elastic cartilage. The skin and a small portion of subcutaneous tissue are closely attached to the fibro elastic cartilage



The cartilage continues inward to form the outer portion (40%) of the external auditory meatus. The entire external auditory meatus, measuring approximately 2.5 cm in length, extends from the concha to the tympanic membrane. The epithelial lining of the external auditory 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 external auditory canal, but almost no subcutaneous tissue between the skin and bone of the inner or osseous portion (60%) of the external auditory canal.

The dehiscences in the anterior wall of the cartilaginous portion of the external auditory canal are known as the Fissures of Santorini. They may allow spread of the infection of any kind from the external auditory canal lumen into the pre auricular soft tissues, parotid gland and temporomandibular joint. The superior portion and some of the posterior portion of the cartilaginous external auditory canal are formed by dense connective tissue that is continuous with the periosteum of the bony canal. Just medial to the bony cartilaginous junction of the canal, in a region called the isthmus, the external auditory canal narrows to the convexity of the anterior and

inferior walls. Medial to the isthmus, the external auditory 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 keratinous debris or cerumen and is often difficult to clean thoroughly and comfortably.

The skin of the cartilaginous portion of the external auditory meatus contains numerous hairs located within hair follicles. Into the follicular canal, drains 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 external auditory canal skin. Together the hair follicle, with the apocrine gland and the sebaceous gland are termed the apopilosebaceous unit.

The 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 apocrine and sebaceous gland secretions are received as noted previously. Obstruction of the drainage of these glands into the follicular canal and subsequently the follicular canal contents into the external auditory canal proper is the primary factor in the pathogenesis of external otitis.

This sets off 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 tropical to temperate climates, but candida and Aspergillus species are common in both climates.

Studies conducted in England and Sweden showed a slight preponderance of Candida Species. Studies conducted in subtropical and tropical countries and areas such as Sicily, Egypt, Nigeria, and Burma 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 fungal and bacterial infections, the most common bacterial isolates being Staphyloccus aureus, Pseudomonas species, and Proteus species.

Beaney and Broughton have attributed the greater frequency of the 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 the fungi in vitro.

Incidence is not geographically uniform. Some are confined to specific geographic regions whereas others such as Aspergillus fumigatus are ubiquitous.

AETIOLOGY:

CLINICAL TYPES AND MYCOLOGY:

The majority of fungi are saprophytic. They subsist on dead organic matter. The rest of fungi are parasitic, which live on the 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.

Organisms causing otomycosis

A Budding forms

a) Saccharomycetes

b) Torulae

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) Pityrosporom

b) Dermatophytes

i) Trichophyton violaccum

ii) T. schoenleinii

iii) T. mentagrophytes

c) Scopulariopsis

d) Fusarium Species

Budding Forms:

They are divided into

a) Saccharomycetes

b) Torulae

c) Monilia

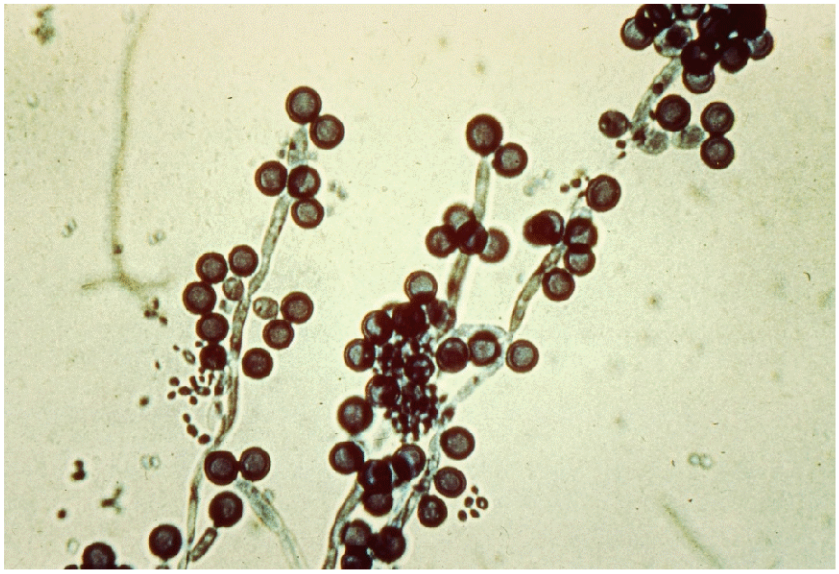
d) Coccidioides

Candida albicans:

Macroscopic Characteristics:

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

Microscopic Appearance:



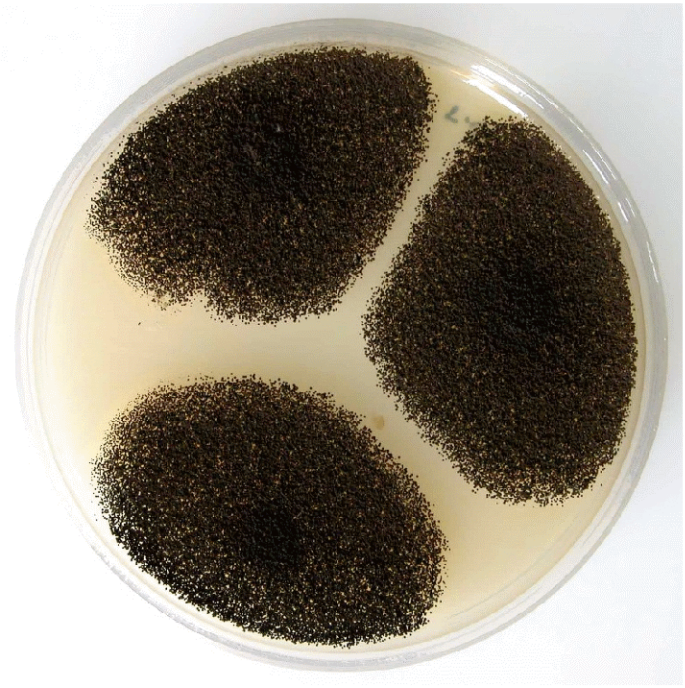
Incubation of an unknown yeast in Serum at 37°C for two hours only, candida albicans shows sprout mycelium also called GERM TUBES (Reynolds Braude phenomenon)

a) ***Aspergilli***:

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

They exhibit hyphae which branches out and intertwine to form a dense mat of growth called the mycelium. Produced from the mycelium are the sporulating hyphae or conidiophores bearing the reproductive bodies or spores.

Macroscopic Appearance:



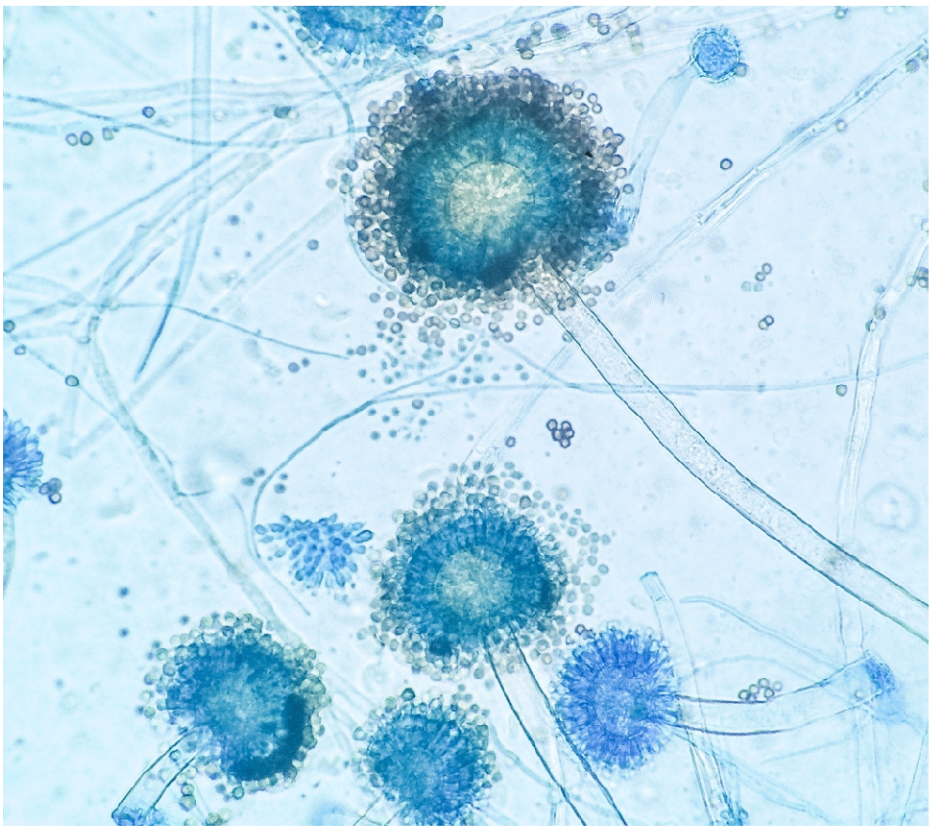
While growing, they produce a white, cotton like mass of filaments which are covered with black granules with varying degree when the stage of sporulation is reached. The spores of this organism are coal black and resemble fine carbon particles.

The most common aspergilli implicated in otomycosis are

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

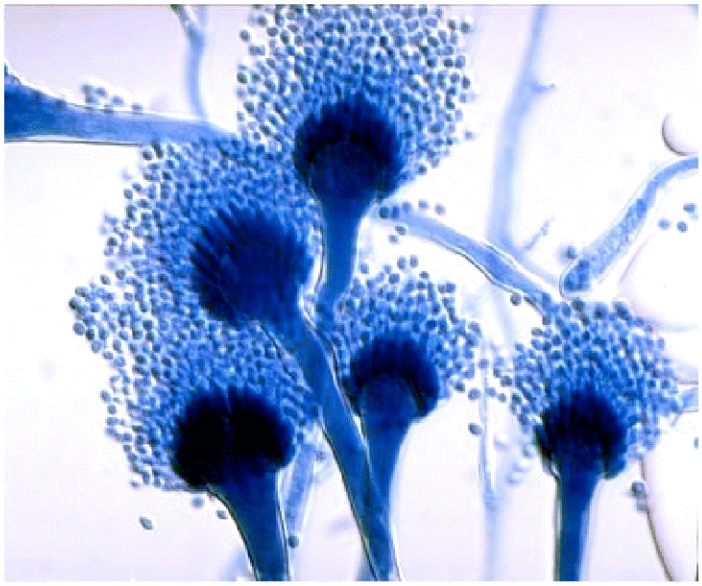
1. Aspergillus Niger:

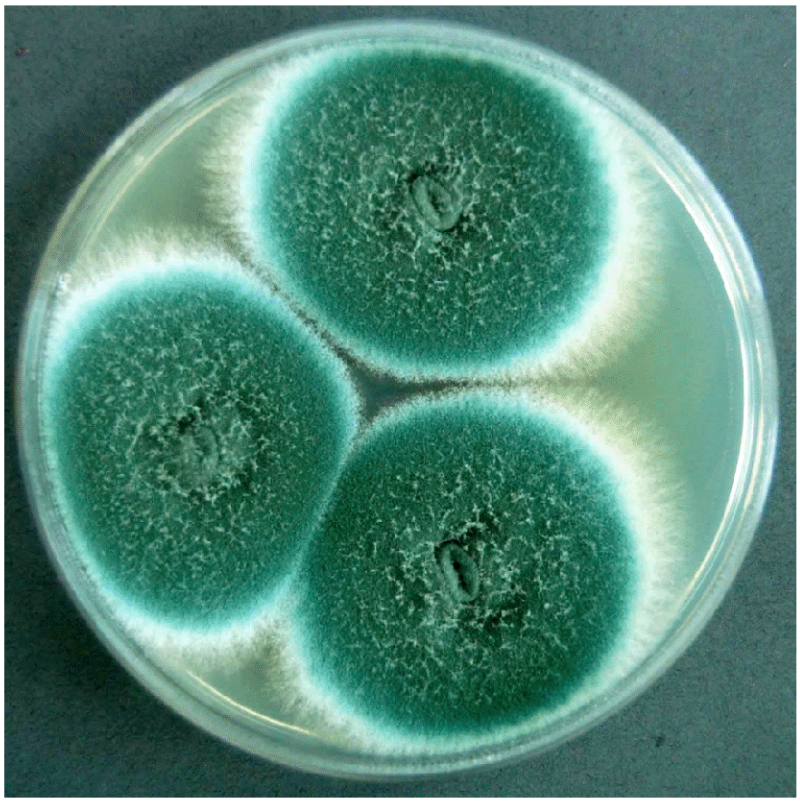
Colony Morphology:



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

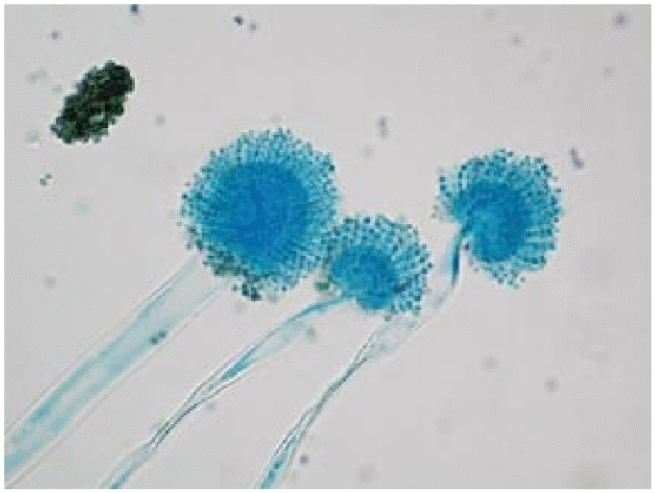
2. Aspergillus fumigatus:





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

3. Aspergillus flavus:

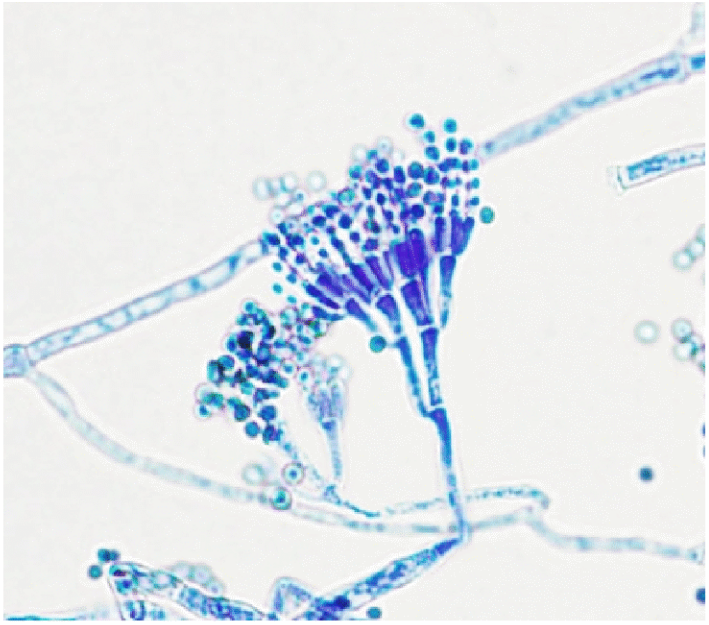


Colonies are rapidly growing, widely spread and floccose in texture. Colour varies from yellow green to dark green.

4. Aspergillus nidulans:

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

5. **Pencillium**:

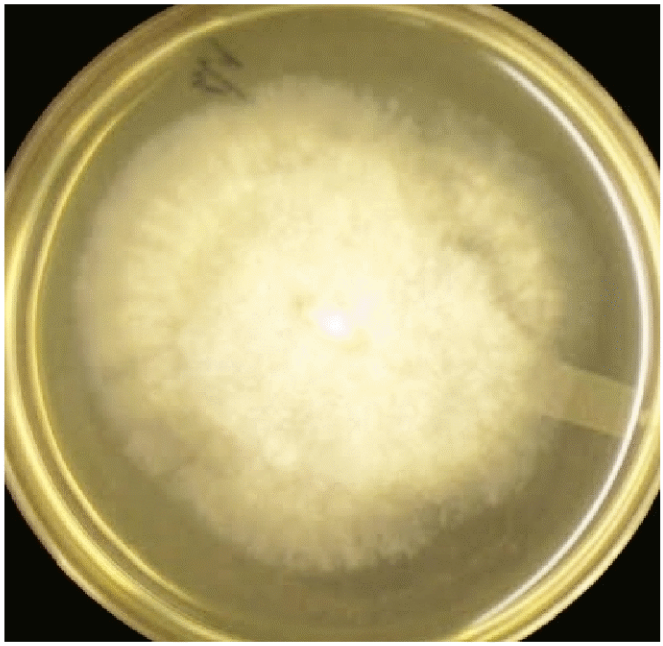


Pencillium is another of the filamentous moulds which produce otomycosis. There are many members of this family. One of them, the Pencillium notatum, produced antibacterial substance, pencillin. Certain other members of this group shows a luxuriating effect on the growth of such organisms. Often it appears that the pyogenic organisms have a suppressing effect on the moulds as they tend to disappear after a short period of time in the 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.

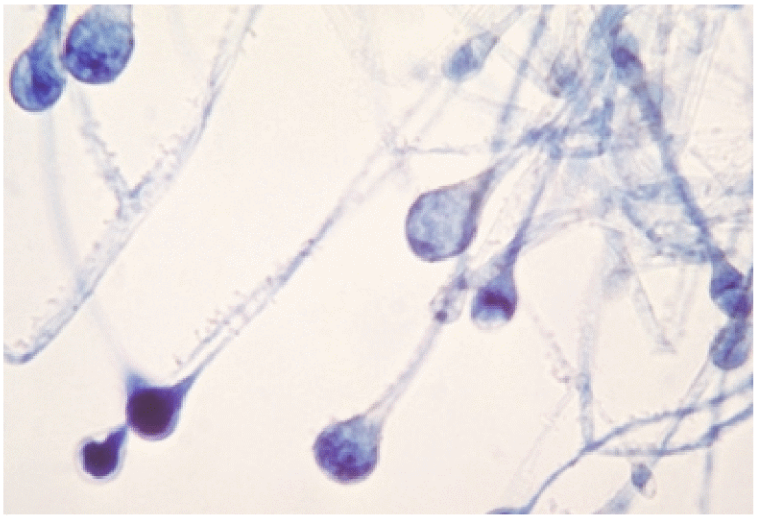
6**. Mucors**:

Mucors produce lesions similar to those attributable to the Aspergilli and Penicillia with the formation of debris in the external auditory meatus. They are less frequently encountered in otomycosis than the other filamentous forms. The ears may serve as a portal of entry for mucormycosis 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: Yeasts are unicellular fungi which occurs spherical or ellipsoidal cells and they reproduce by simple budding.

Yeast like Fungi: Yeast like fungi grow partly as yeast and partly as elongated cuts resembling hyphae. The latter form a pseudo mycelium (eg) candida albicans.

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

Hyphae:

Hyphae is a tubular thread like structure produced by elongation of the cell. Hyphae may be septate or aseptate.

Mycelium: Mycelium is a tangled mass of hyphae.

Conidium: A reproductive propagule produced on the absence of nuclear recombination is a condia

Budding:

A sexual process of reproduction involving the formation of lateral outgrowth from a cell or hyphae is termed budding

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 the other organisms in which the fungus may flourish well.

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, macerated, burned or its integrity otherwise compromised. It may enter the ear as air borne particles or may be introduced into the ear by the patient's finger.

PATHOPHYSIOLOGY

The life cycle of the average fungus 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 of the cases. Probably the only relationship in most instances is the supplying of the necessary moisture that the enables the fungus to grow profusely or the lowering of skin resistance through maceration, thus providing a better medium for the fungus 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 defences 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 the lipid content, tends to prevent moisture within the external auditory 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 is performed with cotton tipped swabs, bobby pins, finger nails or tip of a pencil or pen, match stick or hair grip is capable of damaging the protective horny layer may allow entry of organisms. The acid pit of cerumen inhibits the growth of fungi and bacteria. Because of the gutter beyond the isthmus, it is difficult to dry the external auditory canal, which will then become macerated, creating a dark medium ideal for the growth of fungi and bacteria.

A narrow external auditory canal or excessive cerumen may cause the accumulation of the water within the external auditory canal during swimming and lead to recurrent, otitis externa (Peterkin 1974). Washing the external auditory canal with soap water is a predisposing factor because it often leaves a film of alkali along the external auditory canal wall. The fungal contamination of swimming area is another important causative factor in ear infections. Many patients at 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 inflammatory reaction 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 the infection. Seborrheic areas of the body tend to have a lower pH than normal skin and predispose the patients to infection in these areas (Fabricant and Peristein 1949).

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

Mycologic studies suggest that fungus has a 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 sometimes 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 it is not common. Moulds may be mixed with pyogenic organisms in chronically infected ears, but the pyogens tend to crowed out the moulds. This occurs even with certain of the Penicillia species but probably does not occur in association with the Penicillium notatum from which penicillin is derived.

The sequence of pathogenic changes produced by fungus 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 moisture, temperature or pre-existing irritation.

3. Invasion of epithelium occurs with severe itching and discomfort which may be quite severe.

4. Exfoliation of epithelium ensues as the nature attempts to overcome the infection by casting off upper most cells.

5. Denudation occurs from the exfoliation as the top layers of epithelium are casted off and the external auditory canal becomes filled with the debris.

6. Superficial ulceration result if the pathologic process goes on for a long period. These changes do not always proceed through the entire sequence, sometimes the fungus produces 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 the process in surrounding tissues.

CLINICAL FEATURES

A. Symptoms:

1. Irritation and pruritus of the external auditory canal, often intense and worse at night times. Irritation is found mostly 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 the mixed infection.

3. Discomfort and mild to severe pain in the ear occasionally. Mostly seen in the cases, where the ear is infected with Aspergillus flavus, mixed infection with Gram negative organisms or mixed infection with candida and Aspergillus. Headache is sometimes associated with the 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 the lateral surface.

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

Fungal appearance:

The colour of the mass is usually grey or black. It is mainly determined by the type of fungus concerned. Appearance maybe like wet newspaper or blotting paper or a cotton wool like appearance. It 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 as inactive dry form occurs, in which the external auditory canal is lined by the mould giving a fluffy appearance due to the presence of tiny mycelia (dry mycelial mat)

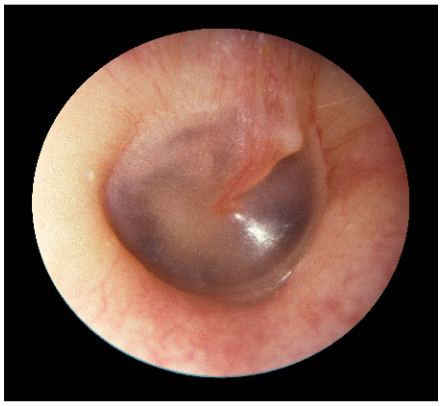
Candida infections generally show as white deposits on magenta coloured skin when the debris is removed it rapidly recovers in 24 hours.

Otoscope Appearance:

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

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

OTOSCOPY

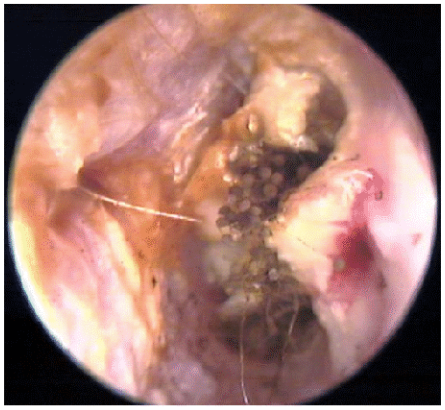


Normal tympanic membrane

Otomycosis with CSOM

Otomycosis with CSOM-
Aspergillus species

Otomycosis- Candida species



Fungal hyphae and
spores seen in external canal

iii) Tympanic membrane:

In most of the 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 become 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 be therefore sent for the fungal culture.

Diagnosis:

1. The above mentioned symptoms and signs

2. In the initial stage, at which patients with otitis externa usually first present themselves, mycelial threads, conidiophores not visible to the naked eye may sometimes be identified with the microscope.

3. Confirmed by fungal culture.

The direct demonstration of fungal elements is essential in establishing diagnosis by detecting presence of causative agent in the clinical materials, which is co-related with the suspected disease. If fungal culture is taken as 'gold standard' in Medical Mycology, direct demonstration of fungi in clinical specimen is 'gold mine' which should be performed meticulously by an experienced person.

MANAGEMENT

1. Antibiotic and steroid drops should be discontinued if they are still being instilled.

2. Removal of the fungal mass, epithelial debris and the discharge from the external auditory canal or the mastoid cavity - Repeatedly and thoroughly by suction or forceps or syringing or cautiously blowing a stream of air into the canal through a fine cannula and dry

thoroughly by swabbing the 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 a furuncle complicates, extreme gentleness in cleaning must be observed or cleansing may have to be delayed until local sensitiveness is being lessened, which can usually be accomplished within twenty four hours. If there is excessive epithelial debris along with the 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 there for twenty four hours. After twenty four hours, the cotton wick is removed. The external auditory canal can usually be cleansed with little discomfort as the medication is also an anaesthetic. The epithelium of the external auditory 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 wet and reinserted with metacresyl acetate.

The treatment is employed for three to four days in succession and then a bland application is substituted. Ichthyol 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 any one of the following fungicides may be applied:

1. Nystatin:

Effective for candida infection but less active against Aspergillus group. Nystatin in boric powder, consisting of 1,00,000 units of Nystatin gm of powder 3 times a 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 a cream and as 3% solution and 0.15% drops for topical application. Very effective for candidial infection can be fungistatic or fungicidal.

4. Econazole: Available as a solution (Econazole nitrate) and as a 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. It is used as a 2.1 cream applied once or twice a day for 10 days.

6. Gentian violet 2.1: Available as drops. Discolours the ear canal and this interfere with clinical examination. Recently some evidence of carcinogenicity is shown.

Other topical antifungal agents are ketoconazole, Natamycin, Tolciclat, Bifonazole, Fenticonzole, Oxiconazole, Tioconazole, ciclopiroxolomine, Tolnaftate, Haloprogin, Flucytosine, Acetic acid, Whit field ointment, selenium sulfide, undecyclenic acid, triacetin etc.

Minimal length of treatment:

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

Prevention:

Accomplished by strict attention to the predisposing causes.

1. Water should be prevented from entering the ears.
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 external 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

Patients presenting with symptoms and signs of Chronic Suppurative otitis media were being selected as the study population. The study was conducted on 150 cases on patients attending ENT Out Patient Department at Government Rajaji Hospital, Madurai. The clinical diagnosis was based on ear discharge, ear itching sensation, ear blocking sensation and the fungal debris in the ear canal.

Inclusion Criteria

- Patients with Chronic Suppurative Otitis Media with Active Discharge.
- Patients presenting with ear discharge, ear pain, ear itching sensation.
- Age of above 12 years.
- All sexes.

Exclusion Criteria

- Patients with Acute Otitis media, Cholesteatoma.
- Age of less than 12 years.
- Patients with complications of suppurative otitis media such as acute mastoiditis, meningitis, brain abscess, petrositis, labrynthitis, etc.
- Patients with immunocompromised states such as Diabetes Mellitus, HIV, Malignancy etc.
- Patients with previously operated ear.
- Patients with anatomical abnormalities of the external auditory canal such as stenosis of ear canal or an exostosis of the ear canal.

The pinna and the ear canal were cleaned with an antiseptic. The ear samples were collected from the ear canal using two moist sterile ear swabs for mycological examination. The samples were sent to the Institute of Microbiology for mycological diagnosis by performing direct microscopy in 10% KOH mount and fungal culture by Sabouraud Dextrose agar

- A) ***Otoscopy***

Appearance of the ear canal and tympanic membrane and presence of ear wax/cerumen, ear discharge, ear infection and fungal debris were documented.

- B) ***10% KOH Mount***

For direct microscopy, a drop of 10% KOH aqueous solution (a keratolytic agent consisting of 10 gms of potassium hydroxide, 10ml glycerine, distilled water 80ml mixed together and stored at room temperature) was used for identification of fungal elements

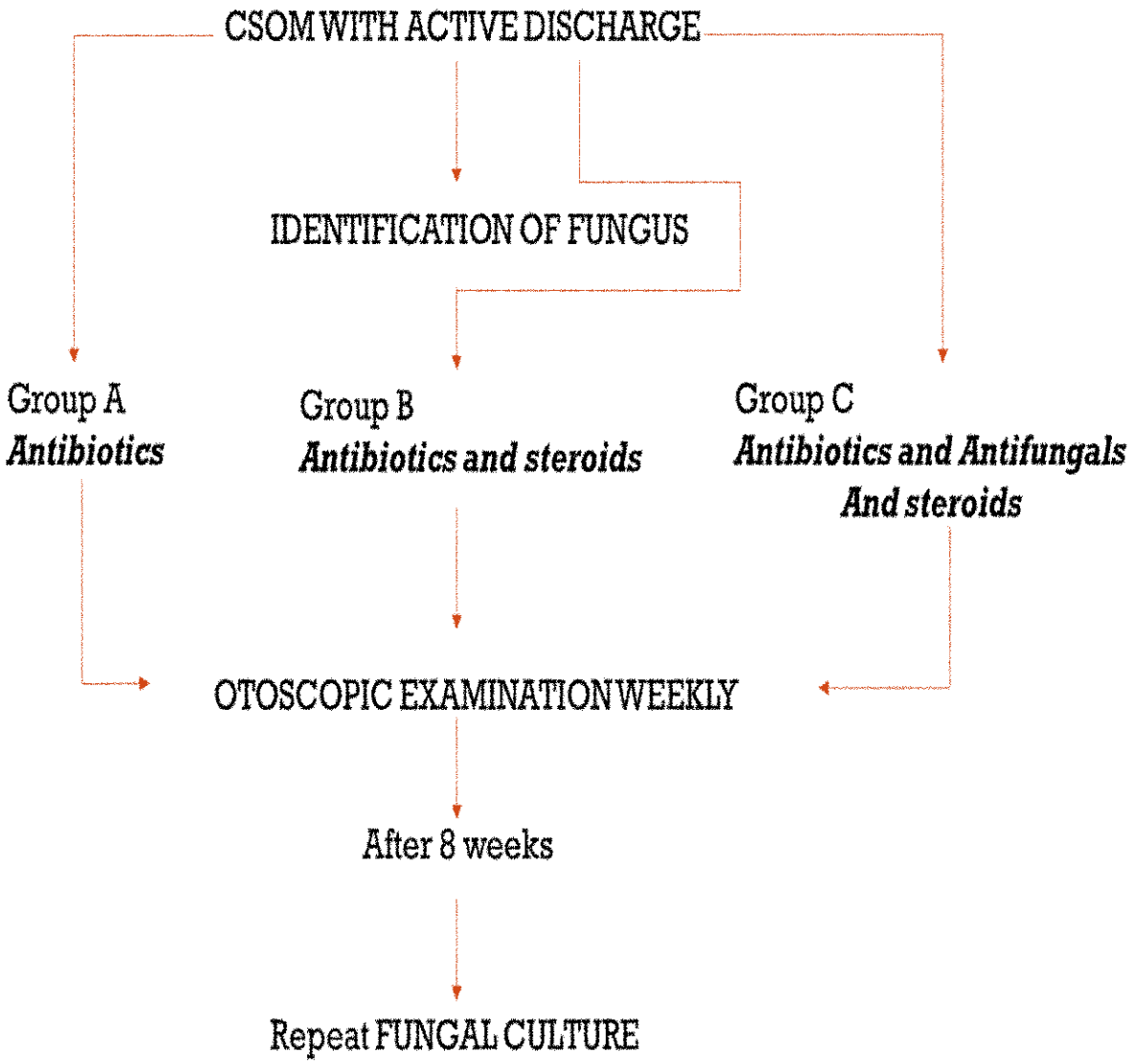
- ***C) Fungal culture***

For fungal culture SABOURAUD'S DEXTROSE AGAR MEDIA was used. Gentamycin was added to reduce contamination

of bacteria. The pathological material wass inoculated in a zig-zag manner on the media and kept in incubator at 25 degree Celsius and 37 degree Celsius, and observed every alternated day for rate of fungal growth, general morphology of colony texture, surface pigmentation up to 6 weeks

- ***D) Lactophenol Cotton Blue Mount***

Under direct microscopy, a glass slide with lactophenol cotton blue with a small piece of fungal growth covered with a cover slip, was viewed. Morphology of the fungus was studied


CSOM WITH ACTIVE DISCHARGE
IDENTIFICATION OF FUNGUS
Group A
Antibiotics
Group B
Antibiotics and steroids
Group C
Antibiotics and Antifungals
And steroids
OTOSCOPIC EXAMINATION WEEKLY
After 8 weeks
Repeat FUNGAL CULTURE

FOLLOW UP:

The patients were being divided into three groups randomly each containing a study population of 50.

- Group A – Local Antibiotic Ear Drops Prescribed
- Group B – Local Antibiotic and Steroid Ear drops Prescribed
- Group C – Local Antibiotic and Antifungal Ear Drops Prescribed

The antibiotic chosen in our study was 0.3% Ofloxacin. The antifungal chosen in our study was 1% Clotrimazole.

The patients were being followed up each week for a period of 8 weeks by otoscopic examination of ear. After 8 weeks, fungal swab was taken again and checked for the presence of fungal species. The presence of fungal species was compared with the three groups and the results were evaluated.

RESULTS

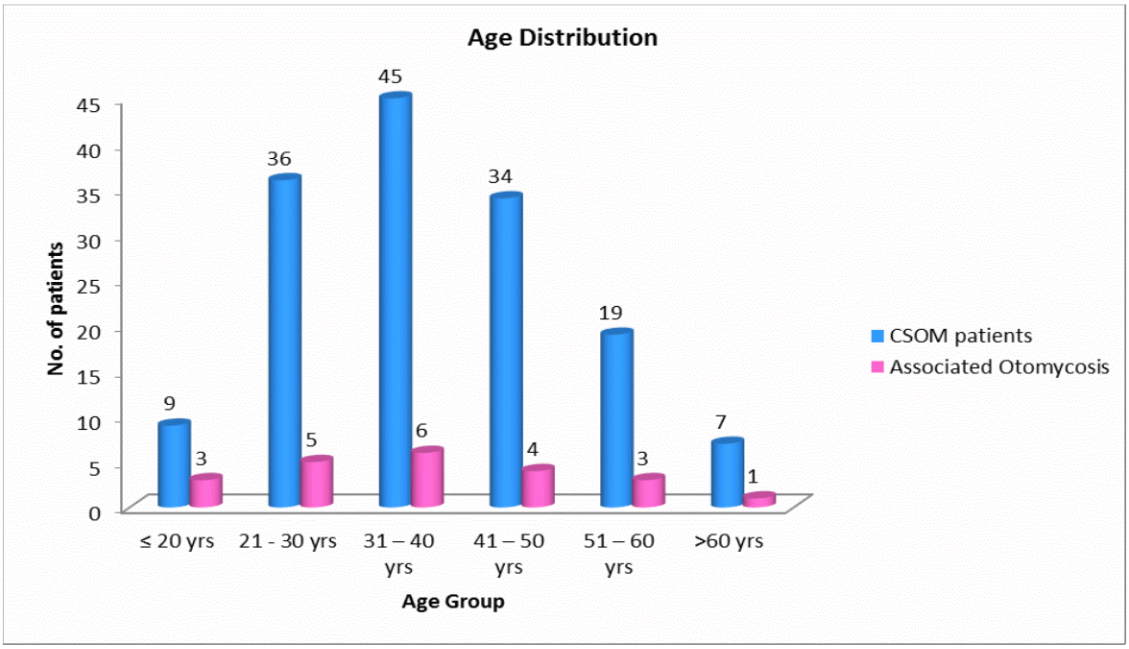
A total of 150 cases of Chronic Suppurative Otitis Media patients were selected for this study, from Department of ENT, Government Rajaji Hospital, Madurai for a period of one year from 2016 to 2017.

Among 150 patients with chronic suppurative otitis media, 22 patients had an associated otomycosis.

Age wise distribution:

Age wise distribution of associated otomycosis in the chronic suppurative otitis media patients was made. It was found that 3 out of 9 cases among 12-20 years (33.3%), 5 out of 36 cases among 21-30 years (13.9%), 6 out of 45 cases among 31-40 years (13.3%), 4 out of 34 cases among 41-50 years (11.8%), 3 out of 19 cases among 51-60 years (15.8%), 1 out of 7 cases among more than 60 years (14.3%) had an associated otomycosis in chronic suppurative otitis media patients.

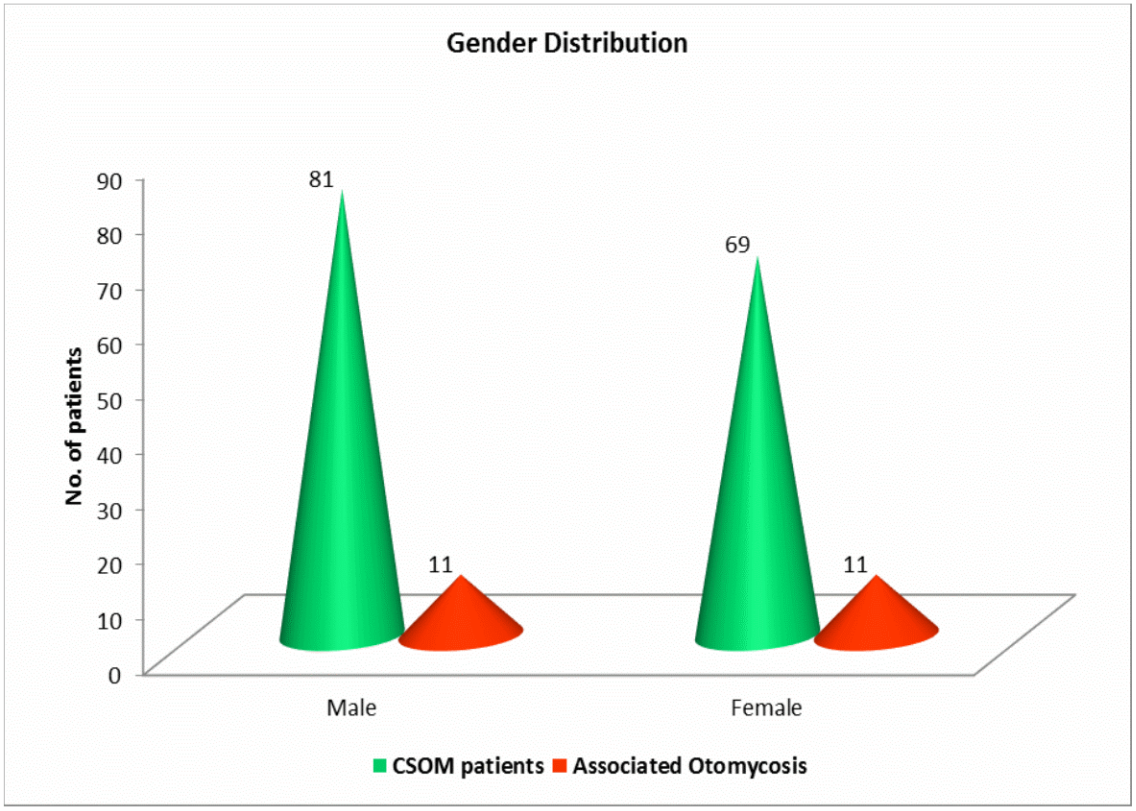
Age Group (in years)	CSOM patients (n=150)	Associated Otomycosis (n=22)	Percentage of Associated Otomycosis Among Individual Age Group
	No.	No. (%)	%
12- 20	9	3 (13.6)	33.3
21 - 30	36	5 (22.7)	13.9
31 – 40	45	6 (27.3)	13.3
41 – 50	34	4 (18.2)	11.8
51 – 60	19	3 (13.6)	15.8
>60	7	1 (4.5)	14.3


Age Distribution
No. of patients
45
40
35
30
25
20
15
10
5
0
9
3
36
5
45
6
34
4
19
3
7
1
≤ 20 yrs
21 - 30 yrs
31 – 40 yrs
41 – 50 yrs
51 – 60 yrs
>60 yrs
Age Group
CSOM patients
Associated Otomycosis

Sex wise distribution:

Sex wise distribution of associated otomycosis in chronic suppurative otitis media patients was made. 11 out of 81 patients among male patients (13.6%), 11 out of 69 patients among female patients (15.9%) had associated otomycosis in chronic suppurative otitis media.

Gender	CSOM patients (n=150)	Associated Otomycosis (n=22)	Percentage of Associated Otomycosis Among Individual Gender
	No.	No. (%)	%
Male	81	11 (50.0)	13.6
Female	69	11 (50.0)	15.9

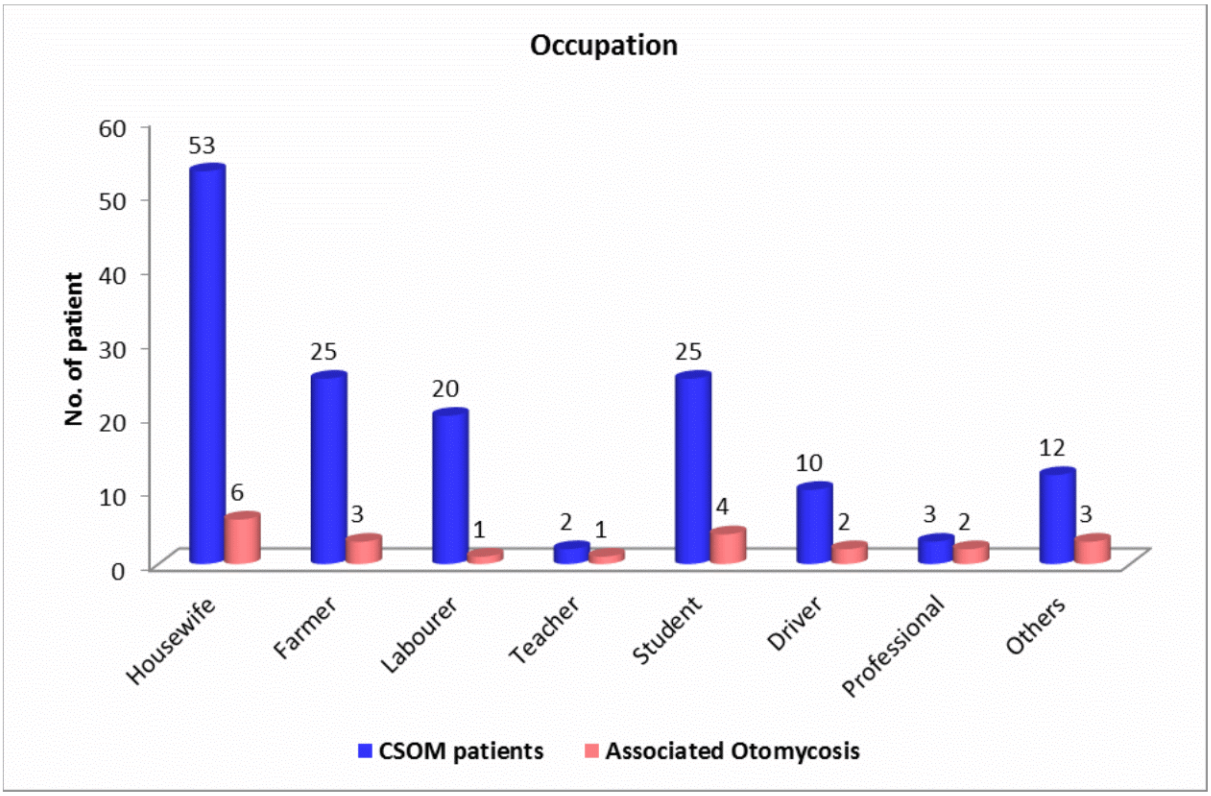

Gender Distribution
No. of patients
90
80
70
60
50
40
30
20
10
0
81
11
69
11
Male
Female
CSOM patients
Associated Otomycosis

Occupation wise distribution

Occupation	CSOM patients (n=150)	Associated Otomycosis (n=22)	Percentage of Associated Otomycosis Among Individual Occupation
	No.	No. (%)	%
Housewife	53	6 (27.3)	11.3
Farmer	25	3 (13.6)	12.0
Labourer	20	1 (4.5)	5.0
Teacher	2	1 (4.5)	50.0
Student	25	4 (18.2)	16.0
Driver	10	2 (9.1)	20.0
Professional	3	2 (9.1)	66.7
Others*	12	3 (13.6)	25.0

*Others include Business, Clerk, Salesman and Sweeper

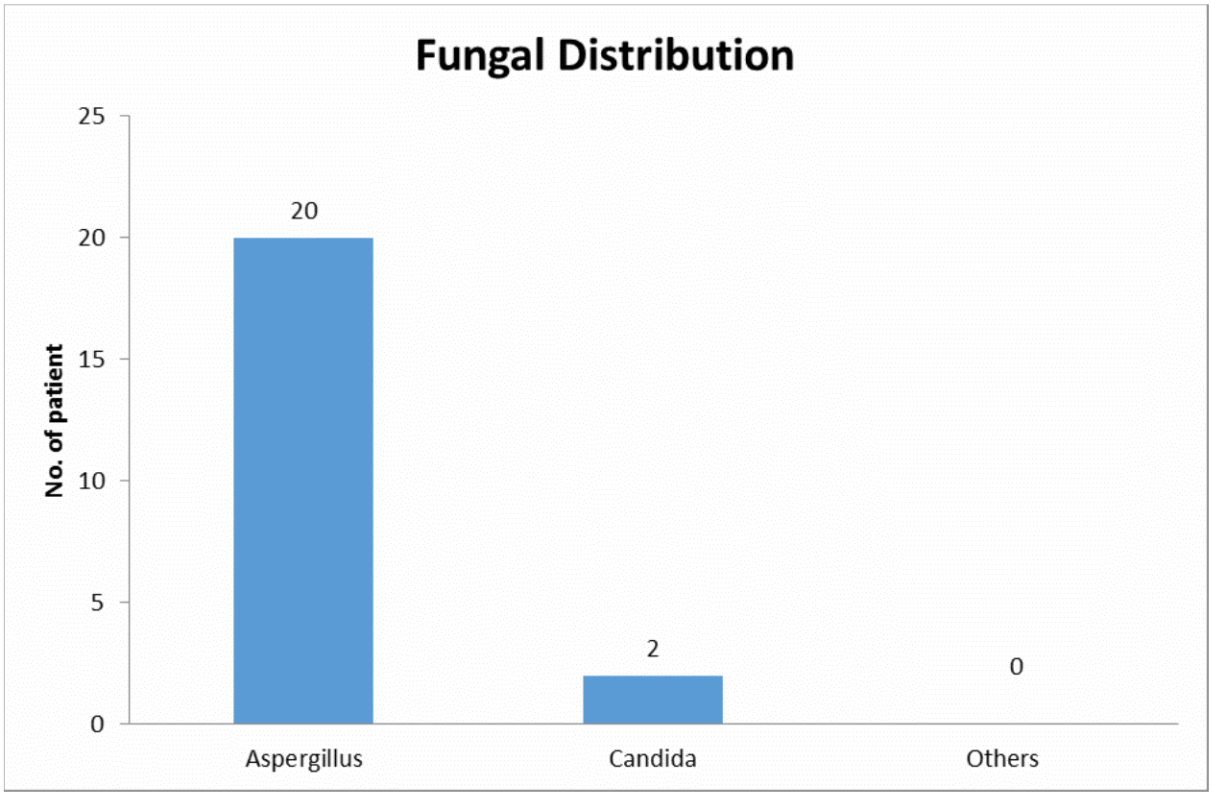
Occupation wise distribution of associated otomycosis in chronic suppurative otitis media patients was made. 6 out of 53 patients among housewives (13.6%), 3 out of 25 patients among farmers (13.6%), 1 out of 20 patients among labourers (13.6%), 1 out of 2 patients among teachers (13.6%) , 2 out of 25 patients among students (13.6%) , 2 out of 10 patients among drivers (13.6%) , 11 out of 81 patients among professionals (13.6%), 3 out of 12 patients among others which include businessmen, clerk, salesman and sweeper (13.6%)


Occupation
No. of patient
60
50
40
30
20
10
0
53
6
25
3
20
1
2
1
25
4
10
2
3
2
12
3
Housewife
Farmer
Labourer
Teacher
Student
Driver
Professional
Others
CSOM patients
Associated Otomycosis

Fungal Distribution:

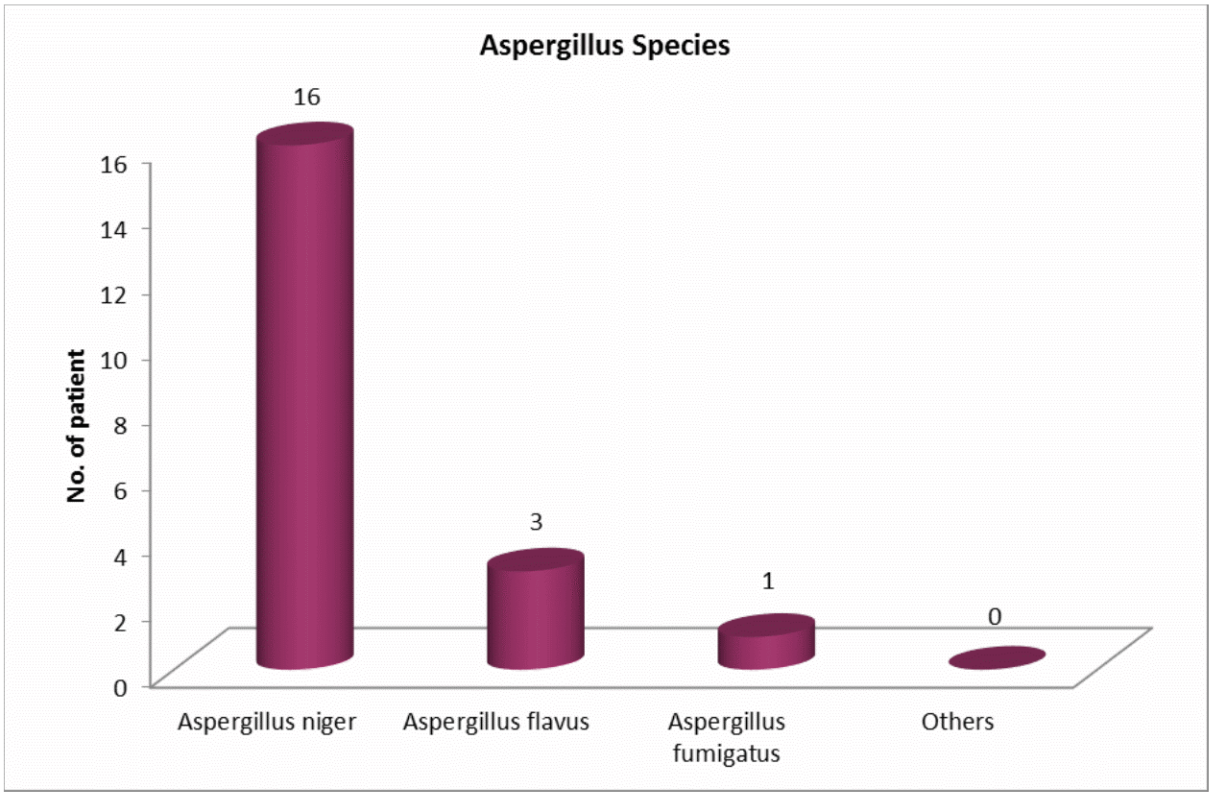
The fungal isolates were analysed among the chronic suppurative otitis media patients. Among 150 patients with chronic suppurative otitis media, 22 patients had an associated otomycosis. Among 22 patients, 20 patients (90.9%) had isolates of Aspergillus species, 2 patients (9.1%) had isolates of Candida species. No other fungal isolates other than aspergillus and candida detected. Aspergillus species was the most common fungus isolated.

Fungus	**No. (%)**
Aspergillus	20 (90.9)
Candida	2 (9.1)
Others	0 (0.0)
Total	22 (100.0)


Fungal Distribution
No. of patient
25
20
15
10
5
0
20
2
0
Aspergillus
Candida
Others

Among 20 Aspergillus isolates, 16 isolates (80%) of Aspergillus niger, 3 isolates (15%) of Aspergillus flavus, 1 isolate (5%) of Aspergillus fumigatus were detected. Aspergillus niger species was the most common Aspergillus species detected.

Aspergillus Species	**No. (%)**
Aspergillus niger	16 (80.0)
Aspergillus flavus	3 (15.0)
Aspergillus fumigatus	1 (5.0)
Others	0 (0.0)
Total	20 (100.0)


Aspergillus Species
No. of patient
16
3
1
0
0
2
4
6
8
10
12
14
16
Aspergillus niger
Aspergillus flavus
Aspergillus fumigatus
Others

Repeat Fungal Culture:

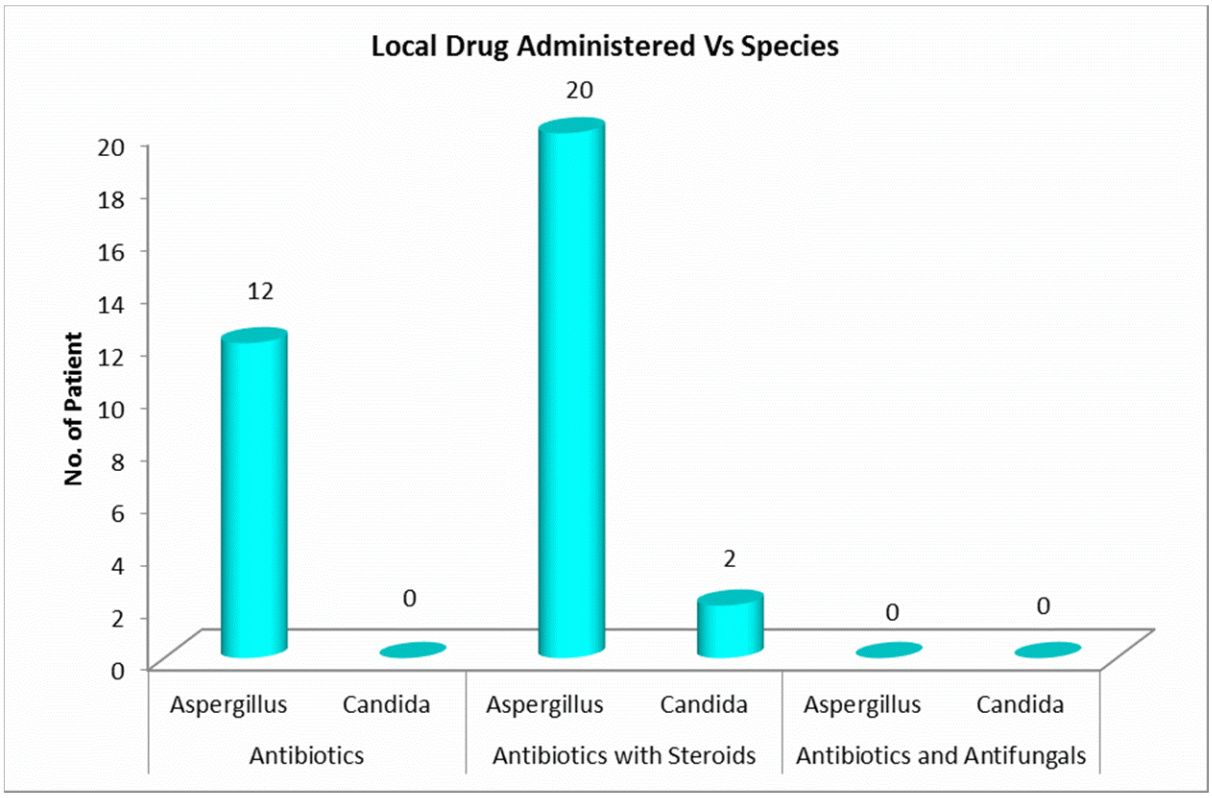
The patients were being followed up each week for a period of 8 weeks by otoscopic examination of ear. After 8 weeks, fungal swab was taken again and checked for the presence of fungal species. The presence of fungal species were compared with the three groups and the results were evaluated.

In group A, among 50 persons who were administering antibiotics, 12 persons (24%) had Aspergillus isolated.

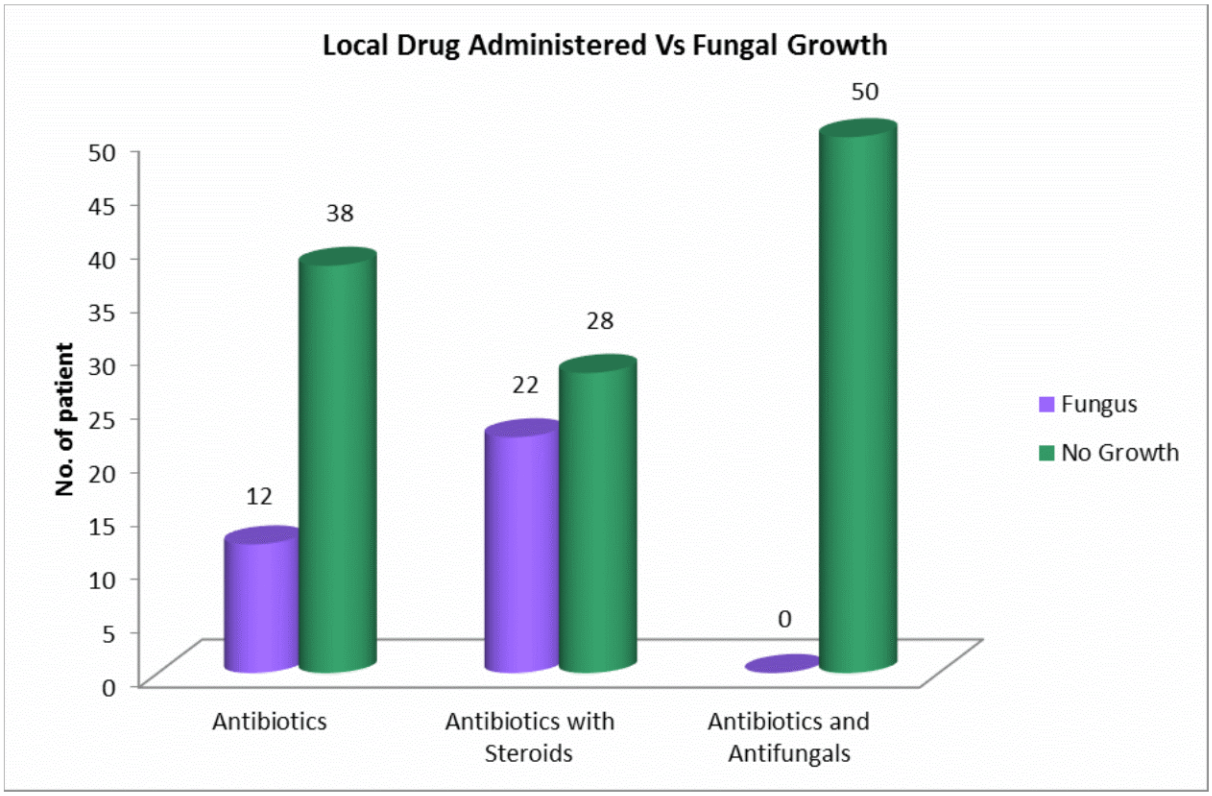
In group B, among 50 persons who were administering antibiotics with steroids, 22 persons had fungal isolates. Among 22 persons, 20 (40%) were isolates of Aspergillus species and 2 (4%) were isolates of Candida species.

In group C, among 50 patients who were administering antibiotics and antifungals with steroids, no isolates of fungus were isolated.

Group	Local Drug Administered	Species	No. (%)
A (n=50)	Antibiotics	Aspergillus	12 (24.0)
		Candida	0 (0.0)
B (n=50)	Antibiotics with Steroids	Aspergillus	20 (40.0)
		Candida	2 (4.0)
C (n=50)	Antibiotics and Antifungals	Aspergillus	0 (0.0)
		Candida	0 (0.0)


Local Drug Administered Vs Species
No. of Patient
0
2
4
6
8
10
12
14
16
18
20
12
0
20
2
0
0
Aspergillus
Candida
Aspergillus
Candida
Aspergillus
Candida
Antibiotics
Antibiotics with Steroids
Antibiotics and Antifungals

Group	Fungus No. (%)	No Growth No. (%)
Antibiotics	12 (35.3)	38 (32.8)
Antibiotics with Steroids	22 (64.7)	28 (24.1)
Antibiotics and Antifungals with steroids	0 (0.0)	50 (43.1)
Total	34 (100.0)	116 (100.0)
P Value	<0.001 (Significant)	


Local Drug Administered Vs Fungal Growth
No. of patient
50
45
40
35
30
25
20
15
10
5
0
12
38
22
28
0
50
Antibiotics
Antibiotics with Steroids
Antibiotics and Antifungals
Fungus
No Growth

DISCUSSION

During the study period from 2016 to 2017, 150 patients with chronic suppurative otitis media were selected. The clinical diagnosis is based on ear discharge, ear itching sensation, ear blocking sensation and the fungal debris in the ear canal. Fungal culture was done with ear discharge being collected.

Among 150 patients with chronic suppurative otitis media, 22 patients had an associated otomycosis in our study. Baruah (1969) conducted a study of 100 cases of CSOM and found fungus positive in 18 cases (18%) [2]. Khanna V et al (2010) conducted study of 110 cases of CSOM and found fungus positive in 26 cases (23.63%) [19].

20 patients (90.9%) had isolates of Aspergillus species and 2 patients (9.1%) had isolates of Candida species among 22 patients with associated otomycosis. Aspergillus species was the most common fungus isolated in our study. Our study correlates with the findings of Dhingra R et al who also found that Aspergillus as the most common fungus isolated in their study[10].

16 isolates (80%) of Aspergillus niger, 3 isolates (15%) of Aspergillus flavus and 1 isolate (5%) of Aspergillus fumigatus were detected among 20 patients. Aspergillus niger was the most common Aspergillus species isolated in our study. This correlates with Reena Ray study in which Aspergillus niger was the most common aspergillus isolate[30].

The increased incidence of Aspergillus niger may be due to their spores. They are found profusely in the atmosphere during the rainy season, due the abundance of the dead organic matter on which they grow. They thrive on the fallen leaves and in the compost heaps and may be found in the vegetative materials.

The patients were being followed up each week for a period of 8 weeks by otoscopic examination of ear. After 8 weeks, fungal swab was taken again and checked for the presence of fungal species. The presence of fungal species were compared with the three groups and the results were evaluated.

In group A, among 50 persons who were administering antibiotics, 12 persons (24%) had fungus isolates. In group B, among 50 persons who were administering antibiotics with steroids,

22 persons had fungal isolates. Dhingra R et al also found out that the incidence of fungal growth is more in patients using antibiotics and steroids in chronic suppurative otitis media patients[10].

In group C, among 50 patients who were administering antibiotics and antifungals with steroids, no fungus were isolated.

CONCLUSION

Most common fungus isolated in chronic suppurative otitis media was Aspergillus.

Most common Aspergillus species isolated in chronic suppurative otitis media was Aspergillus niger.

The antibiotic drop apart from moist and alkaline medium of discharge appears to be mainly responsible for fungal growth and when steroids are added the fungal growth incidence is increased. Thus local drops should be used with great care in treating chronic suppurative otitis media.

Local antibiotic drops with anti-fungal agents may be the ideal treatment in chronic cases.

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PROFORMA

Name : Age/ Sex IP No.

Address : Date :

Occupation :

Socioeconomic status :

Complaints :

Presenting illness:

1. Ear discharge
2. Ear pain
3. Ear itching sensation
4. Hard of Hearing
5. Ringing Noise
6. Other Complaints

Past Ailments:

1. Diabetes Mellitus
2. Previous Ear Surgery
3. Local Antibiotics
4. Local Steroids
5. Local Antibiotics and Steroids
6. Irradiation
7. Tuberculosis
8. Sinusitis and Allergic Rhinitis
9. Head trauma

Habits :

1. Swimming
2. Taking bath in lakes/ponds
3. Ear probing

EAR	RIGHT	LEFT
PINNA		
PREAURICULAR REGION		
POSTAURICULAR REGION		
EXTERNAL ACOUSTIC MEATUS		
TYMPANIC MEMBRANE PERFORATION SIZE SITE MARGIN		
MIDDLE EAR MUCOSA		
TRAGAL SIGN		
MASTOID TENDERNESS		
FACIAL NERVE FUNCTION		

No	Name	Age	Sex	OP No	Occupation	Disease	Fungal Culture	Group A/B/C	Repeat Fungal Culture
1	Vignesh	15	M	110215	Student	R CSOM	No Growth	A	No Growth
2	Selvam	42	M	110215	Farmer	L CSOM	No Growth	B	Aspergillus niger
3	Raja	37	M	116747	Labourer	L CSOM	No Growth	C	No Growth
4	Kanimozhi	24	F	110436	Student	R CSOM	No Growth	A	No Growth
5	Murugeshwari	52	F	57123	Farmer	L CSOM	No Growth	B	No Growth
6	Jegadish	43	M	56388	Business	R CSOM	Aspergillus niger	C	No Growth
7	Kathayi	75	F	113601	Housewife	R CSOM	No Growth	A	No Growth
8	Dharani	20	F	114061	Student	L CSOM	No Growth	B	Aspergillus niger
9	Guru	32	M	38421	Labourer	R CSOM	No Growth	C	No Growth
10	Dhanam	63	F	113299	Housewife	R CSOM	No Growth	A	No Growth
11	Muthu	37	M	38499	Farmer	L CSOM	No Growth	B	No Growth
12	Harija	26	F	46833	Engineer	L CSOM	No Growth	C	No Growth
13	Suresh	41	M	113290	Salesman	L CSOM	No Growth	A	No Growth
14	Irulaye	67	F	37414	Housewife	R CSOM	No Growth	B	Aspergillus niger
15	Rahman	28	M	38963	Salesman	L CSOM	Aspergillus niger	C	No Growth
16	Kannapan	42	M	38999	Farmer	R CSOM	No Growth	A	No Growth
17	Malika	33	F	34804	Housewife	R CSOM	No Growth	B	No Growth
18	Subbulakshmi	46	F	34892	Housewife	R CSOM	No Growth	C	No Growth
19	Anitha	28	F	113431	Housewife	L CSOM	No Growth	A	Aspergillus niger
20	Manikandan	34	F	110088	Engineer	L CSOM	Candida	B	Candida
21	Vinayagam	46	M	113513	Sweeper	L CSOM	No Growth	C	No Growth
22	Ganesan	32	M	113611	Salesman	R CSOM	No Growth	A	No Growth
23	Latha	24	F	48491	Student	R CSOM	Aspergillus niger	B	Aspergillus niger
24	Jeevan	17	M	48999	Student	L CSOM	No Growth	C	No Growth
25	Saranya	40	F	36842	Housewife	L CSOM	Aspergillus flavus	A	Aspergillus flavus

26	Vasuki	34	F	116113	Housewife	R CSOM	No Growth	B	No Growth
27	Kannan	48	M	113143	Driver	R CSOM	No Growth	C	No Growth
28	Chinnammal	57	F	114649	Housewife	R CSOM	No Growth	A	No Growth
29	Karthika	24	F	59438	Student	L CSOM	No Growth	B	No Growth
30	Mariappan	54	M	114391	Farmer	R CSOM	Aspergillus niger	C	No Growth
31	Muzibar	30	M	110008	Clerk	L CSOM	No Growth	A	No Growth
32	Shanmugavel	25	M	55609	Student	L CSOM	No Growth	B	Aspergillus niger
33	Laxmi	39	F	56381	Housewife	R CSOM	No Growth	C	No Growth
34	Mark	32	F	40113	Housewife	L CSOM	No Growth	A	Aspergillus niger
35	Suresh	21	M	5010	Student	R CSOM	No Growth	B	No Growth
36	Bindhu	29	F	114211	Teacher	R CSOM	Aspergillus niger	C	No Growth
37	Deepa	36	F	114634	Housewife	R CSOM	No Growth	A	No Growth
38	Ashok	43	M	58312	Farmer	L CSOM	No Growth	B	No Growth
39	Sankar	37	M	14650	Driver	R CSOM	No Growth	C	No Growth
40	Jeyanthi	54	F	14823	Housewife	L CSOM	No Growth	A	No Growth
41	Krishnamoorthy	61	M	13452	Farmer	L CSOM	No Growth	B	Aspergillus flavus
42	Suja	27	F	16398	Housewife	R CSOM	No Growth	C	No Growth
43	Thangam	56	F	11552	Housewife	L CSOM	Aspergillus niger	A	Aspergillus niger
44	Elango	42	M	9881	Labourer	L CSOM	No Growth	B	No Growth
45	Nagaraj	38	M	21340	Farmer	L CSOM	No Growth	C	No Growth
46	Murugan	55	M	65261	Farmer	R CSOM	No Growth	A	Aspergillus niger
47	Salim	33	M	70640	Driver	L CSOM	No Growth	B	No Growth
48	Manikandan	46	M	24770	Labourer	R CSOM	No Growth	C	No Growth
49	Krishnaveni	39	F	1125003	Housewife	R CSOM	No Growth	A	Aspergillus niger
50	Akshaya	27	F	112667	Housewife	R CSOM	No Growth	B	No Growth
51	Vivek	34	M	28327	Labourer	R CSOM	No Growth	C	No Growth
52	Meenu	29	F	1131181	Housewife	L CSOM	No Growth	A	No Growth
53	Sujin	39	M	1133769	Engineer	L CSOM	Aspergillus niger	B	Aspergillus niger

54	Deepika	47	F	1127643	Housewife	L CSOM	No Growth	C	No Growth
55	Arivalagan	62	M	1138869	Farmer	R CSOM	No Growth	A	No Growth
56	Priya	21	F	1139912	Student	R CSOM	No Growth	B	Aspergillus niger
57	Meenakshi	39	F	245871	Housewife	L CSOM	No Growth	C	No Growth
58	Jenifer	25	F	57068	Student	L CSOM	No Growth	A	No Growth
59	Parveen	31	F	1142655	Housewife	R CSOM	No Growth	B	No Growth
60	Murugan	42	M	62404	Farmer	L CSOM	No Growth	C	No Growth
61	Jeyasree	16	F	62446	Student	R CSOM	Aspergillus niger	A	Aspergillus niger
62	Arokya Raja	34	M	62404	Labourer	R CSOM	No Growth	B	No Growth
63	Guna	41	M	36844	Farmer	L CSOM	No Growth	C	No Growth
64	Selvaraj	45	M	7731	Salesman	R CSOM	No Growth	A	No Growth
65	Soosai	38	M	9202	Labourer	R CSOM	No Growth	B	Aspergillus niger
66	Dharmaraj	57	M	5466	Farmer	L CSOM	No Growth	C	No Growth
67	Laksmi	34	F	16846	Housewife	R CSOM	No Growth	A	No Growth
68	Nalini	28	F	26780	Housewife	L CSOM	No Growth	B	No Growth
69	Mustafa	46	M	2567	Farmer	L CSOM	Aspergillus flavus	C	No Growth
70	Kadar	43	M	811763	Labourer	L CSOM	No Growth	A	Aspergillus niger
71	Vinayagam	35	M	58853	Driver	R CSOM	No Growth	B	No Growth
72	Maheswari	39	F	16365	Housewife	R CSOM	No Growth	C	No Growth
73	Subramani	21	M	61976	Student	L CSOM	No Growth	A	No Growth
74	Irullapan	58	F	62448	Housewife	L CSOM	No Growth	B	Aspergillus niger
75	Sarala	28	F	66963	Housewife	R CSOM	No Growth	C	No Growth
76	Ganesan	51	M	4903	Farmer	R CSOM	No Growth	A	No Growth
77	Dhandapani	55	M	4842	Labourer	L CSOM	Aspergillus niger	B	Aspergillus niger
78	Balu	35	M	5092	Business	L CSOM	No Growth	C	No Growth
79	Papathi	50	M	4009	Housewife	R CSOM	No Growth	A	No Growth
80	Therthamal	60	F	6584	Housewife	L CSOM	No Growth	B	No Growth
81	Kandasamy	43	M	95712	Labourer	L CSOM	No Growth	C	No Growth

82	Moorthy	31	M	61982	Driver	L CSOM	No Growth	A	No Growth
83	Perumal	37	M	14252	Salesman	R CSOM	Aspergillus niger	B	Aspergillus niger
84	Venkatesan	54	M	439	Farmer	R CSOM	No Growth	C	No Growth
85	Sethu	17	M	64947	Student	L CSOM	No Growth	A	No Growth
86	Muthu	26	M	4776	Student	L CSOM	No Growth	B	No Growth
87	Arumugan	56	M	73213	Labourer	L CSOM	No Growth	C	No Growth
88	Deepika	29	F	5492	Housewife	R CSOM	No Growth	A	No Growth
89	Muthusamy	53	M	31210	Farmer	L CSOM	No Growth	B	Aspergillus niger
90	Palani	41	M	72132	Driver	L CSOM	Aspergillus niger	C	No Growth
91	Viji	33	F	33957	Housewife	R CSOM	No Growth	A	No Growth
92	Ashok	25	M	3540	Student	R CSOM	No Growth	B	No Growth
93	Alagapan	62	M	1470	Farmer	R CSOM	No Growth	C	No Growth
94	Radha	46	F	5751	Housewife	L CSOM	No Growth	A	No Growth
95	Meenakshi	39	F	25278	Housewife	L CSOM	No Growth	B	Aspergillus niger
96	Rajan	26	M	30607	Student	L CSOM	No Growth	C	No Growth
97	Moorthy	37	M	62271	Driver	R CSOM	No Growth	A	No Growth
98	Sarawathy	41	F	55677	Housewife	R CSOM	Aspergillus flavus	B	Aspergillus flavus
99	Leelavathi	58	F	4139	Housewife	L CSOM	No Growth	C	No Growth
100	Thirumalaisamy	49	M	77375	Labourer	R CSOM	No Growth	A	No Growth
101	Gandhiraj	32	M	97916	Labourer	L CSOM	No Growth	B	No Growth
102	Murugesan	39	M	106654	Farmer	L CSOM	No Growth	C	No Growth
103	Sahana	28	F	112233	Housewife	R CSOM	No Growth	A	No Growth
104	Thavanila	47	F	57301	Housewife	L CSOM	No Growth	B	Aspergillus niger
105	Vishnu	23	M	113417	Student	L CSOM	No Growth	C	No Growth
106	Samayan	15	M	114927	Student	L CSOM	Aspergillus niger	A	Aspergillus niger
107	Sivadharani	29	F	58097	Housewife	R CSOM	No Growth	B	No Growth
108	Hariharan	42	M	39917	Farmer	R CSOM	No Growth	C	No Growth
109	Prithviraj	35	M	38039	Labourer	L CSOM	No Growth	A	No Growth

110	Rohini	24	F	38032	Student	R CSOM	No Growth	B	No Growth
111	Aarthi	26	F	34386	Housewife	R CSOM	No Growth	C	No Growth
112	Sanjana	19	F	23529	Student	L CSOM	Aspergillus niger	A	Aspergillus niger
113	Aravinth	34	M	27738	Farmer	L CSOM	No Growth	B	No Growth
114	Senthil	46	M	33709	Farmer	L CSOM	No Growth	C	No Growth
115	Priyanka	39	F	816523	Housewife	R CSOM	No Growth	A	No Growth
116	Madhu	47	F	816523	Housewife	R CSOM	No Growth	B	Aspergillus niger
117	Sankar	52	M	73987	Labourer	L CSOM	No Growth	C	No Growth
118	Laila	43	F	79372	Housewife	L CSOM	No Growth	A	No Growth
119	Prabakar	23	M	74049	Student	L CSOM	No Growth	B	No Growth
120	Lakshmi	37	F	26780	Housewife	L CSOM	Aspergillus fumigatus	C	No Growth
121	Priyadarshini	18	F	74617	Student	R CSOM	No Growth	A	No Growth
122	Vetri	35	M	30598	Labourer	R CSOM	No Growth	B	Aspergillus niger
123	Prabu	26	M	33710	Driver	L CSOM	No Growth	C	No Growth
124	Karthick	48	M	60952	Farmer	R CSOM	No Growth	A	No Growth
125	Narmatha	36	F	11389	Housewife	R CSOM	No Growth	B	No Growth
126	Sindhu	28	F	30610	Housewife	L CSOM	No Growth	C	No Growth
127	Janaki	59	F	58096	Labourer	L CSOM	No Growth	A	No Growth
128	Giri	32	M	860444	Driver	L CSOM	Candida	B	Candida
129	Preethi	38	F	33957	Housewife	R CSOM	No Growth	C	No Growth
130	Balaji	43	M	35404	Teacher	L CSOM	No Growth	A	No Growth
131	Mohan	59	M	14702	Labourer	R CSOM	No Growth	B	No Growth
132	Natarajan	45	M	575145	Farmer	R CSOM	No Growth	C	No Growth
133	Therasa	27	F	25278	Housewife	L CSOM	Aspergillus niger	A	Aspergillus niger
134	Vijay	36	M	30607	Salesman	L CSOM	No Growth	B	No Growth
135	Nanthini	15	F	62271	Student	L CSOM	No Growth	C	No Growth
136	Amutha	46	F	55677	Housewife	R CSOM	No Growth	A	No Growth
137	Shanthi	41	F	4139	Housewife	L CSOM	No Growth	B	Aspergillus flavus

138	Selvavel	37	M	77375	Labourer	R CSOM	No Growth	C	No Growth
139	Balaji	53	M	97916	Salesman	R CSOM	No Growth	A	No Growth
140	Nithya	31	F	10668	Housewife	R CSOM	No Growth	B	Aspergillus niger
141	Asha	24	F	112236	Student	R CSOM	No Growth	C	No Growth
142	Sakthivel	35	M	57301	Labourer	L CSOM	No Growth	A	No Growth
143	Kumaran	21	M	113417	Student	L CSOM	No Growth	B	No Growth
144	Ramya	27	F	62446	Housewife	R CSOM	No Growth	C	No Growth
145	Soosai	64	M	62404	Farmer	L CSOM	Aspergillus niger	A	Aspergillus niger
146	Udhaya Kumar	43	M	36844	Driver	L CSOM	No Growth	B	No Growth
147	Nivedha	29	F	773112	Housewife	R CSOM	No Growth	C	No Growth
148	Maheswaran	32	M	920214	Salesman	R CSOM	No Growth	A	No Growth
149	Jeya	46	F	54661	Housewife	R CSOM	No Growth	B	No Growth
150	Anupriya	26	F	25487	Housewife	L CSOM	Aspergillus niger	C	No Growth

MADURAI MEDICAL COLLEGE
MADURAI, TAMILNADU, INDIA -625 020
(Affiliated to The Tamilnadu Dr.MGR Medical University, Chennai, Tamil Nadu)

ETHICS COMMITTEE CERTIFICATE

Name of the Candidate	:	Dr.M.Robin Richards
Course	:	PG in MS., Otorhinolaryngology
Period of Study	:	**2015-2018**
College	:	**MADURAI MEDICAL COLLEGE**
Research Topic	:	A study on associated otomycosis in chronic suppurative otitis media patients in a tertiary care hospital
Ethical Committee as on	:	21.04.2017

The Ethics Committee, Madurai Medical College has decided to inform that your Research proposal is accepted.

Member Secretary Chairman Dean / Convenor

Prof Dr V Nagaraajan
M.D., MNAMS, D.M., Dsc.,(Neuro), Dsc (Hon)
CHAIRMAN
IEC - Madurai Medical College
Madurai

DEAN
Madurai Medical College
Madurai-20

URKUND

Urkund Analysis Result

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2