

## Original Research Article

# Hospital based study on etiopathogenesis and treatment of otomycosis: ethnic Kashmiri population

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## ABSTRACT

**Background:** Otomycosis is the fungal infection of the external ear with bothersome symptoms. The target of the study was to verify the frequency and identification of fungi responsible for the otomycosis and to give the most appropriate treatment. The aims and objectives of the study was to study clinical profile, causative fungal organisms of otomycosis, detect in vitro efficacy of various antifungal solutions against the fungi detected and to establish clinical efficacy of various topical antimycotic solutions in otomycosis in Kashmir.

**Methods:** This study was conducted in the Department of ENT, GMC, Srinagar from February 2014 to July 2015. 152 clinically suspected otomycosis patients were subjected to mycological tests including Gram staining, 10% KOH staining, GTT, SDA and CBL stain to identify the organism. Clotrimazole, terbinafine, luliconazole, sertaconazole and combination of 1% clotrimazole, chloremphenicol, beclomethasone were given randomly in equal number of these patients. Patients were followed for 4 weeks and results of different antifungals were evaluated clinically.

**Results:** Out of 152 patients 61.8% were females and most of the patients belonged to age group of 25-34 yrs. Most of the patients reported in summer season. Otalgia and itching was the most common symptom. *Aspergillus* was the most common species identified whereas *Candida albicans* was the most common individual organism isolated. Luliconazole was most effective drug whereas combination of 1% clotrimazole, chloremphenicol, beclomethasone was least effective.

**Conclusions:** Clinical suspicion of otomycosis is important to prevent unnecessary use of antibiotics. Diagnosis of otomycosis is usually made by clinical findings with pruritis being most common symptom followed by otalgia. In-vitro sensitivity test is of great importance to choose the most active antifungal agents. Patients are advised to avoid removing of ear wax by stiff materials.

**Keywords:** Otomycosis, Kashmir, *Aspergillus*, Luliconazole

## INTRODUCTION

Otomycosis is a superficial, sub-acute or chronic fungal infection of the external auditory canal and tympanic membrane caused by fungi. Otomycosis often occurs due to *Aspergillus niger*, *Aspergillus fumigatus* or *Candida albicans*. *Aspergillus niger* appears as black-headed filamentous growth, *A. fumigatus* as pale blue or green

and *Candida* as white or creamy deposit. It has worldwide occurrence especially in tropics and subtropics but is not so uncommon in temperate climate.<sup>1</sup> It has been estimated to cause 15-20% of external otitis.<sup>2</sup> There may be a considerable difficulty in its diagnosis and treatment.<sup>3</sup> A classical blotting paper like mass in the external auditory canal may not always be seen. The condition often presents as greyish-white moist fungal

debris in the external auditory canal adherent to its skin lining which is hyperaemic and usually oedematous. Thus it may be difficult to distinguish it clinically from other types of otitis externa especially the allergic type in which debris of desquamated epithelium in the external auditory canal is a feature. The diagnostic problem of otomycosis is further complicated by the fact that an allergic state or a bacterial infection of the external auditory canal may superimpose on it.<sup>4</sup> Although microscopy can clarify the diagnosis, fungi may be grown as opportunists. An accurate and systematic myco- and bacteriological appraisal of each case, should comport the lowering of wrong diagnosis and also therapeutic failures in those patients. Otomycosis is not so uncommon in Kashmir despite its temperate climate.

The present study was undertaken in tertiary hospital attending Kashmiri population with suspected otomycosis to assess the clinical profile of otomycosis and identify and study the fungi responsible for the disease. The study included in-vitro sensitivity of different fungi to various commercially available antimycotic solutions and to explore most adequate treatment for the disease by establishing clinical efficacy of various topical antimycotic solutions in otomycosis.

## METHODS

This prospective study was conducted in the Department of ENT, Head and Neck Surgery, S.M.H.S Hospital, and associated Hospitals of Government Medical College Srinagar, from February 2014 to July 2015. One hundred and fifty two clinically suspected patients of otomycosis attending the department of ENT, Head and Neck Surgery, were subjected to mycological study of the external auditory canal debris/exudates.

Clinical details of each patient were recorded. Predisposing factors were noted and the patients subjected to otoscopic and microscopic examination. Samples from the external auditory canals were obtained using sterile swabs which were heavily charged with the suspected fungal debris by rubbing them firmly with the walls of the canal and sent dry to the laboratory immediately. To rule out a yeast infestation a smear was prepared directly from the swabs, heat fixed and stained by Gram's method. For other fungi the debris was suspended in a drop of 10% KOH (potassium hydroxide) and observed directly under microscope for hyphae. Different fungal organisms were identified on the basis of colony characters seen after inoculation and incubation of sabouraud dextrose agar plates at 30°C for 10 days. Germ tube test was routinely applied for yeast colonies to identify the *Candida albicans*. A portion of the fungal colony was emulsified in a drop of 10% KOH and Cotton Blue Lacto phenol and observed under microscope for moulds for different species identification. As per the available resources, in vitro drug sensitivity to fluconazole, voriconazole, flucytosine, caspofungin, amphotericin-B was done for 23 patients with *Candida* species isolated after above testing.

All patients were subjected to the treatment with various topical antifungal drugs after dry aural toileting. Antifungal drug solutions in the recommended concentrations and dosages used were following:

- 1% clotrimazole lotion
- 0.5% fluconazole gel
- 1% terbinafine hydrochloride cream
- 2% sertaconazole cream
- 1% luliconazole lotion
- A combination of 1% clotrimazole, chloremphenicol, beclomethasone ear drops in mixed bacterial –fungal infections.

Patients were followed weekly for a minimum period of 4 weeks. Results of different antifungal drugs were evaluated clinically. Where fungal infection persists, the treatment was repeated or changed.

SPSS software version was used as statistical tool to analyse data.

## RESULTS

In our study majority (61.8%) of the patients were females with female to male ratio of 1.6:1.

**Table 1: Age distribution.**

Age group (years)	Percentage of people (%)
15-24	7.2
25-34	30.9
35-44	24.3
45-54	17.8
55-64	11.2
65-74	8.6

Youngest patient was 15 yrs old female and the eldest patient was 71 yrs old female.

In the present study most (46.1%) of the patients reported to us in the summer season indicating seasonal preponderance of the disease. 44.7% presented in spring season, 9.2% in winter season and no case was registered in autumn season due to flood.

**Table 2: Occupation.**

Occupation	Percentage (%)
House wives	42.1
Farmers	14.5
Employes	10.5
Students	9.9
Teachers	8.6
Businessman	6.6
Shopkeeper	5.9
Construction worker	1.3
Labourer	0.7

As per socioeconomic status is concerned, using Kappuswamy socioeconomic scale, we found 58.6% belong to upper middle class followed by 28.3% in lower middle, 11.2% in upper and 2.0% in upper lower class.

In our study, most (59.9%) of the patients were from urban area during the study period. Otolgia and itching were the most (50.7%) common presenting symptoms followed by itching alone in 17.8%, otalgia, itching and ear discharge in 11.8%, itching and ear discharge in 7.9%, otalgia and ear discharge in 4.6%, otalgia alone in 3.9% and ear discharge in 1.3%. 2% patients had no symptoms and patients were found to have fungal growth as an incidental finding during follow up examination of post-surgical mastoid cavity.

About 94.7% of the patients in the present study were having unilateral otomycosis with slightly increased frequency in right ear (51.3%) as compared to left ear (48.6%) and 5.2% patients were having bilateral disease

It was observed that cleaning of ear with swab stick was the most common (38.2%) predisposing factor among our subjects. 25.7% patients were having no predisposing factor, 18.4% patients had history of using antibiotics and corticosteroid ear drops and 6.6% of the subjects were pregnant females. In our study 3.3% patients were having diabetes mellitus and only 0.7% patients were having allergic otitis externa.

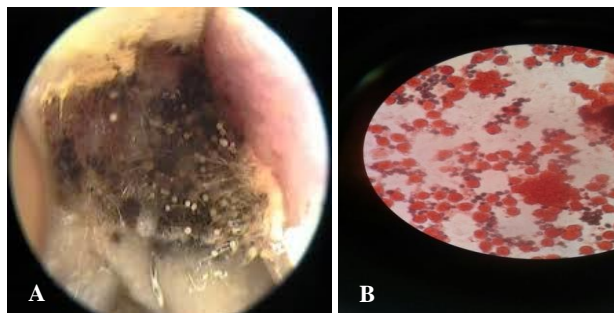
In our study the most common otoscopic finding was white creamy debris (Figure 1) present in 30.3% of the subjects. Next common finding was greyish white debris (Figure 2) present in 25.7% of patients. Black headed filamentous growth (Figure 3A) was present in 22.4% patients, yellowish mass in 14.5% patients and dark brown mass in 7.2% patients on otoscopy. It was observed that tragal sign was positive in 27.6% of the patients.



**Figure 1: Otoscopic picture showing white creamy debris in ear of patient with otomycosis.**

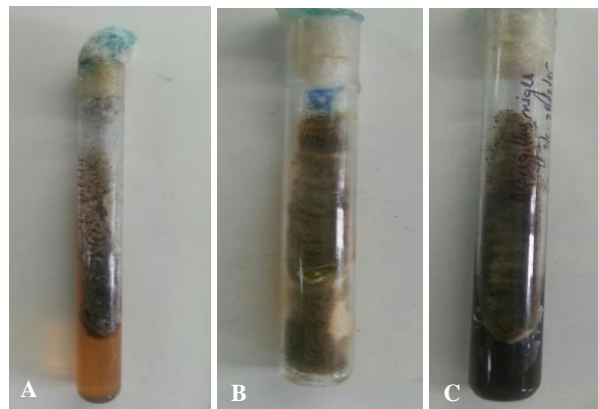


**Figure 2: Otoscopic picture showing greyish white debris in ear of patient with otomycosis.**

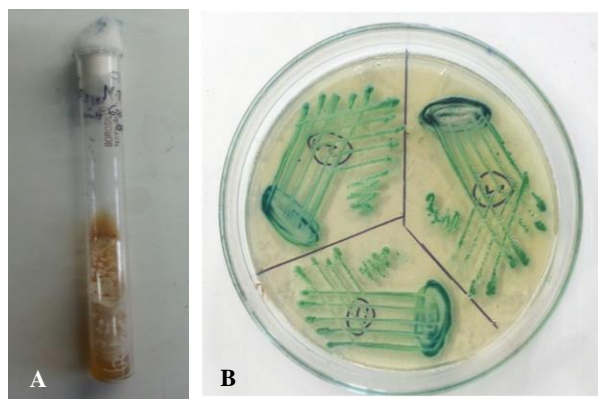


**Figure 3: (A) Otoscopic picture showing black headed filamentous growth in each of a patient; (B) Gram stained slide showing yeasts cells and inflammatory cells.**

In our study gram staining was done in all 152 patients. 58 slides showed yeast cells in addition to inflammatory cells (Figure 3B) whereas 14 showed fruiting bodies in addition to inflammatory cells. 77 slides showed only inflammatory cells with no fungi or bacteria. Only 3 slides were negative for gram staining.



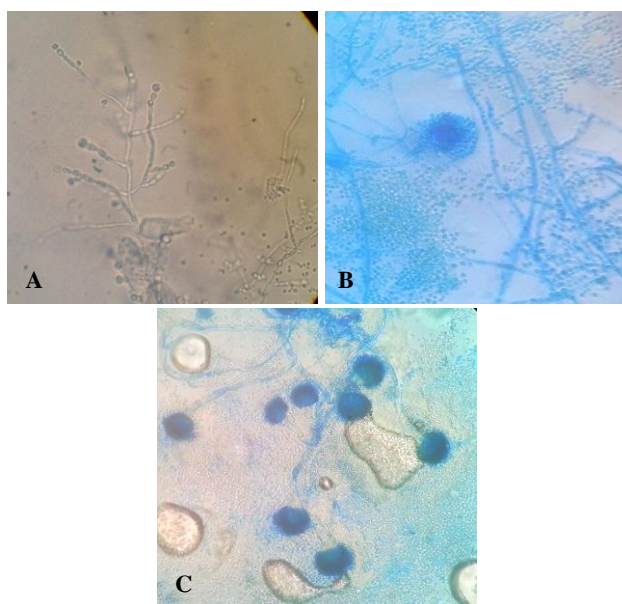
**Figure 4: (A) SDA culture of *A. flavus*, (B) SDA culture showing colonies of *A. niger*, (C) SDA culture showing colonies of *A. fumigatus*.**



**Figure 4 (D and E): SDA culture showing colonies of *Candida albicans*.**

Staining with 10% KOH was the next test done in all the 152 patients and 93 slides were found to be positive for fruiting bodies. This was followed by culture on Sabouraud's dextrose agar media (Figure 4A-4E) that showed fungal growth in all but 3 slides.

Germ tube test was applied on yeast colonies for species identification which showed *Candida albicans* (Figure 5A) to be the pathogen in 35.5% of the specimen whereas cotton blue lactophenol stain was used on moulds for species identification (Figure 5 B and C).



**Figure 5: (A) Germ tube test showing *Candida albicans*; (B) cotton blue lactophenol stain showing *Aspergillus flavus*; (C) cotton blue lactophenol stain showing *Aspergillus fumigatus*.**

Cummulating all the above test results *Aspergillus* was the most common species (51.3%) in our study followed by candida in 29.6% and *Trichophyton* in 5.9%. Mixed infections were seen in 10.52% patients in which *Candida albicans* plus *Aspergillus niger* was the most

common combination (3.3%). *Candida albicans* (27%) was overall the most common individual organism followed by *Aspergillus flavus* (22.4%) and *Aspergillus niger* (21.1%). It was observed that in females *Aspergillus flavus* was most common (27.5%) organism isolated whereas in males *Candida albicans* was more common (35.1%). Various organisms isolated from different age group showed following trends:

- *Trichophyton tonsurans* was the most common (30%) organism in age group of 15-24 yrs.
- *Candida albicans* was the most common (31.1%) organism in age group of 25-34 yrs.
- *Aspergillus flavus* was the most common (33.3%) organism in age group of 35-44 yrs.
- *Candida albicans* was the most common (19.6%) organism in age group of 45-54 yrs.
- *Aspergillus niger* was the most common (35.3%) organism in age group of 55-64yrs
- *Aspergillus flavus* and *Aspergillus niger* both were seen in equal number (23.1%) in 65-74 yrs of age group.

Seasonal variation in the isolated organism showed *Aspergillus flavus* was the most common (25%) species isolated in winter season whereas, *Candida albicans* was the most common species isolated in spring (28.4%) as well as summer (29%).

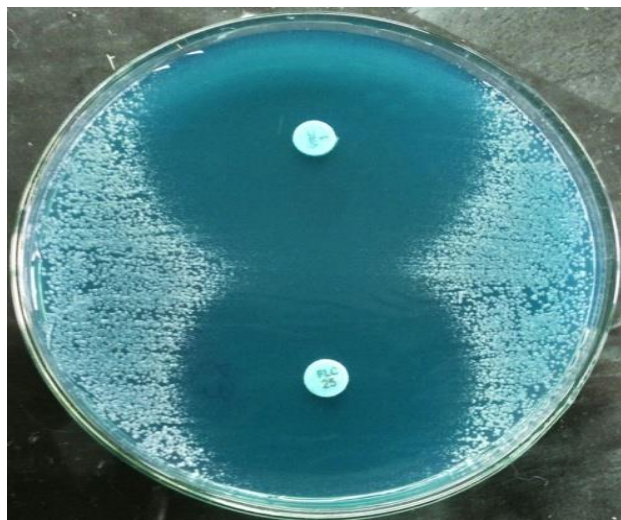
Isolated organism showed variation in different occupation group. In house wives, *Aspergillus flavus* was the most common (n=18) organism isolated. In businessman, *Aspergillus niger* was the most common species isolated (n=4). In construction workers, *Candida albicans* and *Candida tropicalis* were seen with equal frequency (n=1). In farmer, *Candida albicans* (n=6) was the most common species isolated. In Govt. employee, *Aspergillus niger* (n=5) was the most common species isolated. In labourers, only *Aspergillus flavus* was isolated. In shopkeepers, *Candida albicans* (n=5) was most common. In students, both *Candida albicans* and *Aspergillus flavus* were seen in equal number (n=3each). In teachers, *Candida albicans* (n=5) was the most common species isolated.

Among the different socioeconomic classes: *Candida albicans* was the most common (27.5%) organism isolated in lower middle class. *Aspergillus flavus* (35.3%) was the most common in upper class. *Candida albicans* was the most common organism (27.3%) isolated in upper middle class. In upper lower class, *Aspergillus fumigatus*, *Candida albicans* and *Candida tropicalis* were isolated with equal frequencies.

Among the rural subjects, *Aspergillus flavus* was the most common (26.3%) organism isolated and *Candida albicans* was isolated in 29.7% of urban subjects

As per available resources in-vitro drug sensitivity to fluconazole, voriconazole, flucytosine, caspofungin,

ampho-B was done for the *Candida* species isolated in 23 of the patients and all the species were found to be sensitive to all the drugs used for testing (Figure 6).



**Figure 6: *Candida* species susceptible to fluconazole and voriconazole.**

In the present study, meanwhile patients were started on empirical treatment with 6 drugs i.e. clotrimazole,

serticonazole, terbinafine, lulliconazole, fluconazole and combination of 1% clotrimazole, chloremphenicol and beclomethasone that were given randomly in equal number of patients and their effect was observed at 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> week.

Lulliconazole was given in 25 patients and all were symptom free at the end of 1<sup>st</sup> week as depicted in the table above.

Serticonazole was given in 25 patients and all were symptom free at the end of 2<sup>nd</sup> week. Terbinafine given to 25 patients and all were symptom free at the end of 2<sup>nd</sup> week.

Fluconazole was given to 26 patients and none was symptom free at the end of 1<sup>st</sup> week. Drug was changed in 5 of these patients after continuing the fluconazole for second week.

Clortimazole was given in 26 patients and drug change was needed in 12 of these patients.

Combination of 1% clotrimazole, chloremphenicol and beclomethasone was given to 25 patients and drug was changed in 24 patients and only 1 patient was symptom free that too after the end of 2<sup>nd</sup> week.

**Table 3: Effect of drugs.**

S.no.	Name of the drug	Total no. of patients receiving drug	Results after 3 weeks	
			Symptom free	Need drug change
1	Lulliconazole	25	25	nil
2	Serticonazole	25	25	Nil
3	Terbinafine	25	25	nil
4	Fluconazole	26	21	5
5	Clotrimazole	26	14	12
6	Combination of 1% clotrimazole, chloremphenicol and beclomethasone	25	1	24

Most of the organisms were sensitive to lulliconazole, serticonazole and terbinafine with little variations. *Aspergillus* was equally sensitive to lulliconazole, terbinafine, serticonazole and fluconazole while as clotrimazole and combination was less effective.

*Candida* was sensitive to lulliconazole, terbinafine, serticonazole and fluconazole where as clotrimazole and combination of drugs were least effective. Trichophyton was sensitive to all except combination. Mixed infections responded to all except combination of drugs.

## DISCUSSION

In our study majority (61.8%) of the patients were females with female to male ratio of 1.6:1. Youngest patient was 15 yrs old female and the eldest patient was 71 yrs old female. Similar results were seen in study conducted by Moharram et al who in their study on 124

patients found that the disease was more prevalent among persons between 21-30 years.<sup>5</sup> Aneja et al in their study found the disease to be more prevalent in females than males in the age group of 31-40 years.<sup>6</sup>

In the present study most (46.1%) of the patients reported to us in the summer season indicating seasonal preponderance of the disease. This is comparable to studies done by Paulose et al and Pontes et al who found highest prevalence of otomycosis in summer season.<sup>7,8</sup>

The study group had 42.1% house wives comprising majority followed by 14.5% farmers, 10.5% Govt. employee, 9.9% students, 8.6% teachers, 6.6% businessman, 5.9% shopkeeper, 1.3% construction worker and 0.7% labourer. It is consistent with the study conducted by Yehia et al who in their study found the disease was significantly higher in females mainly housewives than males.<sup>9</sup> Barati et al in their study found

that construction workers and farmers (working in dry dusty environment) made up the biggest group (61.1%) while among female and male patients house wives and farmers were the biggest group (73.2%) respectively.<sup>10</sup>

As per socioeconomic status is concerned, using Kuppaswamy socioeconomic scale, we found 58.6% belong to upper middle class followed by 28.3% in lower middle, 11.2% in upper and 2.0% in upper lower class. However, Chander et al found disease to be more in low socioeconomic status with poor personal hygiene.<sup>11</sup>

Otalgia and itching were the most (50.7%) common presenting symptoms followed by itching alone in 17.8%; otalgia, itching and ear discharge in 11.8%; itching and ear discharge in 7.9%; otalgia and ear discharge in 4.6%; otalgia alone in 3.9% and ear discharge in 1.3%. 2% patients had no symptoms and patients were found to have fungal growth as an incidental finding during follow up examination of postsurgical mastoid cavity. It is consistent with the study done by Barati et al who found pruritis being the most common symptom followed by otalgia.<sup>10</sup> Similarly, fullness of ear and itching followed by earache, ear discharge and tinnitus were the predominant complaints in study conducted by Sharada et al.<sup>12</sup>

About 94.7% of the patients in the present study were having unilateral otomycosis with slightly increased frequency in right ear (51.3%) as compared to left ear (48.6%) and 5.2% patients were having bilateral disease. Araiza et al also found disease to be unilateral (90.7%) in his study.<sup>13</sup> However, Nandyal et al and Sharada et al found more involvement of left ear.<sup>14,12</sup>

It was observed that cleaning of ear with swab stick was the most common (38.2%) predisposing factor among our subjects. 25.7% patients were having no predisposing factor, 18.4% patients had history of using antibiotics and corticosteroid ear drops and 6.6% of the subjects were pregnant females. In our study 3.3% patients were having diabetes mellitus and only 0.7% patients were having allergic otitis externa. It is consistent with the study done by Jia et al who found frequent scratching of the external ear canal to be the most common (79.63%) predisposing factor followed by taking ototopical and/or oral antimicrobials (24.07%).<sup>15</sup>

In our study the most common otoscopic finding was white creamy debris present in 30.3% of the subjects. Next common finding was greyish white debris present in 25.7% of patients. Black headed filamentous growth was present in 22.4% patients, yellowish mass in 14.5% patients and dark brown mass in 7.2% patients on otoscopy. It was observed that tragal sign was positive in 27.6% of the patients. However, Chander et al in his study of 110 symptomatic otomycosis patients found that classical blotting paper or wet newspaper appearance of the canal and sometimes tympanic membrane was the most common otoscopic finding.<sup>11</sup>

Cumulating all the above test results *Aspergillus* was the most common species (51.3%) in our study followed by candida in 29.6% and *Trichophyton* in 5.9%. Mixed infections were seen in 10.52% patients in which *Candida albicans* plus *Aspergillus niger* was the most common combination (3.3%). *Candida albicans* (27%) was overall the most common individual organism followed by *Aspergillus flavus* (22.4%) and *Aspergillus niger* (21.1%). Araiza et al in their study which comprised 97 cases of clinically and mycologically proven otomycosis or fungal otitis externa gathered during 12 yrs found that the major causal agents were several species of *Aspergillus* (63.9%), of which *Aspergillus flavus* was commonest (26%), followed by *Candida albicans* (26.8%) and *Aspergillus niger* (21%) which is consistent with our results.<sup>13</sup> In another study, however, Pontes et al found that the most frequently isolated species were *C. albicans* (30%), *C. Parapsilosis* (20%), *A. niger* (20%), *A. flavus* (10%), *A. fumigatus* (5%), *C. Tropicalis* (5%), *Trichosporon asahii* (5%) and *Scedosporium apiospermum* (5%).<sup>8</sup> Similarly, Sampath Prasad et al also found *Aspergilli* as the most common (80%) isolates and Audo et al found *Aspergillus flavus* as most frequent species isolated.<sup>16,2</sup>

In the present study, meanwhile patients were started on empirical treatment with 6 drugs i.e. clotrimazole, serticonazole, terbinafine, lulliconazole, fluconazole and combination of 1% clotrimazole, chloremphenicol and beclomethasone that were given randomly in equal number of patients and their effect was observed at 1<sup>st</sup> week.

At one week's observation, 67 patients (44.1%) were completely symptom free whereas 62(40.8%) patients had partial relief and 23 (15.1%) had no relief at all. Among 23 patients who had no symptomatic relief at first week, most (n=19) belong to the group who were given combination of drugs whereas 4 belong to the group which were prescribed clotrimazole. All these patients were switched to different drugs in the second week. Lulliconazole was given to 12 patients, serticonazole to 2 patients and terbinafine was given to 9 of these patients. Patients who were completely symptom free were taken off the topical antifungals and those with partial relief continued with the same drug for the second week.

At the second week, among the patients who were switched to different drugs, 22 were symptom free whereas one patient who was prescribed terbinafine had partial relief. Among the patients who continued same drug for the second week, 44 patients were symptom free whereas 18 other patients continued with their symptoms. 19 patients who continued to be symptomatic at 2<sup>nd</sup> week were given different drugs for the 3<sup>rd</sup> week. 9 patients were given lulliconazole, 9 were given terbinafine and 1 was given serticonazole and all of the patients were found to be asymptomatic after the end of 3<sup>rd</sup> week. Review examination of all the 152 patients was

done at the end of 4<sup>th</sup> week and they were found to be completely asymptomatic.

Most of the organism was sensitive to luliconazole, serticonazole and terbinafine with little variations.

*Aspergillus* was equally sensitive to luliconazole, terbinafine, serticonazole and fluconazole while as clotrimazole and combination was less effective.

*Candida* was sensitive to luliconazole, terbinafine, serticonazole and fluconazole where as clotrimazole and combination of drugs was least effective. *Trichophyton* was sensitive to all except combination. Mixed infections responded to all except combination of drugs.

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