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Original Research Article

Hospital based study on the effect of flood on change in profile of otomycosis in ethnic Kashmiri population

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ABSTRACT

Background: Kashmir valley witnessed devastating floods in the month of September 2014. The target of the study was to assess the changes in clinical profile of otomycosis and fungi responsible for the disease, in-vitro sensitivity of different fungi to various commercially available antimycotic solutions and clinical efficacy of various topical antimycotic solutions in otomycosis in pre and post flood period.
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 to identify the organism. Clotrimazole, terbinafine, lulliconazole, sertaconazole and combination of 1% clotrimazole, chloramphenicol, beclomethasone was given randomly in equal number of these patients and were followed for 4 weeks. Results of different antifungals were evaluated clinically.
Results: The trend varies in pre and post flood period. *Candida albicans* was the most common organism isolated in pre-flood period whereas *Aspergillus flavus* was the most common organism isolated in post flood period. In the pre flood period *Candida* and *Aspergillus* species had equal rate of isolation. However, in post flood period *Aspergillus* was most common species isolated. Effect of lulliconazole and terbinafine was same in pre and post flood time but serticonazole and fluconazole showed slight variation in effectiveness in post flood period. Clotrimazole and combination of 1% clotrimazole, chloramphenicol and beclomethasone were least effective post flood.
Conclusions: Flood had its impact on profile of otomycosis. *A. flavus* became more common species in post flood period. It was observed that flood had some impact on drug treatment too but further studies and tests are needed to confirm the effectiveness of drugs on treatment of otomycosis.

Keywords: Otomycosis, Kashmir, Flood, *Aspergilius*, Lulliconazole

INTRODUCTION

Otomycosis is a superficial, sub-acute or chronic fungal infection of the external auditory canal and tympanic membrane caused by fungi which often occurs due to *Aspergillus niger*, *Aspergillus fumigatus* or *Candida albicans*. *A. 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.[1]

Otomycosis is not so uncommon in Kashmir despite its temperate climate. The present study was undertaken in 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.

During the first week of September 2014, while the study was going on, the Jammu and Kashmir region witnessed devastating floods across the majority of its districts, caused by multi-day heavy rainfall events. Floods are the most common type of disaster globally, responsible for almost 53,000 deaths in the last decade alone (23:1 low- versus high-income countries).[2] According to data provided by the Home Ministry of India, several thousand villages across the state were hit and 390 villages completely submerged. The preliminary assessment of property damage was estimated between INR 50,000 million to INR 60,000 million. Approximately 277 people died.[3] The immediate and apparent health impacts of flood include drowning, injuries, hypothermia and animal bites. But this devastating flood also affected my study on otomycosis and show changes in pattern of clinical profile and response to drugs. The changes were noticed and comparison was drawn.

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 or 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 (SDA) plates at 30^0C for 10 days. Germ tube test was routinely applied for yeast colonies to identify the *C. albicans*. A portion of the fungal colony was emulsified in a drop of 10% KOH and cotton blue lactophenol and observed under microscope for moulds for different species identification. As per the available resources, in vitro drug sensitivity to fluconazole, voriconazole, flucytosine, caspofungin, ampho-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 1% clotrimazole lotion, 0.5% fluconazole gel, 1% terbinafine hydrochloride cream, 2% sertaconazole cream, 1% luliconazole lotion, a combination of 1% clotrimazole, chloramphenicol, 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. 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.

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.

As per socioeconomic status is concerned, using Kuppuswamy 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.

Table 1: Pre and post flood scenario.

Address	Pre-flood	Post-flood	Total
Rural	35	26	61
Urban	35	56	91
Total	70	82	152

Equal number of patients (n=35) reported from urban and rural areas in pre flood period. But there was a rise in no. of patients from urban area in post flood period.

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 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. However, out of 152 patients, 82 patients were exposed to flood making it a reasonable risk factor.

Figure 1: White creamy debris in each of patient with otomycosis.

Figure 2: Greyish white debris in each of patient with otomycosis.

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.

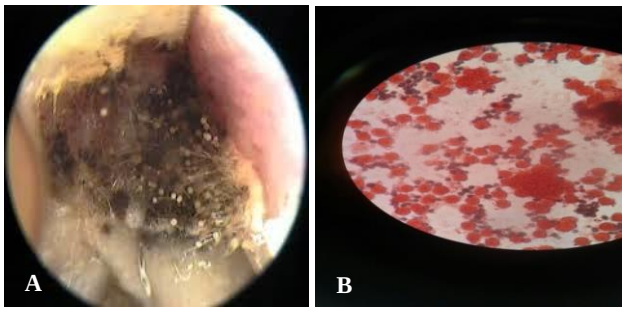

Figure 3: (A) Black headed filamentous growth in each of a patient, (B) Gram stained slide showing yeasts cells and inflammatory cells.

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.

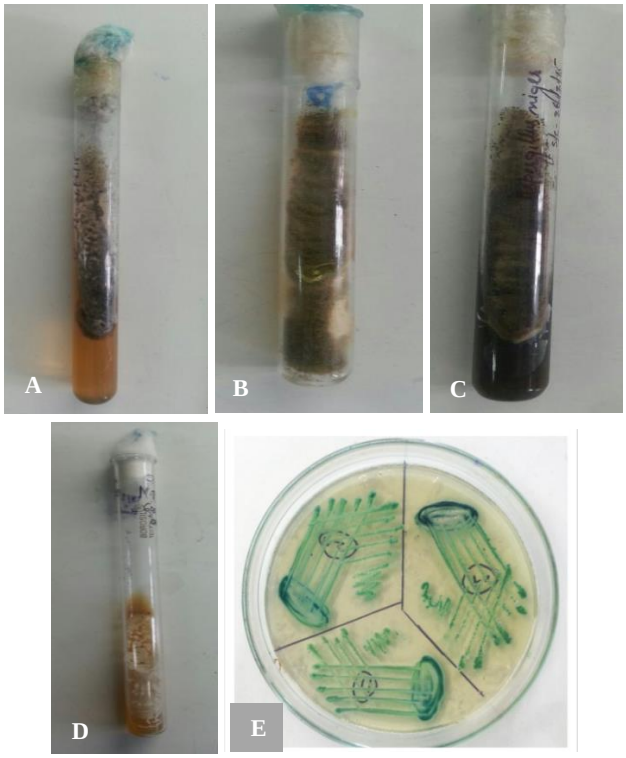

Figure 4: (A) SDA culture of *A. flavus*, (B) SDA culture showing colonies of *A. niger*, (C) SDA culture showing colonies of *A. fumigatus*, (D and E) SDA culture showing colonies of *C. albicans*.

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-E) that showed fungal growth in all but 3 slides.

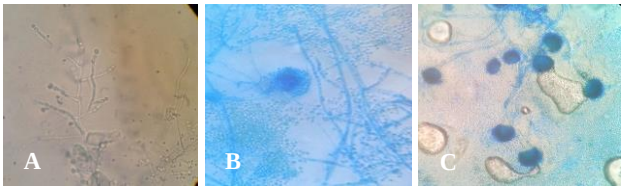

Figure 5: (A) Germ tube test showing *C. albicans*, (B) cotton blue lactophenol stain showing *A. flavus*, (C) cotton blue lactophenol stain showing *A. fumigatus.*

Germ tube test was applied on yeast colonies for species identification which showed *C. albicans* (Figure 5A) to be the pathogen in 35.5% of the specimen whereas cotton blue lactophenol stain was used on moulds (67.8%) for species identification (Figure 5B and C).

Table 2: Pre flood and post flood scenario.

Result	Pre-flood	Post-flood	Total
AFl	7	27	34
AFu	4	7	11
AN	14	18	32
AT	1	0	1
CA	23	18	41
CT	3	1	4
TT	5	3	8
TR	0	1	1
CA+AFl	3	0	3
AFu+AT	0	1	1
CA+AFu	0	1	1
CA+AN	4	1	5
AN+TT	2	0	2
CA+AFl	0	1	1
CA+AT	1	0	1
CA+TT	1	0	1
CT+AN	0	1	1
Total	68	80	148

Cumulating all the above results, it was observed that *C. albicans* was the most common (n=23) organism isolated in pre-flood period whereas *Aspergillus flavus* was the most common (n=27) organism isolated in post flood period. Overall in the pre flood period *Candida* and *Aspergillus* had equal rate of isolation (n=26each). However, in post flood period *Aspergillus* was most common (n=52) species isolated as depicted in Figure 6.

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 7).

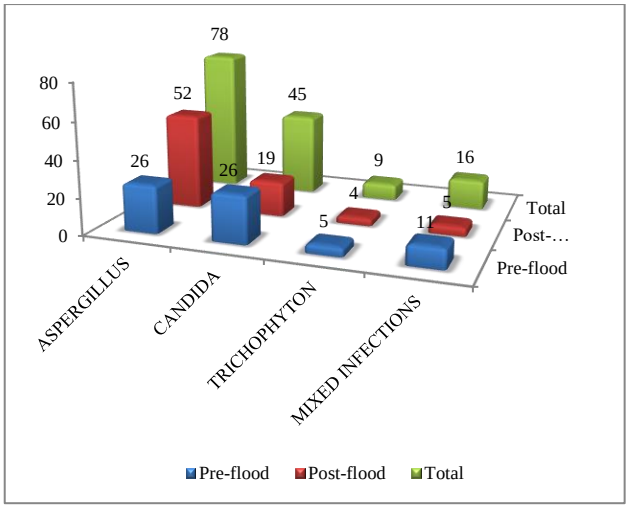

Figure 6: Changed trend in organism isolated in pre and post flood period.

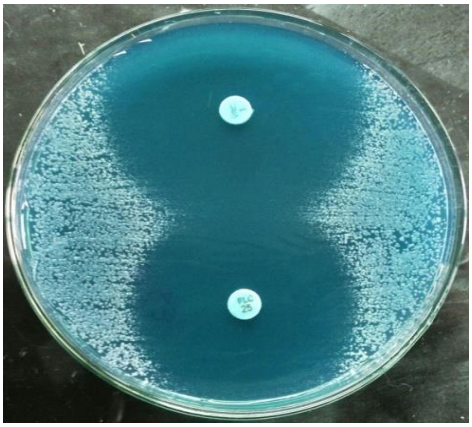

Figure 7: *Candida* species susceptible to fluconazole and voriconazole.

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, chloramphenicol and beclomethasone that were given randomly in equal number of patients and their effect was observed at 1st, 2nd, 3rd and 4th week.

All the data obtained was divided and analysed in pre flood and post flood time and following results were obtained.

Lulliconazole was given to 11 patients pre flood and 14 patients post flood and all were symptom free at the end of 1st week and show same affectivity in pre and post flood time.

Serticonazole was given in 11 patients pre flood and all were symptom free after 1st week. However, it was given to 14 patients post flood. 10 were symptom free whereas 4 were partially relieved and needed change of drug to lulliconazole.

Terbinafine was given to 12 patients pre flood and all were symptom free after 2nd week of treatment. Post flood, it was given to 13 patients and all were symptom free after 2nd week.

Fluconazole was given in 12 patients pre flood and they were all symptom free after 2 weeks. However, post flood 14 patients were given fluconazole. 9 were symptom free after 2 weeks and 5 needed change of drug to lulliconazole.

Clotrimazole was given to 12 patients pre flood. 9 were symptom free after 2nd week but 3 needed change of drug. However, 14 patients were given clotrimazole post flood and only 2 were symptom free and 12 patients needed change of drug.

Combination was given to 12 patients out of which 5 were partially relieved and 7 showed no relief. 11 patients needed change of drug. However, post flood 13 patients were given combination of which 1 showed partial relief and 12 no relief and all needed change of drug.

Table 3: Effect of drugs in pre and post flood period.

S. no.	Name of the drug		Total no. of patients receiving drug	Results after 3 weeks	
				Symptom free	Need drug change
1	Lulliconazole	Pre flood	11	11	Nil
		Post flood	14	14	Nil
2	Serticonazole	Pre flood	11	11	Nil
		Post flood	14	10	4
3	Terbinafine	Pre flood	12	12	Nil
		Post flood	13	13	Nil
4	Fluconazole	Pre flood	12	12	Nil
		Post flood	14	9	5
5	Clotrimazole	Pre flood	12	9	3
		Post flood	14	2	12
6	Combination of 1% clotrimazole, chloramphenicol and beclomethasone	Pre flood	12	1	11
		Post flood	13	Nil	13

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 to 30 years.[4] Aneja et al in their study found the disease to be more prevalent in females than males in the age group of 31 to 40 years.[5]

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.[6,7]

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.[8] 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.[9]

As per socioeconomic status is concerned, using Kuppuswamy 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.[10] As the flood affected the Srinagar city ruining the posh area, we reported more patients from upper middle class which further strengthen the association of poor personal hygiene with the disease, as rise in disease in upper middle class was noticed only after floods which affected the hygiene of upper middle class by destroying their residential.

In our study, most (59.9%) of the patients were from urban area during the study period. However, the trend in post-flood period was different from pre flood period. Equal number of patients (35) reported from urban and rural areas in pre flood period. But rise in no. of patients from urban area was seen in post flood period. 56 from urban against 26 from rural patients reported in post flood period to ENT OPD with otomycosis indicating the environmental factors predisposing to otomycosis.

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 post-surgical mastoid cavity. It is consistent with the study done by Barati et al who found pruritis being the most common symptom followed by otalgia.[9] Similarly, fullness of ear and itching followed by earache, ear discharge and tinnitus were the predominant complaints in study conducted by Sharada et al.[11]

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.[12] However, Nandyal et al and Sharada et al found more involvement of left ear.[13, 11]

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 oral antimicrobials (24.07%). [14]

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.[10]

Cumulating all the test results variation was noted in pre and post flood period. It was observed that Candida albicans was the most common organism (n=23) isolated in pre-flood period whereas *A. flavus* was the most common organism (n=27) isolated in post flood period. Overall in the pre flood period *Candida* and *Aspergillus* species had equal rate of isolation (n=26 each). However, in post flood period Aspergillus was most common (n=52) species isolated. There was decrease in mixed infections from 11 to 5 in post flood period.

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 & beclomethasone that were given randomly in equal number of patients and their effect was observed at 1st, 2nd, 3rd and 4th week.

All the data obtained was divided and analysed in pre flood and post flood time and following results were obtained.

Lulliconazole was given to 11 patients pre flood and 14 patients post flood and all were symptom free at the end of 1st week and show same affectivity in pre and post flood time.

Serticonazole was given in 11 patients pre flood and all were symptom free after 1st week. However, it was given to 14 patients post flood. 10 were symptom free whereas 4 were partially relieved and needed change of drug to lulliconazole.

Fluconazole was given in 12 patients pre flood and they were all symptom free after 2 weeks. However, post flood 14 patients were given fluconazole. 9 were symptom free after 2 weeks and 5 needed change of drug to lulliconazole.

Terbinafine was given to 12 patients pre flood and all were symptom free after 2nd week of treatment. Post flood, it was given to 13 patients and all were symptom free after 2nd week.

Clotrimazole was given to 12 patients pre flood. 9 were symptom free after 2nd week but 3 needed change of drug. However, 14 patients were given Clotrimazole post flood and only 2 were symptom free and 12 patients needed change of drug.

Combination was given to 12 patients out of which 5 were partially relieved and 7 showed no relief. 11 patients needed change of drug. However, post flood 13 patients were given combination of which 1 showed partial relief and 12 no relief and all needed change of drug.

It was observed that flood had some impact on drug treatment too but further studies and tests are needed to confirm the effectiveness of following drugs on treatment of otomycosis.

CONCLUSION

Flood had its impact on profile of otomycosis. *A. flavus* became more common species in post flood period. It was observed that flood had some impact on drug treatment too but further studies and tests are needed to confirm the effectiveness of drugs on treatment of otomycosis.

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