ORIGINAL ARTICLE

Prevalence of fungal infections in a tertiary care centre: A retrospective study

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ABSTRACT

Back ground: During recent years, fungal infections have risen exponentially and are a significant cause of morbidity and mortality in hospitalised patients. Fungal infections are commonly observed in patients with uncontrolled diabetes mellitus, organ transplant, use of invasive devices and broad spectrum antimicrobial agents. **Objective:** A retrospective analysis for a period of one year was undertaken to know the prevalence of common fungal infections in a tertiary care hospital. **Materials and Methods:** Clinical samples collected from patients presenting with clinically suspected fungal infections were received in the microbiology laboratory attached to the Medical College Hospital, Thiruvananthapuram, Kerala, India. Direct microscopy with 10% potassium hydroxide was done to visualize the presence of fungal elements, and Gram staining was done for any suspected yeast infection. India ink stain was done for cerebrospinal fluid. The samples were inoculated on Sabouraud's Dextrose Agar and kept at 22°C and 37°C. **Results:** A total of 366 samples with suspected fungal aetiology were included in the study. The isolates were maximum in adults (66.66%). Females (54.5%) were more affected than males (45.5%). There were 81 isolates of which one was yeast, 28 were yeast-like fungi, and 52 were mould fungi. Non-albicans Candida (32.09%) and *Aspergillus flavus* (20.98%) were the predominant fungal isolates. **Conclusion:** The predominant isolate obtained in this study was non-albicans Candida. Among moulds, aspergillus species was the most common isolate. An increase in fungal infections may be due to an increase in the number of AIDS patients in our hospital.

Key words: Fungal infections, non-albicans Candida, *Aspergillus flavus*

INTRODUCTION

Fungal infections have risen exponentially over the past few decades, however, they still remain under-reported. Fungal isolates which were considered as laboratory contaminants are now emerging as major pathogens. Some reasons for this are the emergence of acquired immunodeficiency syndrome, increasing the incidence of diabetes mellitus, organ transplantation, chemotherapy and misuse/overuse of antimicrobials.

The changes seen are that now these organisms are capable of affecting not only immunecompromised patients but also healthy immune-competent individuals and some species of non-albicans *Candida* are more common than *Candida* albicans which was the predominant species earlier.[1,2]

Hence, this retrospective study was undertaken to find the prevalence of fungal infections and characterise the common fungal species isolated in this tertiary referral centre.

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MATERIALS AND METHODS

A retrospective study was conducted in Government Medical College, Thiruvananthapuram from July 1, 2013 to June 31, 2014 to find the prevalence of fungal infections, their species and diseases caused.

All specimens sent to the Department of Microbiology for fungal culture during this period were included in the study. Nail clippings and skin obtained after

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cleaning the area with 70% alcohol and collected in sterile petri dishes were sent to the laboratory. Sterile body fluids, tissues, pus, pus swabs, invasive catheter tips and urine were collected aseptically and transported in sterile containers or syringe. Sputum was collected and transported in clean, dry containers. Blood was collected directly in brain heart infusion bottles. Samples were examined by preparing wet mounts or by potassium hydroxide preparation. For examination of cerebrospinal fluid (CSF), India ink stain and Gram stain were used.

The samples were inoculated into two tubes of Sabouraud's dextrose agar and incubated at room temperature and 37°C. The tubes were examined on alternate days for the first 2 weeks and then twice weekly for the next 2 weeks. Isolates were identified based on the morphological details, the rate of growth, colour, texture and pigmentation of obverse and reverse. Microscopy of the growth was done using lactophenol cotton blue mount. Yeast isolates were identified by Gram stain and germ tube test.

RESULTS

A total of 366 samples sent from various departments were included in the study. Of these, fungal growth was obtained from 81 (22.14%) samples. The rest of the (285, i.e., 77.86%) samples were sterile [Table 1]. Rate of isolation was more in females and adults [Tables 2 and 3].

The highest rate of isolation was from body fluids/pus/tissue (80.24%). This was followed by urine (9.87%), skin/hair/nail (3.70%), sputum (2.46%), blood (2.46%) and CSF (1.23%) [Table 4].

Among the isolates, 52 (64.19%) were mould, 28 (34.57%) were yeast-like fungi, and 1 (1.24%) was yeast (*Cryptococcus neoformans*). Dimorphic fungi were not isolated in this study [Table 5].

Yeast-like isolates included non-albicans *Candida* (32.09%) Rhodotorula spp. and Trichosporon species. There was no isolate of *C. albicans*. Most of the isolates of non-*albicans Candida* (57.69%) were from body fluids/pus/tissue. Rhodotrula spp. was isolated from continuous ambulatory peritoneal dialysis fluid and Trichosporon species from a skin biopsy. The isolate of *C. neoformans* was from CSF. Among moulds, the most common was *Aspergillus flavus* (20.98%) followed by *A. niger* (14.81%) and *A. fumigatus* (12.34%) [Table 6].

DISCUSSION

Fungal infections are usually insidious and their diagnosis and treatment is often delayed due to co-existing illnesses.[3] We received a total of 366 samples in our laboratory of which 81 were culture positive. In this study, adults were mostly affected. This correlates with the studies done by Aggarwal[4] and Nawal.[5] In this study the most common fungal isolate was non-albicans Candida (32.91%) followed by *A. flavus* (21.51%). This is consistent with the emergence of non-albicans Candida all over the world.[6,7] A study conducted in the United States reported non-albicans Candida as an emerging pathogen causing fungemia.[8] The isolates of *A. flavus, A. niger* and *A. fumigatus* obtained in this study were from body fluids/pus/tissue. *A. flavus* has been

Table 1: Distribution of total samples

Total number of samples	Culture positive (%)	Culture sterile (%)
366	81 (22.14)	285 (77.86)

Table 2: Sex-wise analysis of fungal isolates obtained from clinical samples

Gender	Number of samples	Number of isolates	Percentage
Male	201	36	45.5
Female	165	45	54.5
Total	366	81	100

Table 3: Age-wise distribution of fungal isolates obtained from clinical samples

Age group	Total	Number of isolates	Percentage
Neonates (0-28 days)	8	2	2.48
Paediatric (29 days-18 years)	44	14	17.28
Adults (up to 60 years)	256	54	66.66
Geriatric (>60 years)	58	11	13.58
Total	366	81	100

Table 4: Distribution of fungal positivity from various samples

Samples	Blood	CSF	Body fluids/ pus/tissue	Skin/ hair/nail	Urine	Sputum	Total
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	
Fungal positivity	2 (2.46)	1 (1.23)	65 (80.24)	3 (3.70)	8 (9.87)	2 (2.46)	81

Table 5: Number of fungal isolates

Isolate	Number (%)
Mould	52 (64.19)
Yeast-like fungi	28 (34.57)
Yeast	1 (1.24)
Dimorphic fungi	0 (0)
Total	81 (100)

Table 6: Spectrum of isolates among various samples

Organism	Blood	CSF	Body fluids/ pus/tissue	Skin/hair/nail	Urine	Sputum	Total
Non-albicans Candida	1		15		8	2	26
Rhodotorula spp.			1				1
Trichosporon spp.				1			1
Cryptococcus neoformans		1					1
Aspergillus flavus			17				17
Aspergillus niger			11	1			12
Aspergillus fumigatus			10				10
Aspergillus terreus			1				1
Zygomycetes	1		5	1			7
Fonsecaea pedrosoi			1				1
Aureobasidium pullulans			1				1
Exophiala jeanselmei			1				1
Chrysosporium spp.			1				1
Alternaria spp.			1				1
Total	2	1	65	3	8	2	81

CSF: Cerebrospinal fluid

reported to be the most common fungal isolate in studies on FRS from India.[9,10] A recent study from the United States by Montone et al. also found *Aspergillus* species to be the most common cause of FRS.[11]

The rare isolates obtained from body fluids/pus/tissue included *Fonsecaea pedrosoi, Aureobasidium pullulans, Exophiala jeanselmei, Chrysosporium* species and *Alternaria* species. In this study, *C. neoformans* was isolated from one CSF sample. The patient was HIV positive. Cryptococcal meningitis is commonly associated with immunocompromised patients.[12] Dimorphic fungi were not obtained in this study.

CONCLUSION

The management of fungal infections is challenging. It is complicated by difficulty in diagnosis and increasing resistance of pathogens to available antifungal drugs. Rapid diagnosis of fungal infections remains limited and culture detection of fungal isolates is often delayed due to slow or absent growth of fungal isolates from clinical samples.[3] The clinician microbiologist collaboration will help in improving patient care.

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Conflicts of interest
There are no conflicts of interest.

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