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Diversity and Abundance of Human Pathogenic Fungi in Opportunistic Patients

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***Abstract*: Pathogenic fungi are a growing health concern worldwide, due to the opportunistic nature. Fungi are everywhere. There are millions of different fungal species on earth. Fungal diseases are often caused by fungi that are common in environment. Mycotic infections have become very frequent in recent years. Normally mycosis occurs in compromised individuals. The aim of the study is to determine the fungal biodiversity causing diseases in patients. In present investigation 111 patients were screened for the presence of the fungal infections and 27 different species of fungi were isolated from various clinical samples.**

***Keywords*: Biodiversity, compromised, investigation, opportunistic, pathogenic.**

1. Introduction

Opportunistic infections have become a growing global public health problem particularly in immunosuppressed patients (Chakrbarti et al., 1992, Staib., 1996, Beffa et al., 1998) Mycotic infections have become more frequent in recent years. Its significance has increased many folds in contemporary medicine particularly with the advent of AIDS. Normally, mycoses occurs in immune compromised individuals having some underlying conditions such as malignant tumors, hematoblastosis, chronic infections or administration of multiple chemotherapeutic agents. 10,000 species on fungi have been recognised and described and about 180 species are recognised at primary pathogens of man and animals. Fungi infecting immunocompromised patients are called opportunistic pathogens. Many of these are ubiquitous in environment of the patient and become the source of infections. (Colombo AL. 2000., Pfaller MA 1996) Candida species are most common pathogens capable of causing infections in hospitalised patients (Komshian et al., 1989, Pfaller, 1994, 1995) unfortunately, medical community is not aware of such secondary infections due to fungi in their patients, leading to grave consequences. Recent studies estimate that fungal infections, especially those caused by candida, cryptococcus and aspergilus species kill more than 1 million people annually (Guilhem et al. 2019) Infections caused by opportunistic human fungal pathogens are a source of increasing medical concern (Hovhannisyan et al. 2019). Fungal infections are uncommon and therefore are hard to study. Clinical manifestations of such infections vary a great deal and therefore, diagnosis is difficult. Invasive fungal infections present a major challenge to a growing patient population. In this study we determined the abundance of fungal biodiversity among patients undergoing treatment for various ailments in the hospital. The objective of the present study is to examine the incidence of opportunistic fungi in local population.

2. Methodology

The patients were screened for fungal infection at government and private hospitals of Jabalpur. The clinical samples investigated were peripheral blood, urine, sputum andcerebro spinal fluid (CSF).

1) Collection of clinical samples

1. *Collection of blood*: 2 ml of blood from the patient was collected by means of vein puncture using sterilized needles and syringes. The blood was immediately transferred to a previously sterilized bottle containing 3 ml of Sabouraud's dextrose broth and coated with heparin as anticoagulant. The bottle was agitated rapidly but gently to ensure proper mixing of the blood with anticoagulant. Samples were brought immediately to the laboratory. The bottle with the mixture was then incubated for 24 hours at 28 +- 1 degree C.
2. *Collection of urine:* Early morning 5ml of midstream first urine sample of the patient was collected under sterile condition in sterilized wide mouth plastic bottles. The sample was then centrifuged at 2000rpm for 15 minutes. Supernatant was discarded and the sediment of urine was used.
3. *Collection of sputum:* Early morning sample of sputum was collected after the patient had brushed and washed his mouth vigorously with sterile saline water. Fresh single cough specimen was collected in sterilized wide mouth plastic bottles.
4. *Collection of CSF:* The CSF was obtained by

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puncturing the subarachnoidal spacein the interspace between the 3rd and 5th lumber vertebra. The puncture was done aseptically under local anaesthesia. A special lumber puncture needle was used.

Samples were inoculated in SDA slants. The slants were incubated at 28 degree C up to 2 weeks. Yeasts were identified on the basis of chlamydospores, germ tube formatiom, biochemical tests and yeast identification programme (Kwon Chung and Bennett 1992.) Molds were identified on the basis of thermotolerance, culture, macro and micro morphological characteristics of the fungi.

3. Results

Out of 111 cases, 62 (55.85%) were found positive. The frequency of male patients was more than females (Table 1) In the present study 27 species of fungi were isolated from various clinical samples and 60.67% isolates belonged to yeast species and 39.32% to mould (Fig. 1, 2, 3) The yeast species isolated from clinical samples were Candida albicans, C. glabrata, C. gulliermondii, C. parapsilosis, C. tropicalis, non albicans candida species, Trichosporonbeigelli, Cryptococcus albidus , Cryptococcus neofarmans. Hyaline moulds isolated were Aspergillus flavus, A. fumigates, A. nidulans, A. terreus, Penicillium Sp. Parcilomycesvariotii, Acremonium Sp. Cylindrocarponlichenicola, Fusarium soloni, Trichophyton rubrum and Apisporamontagene. Only three genus of demutiaceous moulds- Alternaria alternata ,Curvulariaverruculosa and Cladosporium cladosporioides.(Table 2)

Table 1

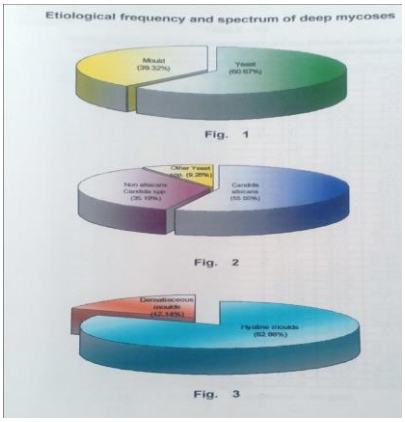
Age and sex distribution of 62 positive cases of deep mycoses

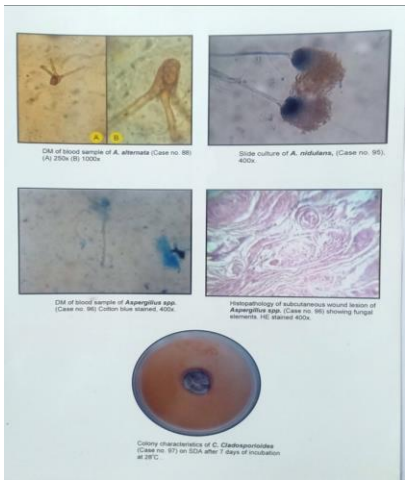
Age in years	Male		Female		Total No. of cases	% of Total Cases
	No. of cases	% of cases	No. of cases	% of cases		
0-10	4	80	1	20	5	8.06
11-20	-	-	1	100	1	1.61
21-30	7	50	7	50	14	22.58
31-40	11	61.11	7	38.89	18	29.03
41-50	7	77.78	2	22.22	9	14.52
51-60	6	66.67	3	33.33	9	14.52
61-70	4	66.67	2	33.33	6	9.68
TOTAL	39	62.90	23	37.1	62	100

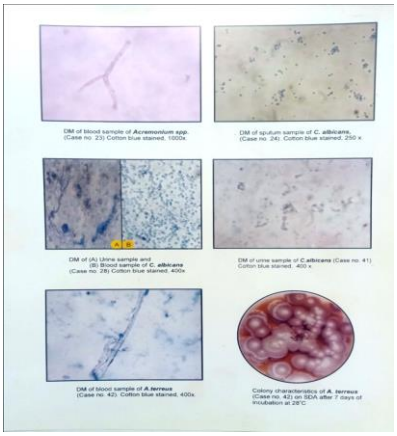
Table 2

Frequency of different species of fungi isolated from various types of clinical samples

S. No.	Species isolated	Samples collected				Total	Percentage		
		Blood	Urine	Sputum	CSF		Total %	Yeast & Mould	With respect to yeast & mould
1.	*Candida albicans*	09	15	06		30	33.70	60.67	*Candida albicans* 55.55
2.	Unidentified non-albicans Candida	05	02	-	-	07	7.86		Non *albicans candida* sp. 35.19
3.	*Candida glabrata*	01	04	-	-	05	5.62		
4.	*Candida gulliermondii*	03	-	-	-	03	3.37		
5.	*Candida parapsilosis*	02	01	-	-	03	3.37		
6.	*Candida tropicalis*	01	-	-	-	01	1.12		
7.	*Trichosporon beigelii*	-	01	-	-	01	1.12		Other yeast sp. 9.26
8.	*Cryptococcus neoformans*	-	-	-	02	02	2.24		
9.	*Cyrptococcus albidus*	-	01	-	-	01	1.12		
10.	*Cryptococcosis* sp.	01	-	-	-	01	1.12		
11.	*Aspergillus flavus*	02	01	-	-	03	3.37	39.32	Hyaline mould 82.86
12.	*Aspergillus fumigatus*	02	01	-	-	03	3.37		
13.	*Aspergillus* sp.	01	-	-	-	01	1.12		
14.	*Aspergillus candidus*	01	-	-	-	01	1.12		
15.	*Aspergillus terreus*	01	01	-	-	02	2.24		
16.	*Aspergillus nidulans*	01	-	-	-	01	1.12		
17.	*Penicillium* sp.	03	01	01	-	05	5.62		
18.	*Paecilomycesa variotii*	03	01	-	-	04	4.49		
19.	*Acremonium* sp.	02	-	-	-	02	2.24		
20.	*Fusarium solani*	01	-	-	-	01	1.12		
21.	*Cylindrocarpon lichenicola*	01	-	-	-	01	1.12		
22.	*Trichophyton* rubrum	01	-	-	-	01	1.12		
23.	*Apispora montageni*	01	-	-	-	01	1.12		
24.	Unidentified spp.	01	-	02	-	03	3.37		
25.	*Alternaria alternata*	02	-	01	-	03	3.37		Dematiaceous Mould 17.14
26.	*Curvularia verruculosa*	02	-	-	-	02	2.24		
27.	*Cladosporium cladosporioides*	01	-	-	-	01	1.12		
	TOTAL	48	29	10	02	89		99.99	







4. Conclusion

Fungal infections have increased significantly on the global basis and the clinical entity of great public health importance in modern era. A total of 89 etiologic agents were isolated from different clinical samples. The cases of deep mycoses are alarmingly high. The concerned clinicians are not aware of such secondary infections associated with the primary disorder of the patients. A variety of pathogenic fungi are associated in the disease process. Therefore human pathogenic fungal biodiversity is a significant factor in the causation of such diseases in the patients. It is suggested that such patients be regularly monitored and treated for such infection along with primary disorder. So as to avoid any complication to develop in the management of patients.

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