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RESEARCH ARTICLE

ASSESSMENT OF INCIDENCE OF MYCOLOGICAL INFECTIONS IN BURN WOUNDS AND THEIR ANTIMYCOTIC RESISTANCE PATTERN AT TERTIARY CARE HOSPITAL IN WESTERN RAJASTHAN, INDIA

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ABSTRACT

Fungal-infection in the burn patient is a leading cause of morbidity and mortality known to cause many deaths remains one of the most challenging concerns for the burn treating team. This study was conducted at the tertiary care level to determine frequency of wound infections by fungus in burn patients and antimycotic resistance pattern of isolates. One hundred & fifty patients of all age groups were included in the study. Samples were collected from the burn wounds & processed microbiologically. Fungi were found to cause burn wound infection in 40 out of 150 cases (26.67%) with predominant Candida non-albicans spp. 24 cases.-60%, Moulds 12 cases- 30% & *C.albicans* 4 cases- 10 % among total fungal isolates. 75% Moulds were resistant to fluconazole& itroconazole, while 100% were resistant to clotrimazole. 50% candida albicans were resistant to Fluconazole& Itraconazole while 75% were resistant to clotrimazole. Among Candida non- albicans 75% were resistant to fluconazole, Itraconazole & clotrimazole. Voriconazole is still responding well in 85-90% cases due to its broad spectrum & replaced as first line therapy. This study identified clinicoepidemiological profile of burn wound infections by fungus in Western Rajasthan & concluded that a proper care of burn wound that predispose to fungal invasion, early diagnosis & appropriate treatment may helps in reduction of infection rates & decrease in morbidity & mortality rate.

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INTRODUCTION

Burns are one of the most common serious and devastating forms of trauma. Every year approximately 3 Lacks peoples die from burn injuries all over the world. Burn is the second major cause of trauma related deaths after road traffic accidents with high morbidity and mortality. (WHO 2008) It is third most common cause of death among children aged 5-14yrs with road traffic accidents and drowning being first and second respectively. (Durtschi *et al*., 1980) Despite significant advances in burn care, infection remains a major cause of morbidity and mortality in burn patients. (Wibbenmeyer *et al*., 2006) The major challenge for a burn team is nosocomial infection in burn patients, which is known to cause over 50% of burn deaths. 7–12% of hospitalized patients end up with hospital acquired infections globally with more than 1.4 million people suffering from infectious complications acquired in the hospital. (WHO, Geneva, Switzerland, 2nd edition, 2002)

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The situation is worsened by the emergence of poly-microbial resistant strains of nosocomial pathogens.(Kamat 2000)Burn wound infection (BWI) is primarily caused by bacteria (70%) followed by fungi (20–25%), and virus (5–10%). Fungi cause BWI as part of monomicrobial or polymicrobial infection, fungaemia, rare aggressive soft tissue infection and as opportunistic infections. (Horvath *et al*., 2007)

The risk factors for acquiring fungal infection in burns include age of patient, total body surface area (TBSA) (30–60%) burned, full thickness burns, inhalational injury, prolonged hospital stay, open dressing, artificial dermis, central venous catheters, antibiotics, steroid treatment, long-term artificial ventilation, fungal wound colonization (FWC), hyperglycemic episodes and other immunosuppressive disorders.Clinically, patients with fever, despite the intake of broad-spectrum antibiotics for >7–15 days, and deteriorating condition in the presence of risk factors should be suspected of fungal infection.

Aims & Objectives

(1) To study incidence pattern of burn wound infections by fungus.
(2) To determine mycological spectrum of burn wound infections.
(3) To determine antifungal resistance pattern of isolates.
(4) To find out correlation between mortality and fungal - infection.

MATERIALS AND METHODS

The Study was conducted in the department of Microbiology, Dr. S. N. Medical College, Jodhpur Rajasthan from January 2015 to June 2015. A total 300 surface swab samples from burn wound of 150 burn patients were collected with aseptic precautions, from Burn unit of Mahatma Gandhi Hospital, Dr. S.N. Medical College, Jodhpur, Rajasthan.

Data collection

A detailed history was taken that included patient's name, age, gender, residential status, date, site, mode & type of burn, date of admission & any chronic illness like psychosis, depression, diabetes mellitus, cancer or any h/o immunosuppressive therapy.

Sample processing & microbial identification

Samples were processed at Department of Microbiology, Dr. S. N. Medical College, Jodhpur, Rajasthanby standard microbiological procedures. Two separate swabs were taken from burn wound, first was used to prepare direct smear for Gram's staining & addition of 10% KOH for fungal identification, the 2nd swab was used for fungal culture.(Moline, 1999; Duguid, 1999; Forbes *et al*., 2002) Samples were inoculated on various mycological media (Sabouraud's dextrose agar with and without chloramphenicol) in duplicate tubes and incubated at 25 and 37°C for up to 4 weeks before giving a negative culture report. Yeasts were identified by germ tube test, characteristics morphology on Glucose agar-1%, culture characteristics on HI chrome agar (HI media, Mumbai, India) & confirmed by Automated Vitek-2 system. Moulds were identified using lacto phenol cotton blue mount preparation & morphology found on slide culture.(Moline, 1999; Duguid, 1999; Forbes*et al*., 2002; Freydiere *et al*., 2001)

The antifungal susceptibility of the isolates was tested by broth micro-dilution method as per CLSI recommendation.(NCCLS 2004)

RESULTS

As mentioned in table no.1, Majority of the patients (34.66%) were in the age group of 21-30 years, followed by 28% in the age group of 31-40 years & 24% were in the age group of 11-20 yrs. The Majority of the patients (62%) were in rural geographical area and 38% of urban area. The study revealed that Fungi were found to cause burn wound infection in 26.67% cases with predominantly Candida non-albicans spp.-24 cases (60%) (C.parapsilosis-12, C.tropicalis-6, C.glabrata-2, C.krusei-2, & C.gullenmondi-2} Moulds-12 cases (30%), (Aspergillus spp.-08, penicillium-1, mucor-2, fusarium-1) & C.albicans -4 cases (10 %) among total fungal isolates. Out of total 40 patients with fungal infection, unfortunately 24 (60%) were expired even less total body surface area involved in burn injury. Out of total expired patients 10 were infected with moulds (83.33%), 12 were infected with C.non albicans (50%) & 2 were infected with C.albicans (50%) out of total respected cases.

Regarding resistance pattern of isolates 75% Moulds were resistant to fluconazole& itroconazole, while 100% were resistant to clotrimazole. 50% candida albicans were resistant to fluconazole& Itraconazole while 75% were resistant to clotrimazole. Among Candida non- albicans 75% were resistant to fluconazole, Itraconazole & clotrimazole. Voriconazole is still responding well in 85-90% cases due to its broad spectrum & replaced as first line therapy, our results were similar to previous Walsh *et al*., 2008; Capoor *et al*., 2010 studies.

Table 1. Age wise distribution of patients

Age group	Male	female	Total	%
0-10	02	02	04	2.67
11-20	18	18	36	24
21-30	36	16	52	34.66
31-40	24	18	42	28
41-50	02	02	04	2.67
>50	10	02	12	8.0
Total	92	58	150	100 %

Table 2.Fungal species isolated

Fungal-isolates	Fungal spp.	cases	%
C.albicans	C.albicans	4	10
C.non-albicans	C.parapsilosis	12	30
	C.tropicalis	6	15
	C.glabrata	2	5
	C.krusei	2	5
	C.gullenmondi	2	5
Moulds	Aspergillus spp.	8	20
	Mucor	2	5
	Penicillium	1	2.5
	Fusarium	1	2.5
Total		40	100

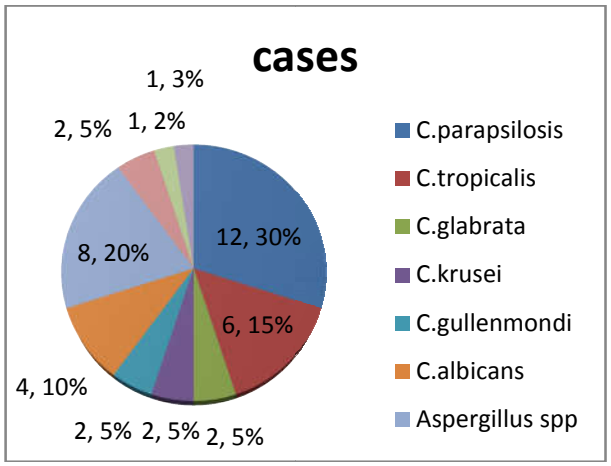

Figure 1. % of fungal isolates

Table 3. Resistance pattern of fungal isolates in %

Fungal Isolates	FLC	VRC	IT	AP	NS	CC	MF	CF	FLT
C.albicans	50	0	50	25	25	75	15	25	25
C.non-Albicans	75	15	75	33.33	25	75	25	25	33.33
Moulds	75	20	75	50	50	100	50	50	50

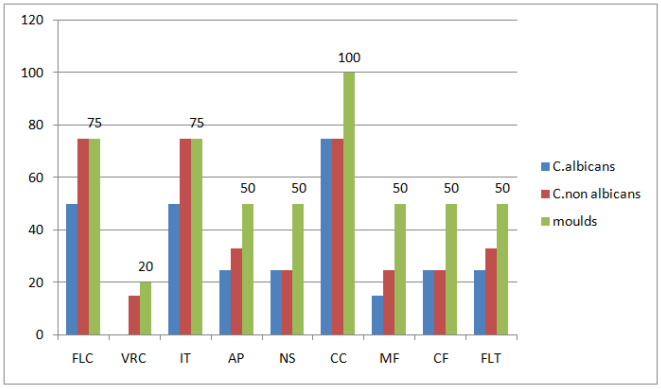

Figure 2. Resistance pattern of fungal isolates in %

FLC-Fluconazole,VRC-Voriconazole,IT-Itraconazole,AP-Amphotericin-B NS-Nystatin,CC-Clotrimazole,MF-Micafungin,CF-Caspofungin,FLT-Flucytocin

DISCUSSION

Although survival rates for burn patients have improved substantially in the past few decades due to advances in modern medical care in specialized burn centers, still nosocomial infections represent a major challenge for a burn team in burn patients, which are known to cause over 50% of burn deaths. (American Burn Association, 2000; Lionelli, 2005; National Safe Kids Campaign, 2002; Roth and Hughes, 2004; Saffle *et al*., 1995; Washington, 1993) The current study showed that infection of the burn wound is almost the rule. Such opportunistic invasion by bacteria and fungi might result from several factors including the presence of coagulated proteins, the absence of blood-borne immune factors, and the a-vascularity of the burn wound.

This study revealed that among total 150 patients studied fungi were found to cause burn wound infection in 40 patients (26.67 %) with predominantly Candida non - albicans spp. 24 patients (60%), Moulds-12(30%) & C.albicans-4 (10 %) among total fungal isolates. This is comparable with Church *et al.* study, 2006, Walsh *et al*., 2008; Capoor *et al*., 2010 studies.

Out of total 40 patients with fungal infection, unfortunately 24 (60%) were expired even less total body surface area involved in burn injury. Out of total expired patients 10 were infected with moulds (83.33%), 12 were infected with C.non albicans (50%) & 2 were infected with *C.albicans* (50%). This is comparable to many studies (Ballard *et al*., 2008; Murray *et al*., 2008). Which reported that other species of *Candida* has emerged to be equally important in immunocompromised burn patients with high mortality. (Mathews *et al*., 2001; Leung *et al*., 2002; Gupta *et al*., 2004) The high percentage of fungal colonization increasing with the duration of hospital stay is probably due to empirical use of broad-spectrum antibiotics.

Compared to several earlier reports on burn wound colonization and invasive infection, one of the most striking difference in our study is the high mortality 83.33% with mould infection which may be due to angio-invasive nature of Aspergillus which favors fungaemia with fatal outcome.

Conclusion

In conclusion, burns provide a suitable site for fungal invasion and infection mainly because of the larger area involved and longer duration of patient stay in the hospital. To ensure early and appropriate therapy in burn patients, a frequent evaluation & proper care of the burn wound is necessary, a strict antibiotic policy should be followed by all burn institutions and a rotation program for topical antimicrobial may retard the development of resistance. Therefore, a continuous surveillance of fungal prevalence in environment of burn unit and a regular update of their antimycotic resistance pattern are essential to maintain good infection control programs in the burn unit, thus improving the overall infection-related morbidity and mortality. The Prudent uses of antibiotics should be practiced to prevent future development of resistance as well as predisposition of fungal invasion & infection in burn patients.

Most of the infections are misdiagnosed due to lack of clinical awareness and similar presentation as bacterial infection coupled with paucity of mycology laboratories. Nonetheless, early diagnosis and treatment of these mycoses can be life-saving as the mortality is otherwise very high. (Mousa, 1999; Tsoutsos *et al*., 2001; Gupta *et al*., 2005) There is worldwide decrease in bacterial infections due to better care of burn patients and availability of effective antibiotics. Consequently, the fungal BWI has shown an increasing trend. (Murray *et al*., 2008; Becker *et al*., 1991; Ballard *et al*., 2008; Mousa, 1997; Schofield *et al*., 2007; Cochran, 2002) Improvement in topical antifungal therapy with mould activity and implementation of appropriate systemic antifungal therapy guided by antifungal susceptibility improves the outcome for severely injured burn victims susceptible to fungal infection. All the more, infection control practices should be followed and microbiological surveillance data should be used frequently to monitor the trend, as the treatment is expensive.

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REFERENCES

American Burn Association. 2000.Burn incidence and treatment in the US: 2000 fact sheet. http://www. ameriburn.org. (Online)

Ballard J, Edelman L, Saffle J, Sheridan R, Kagan R, Bracco D, *et al*. Multicentre Trials Group. American Burn Association. *J Burn Care Res*., 2008;29:213–21. (PubMed)

Becker WK, Cioffi WG, McManus AT, Kim SH, McManus WF, Mason AD, *et al*. Fungal burn wound infection: A 10 year experience. *Arch Surg*.,1991;126:44–8. (PubMed)

Cochran A. Systemic *Candida* infection in burn patients: A case control study of management patterns and outcomes. Surg Infect (Larchmt) 2002;3:367–74. (PubMed)

Ducel, G., J. Fabry, and L. Nicolle, Eds., Introduction in Prevention of HospitalAcquired Infections—A Practical Guide. WHO, Geneva, Switzerland, 2nd edition, 2002.

Duguid JP. (1999): Staining methods. In practical medical microbiology. Edited by: ColleeJG, Marmion BP, Fraser AG and Simmons A. (14th edition) London, UK. p796.

Durtschi MB, Kohler TR, Finley A, Heimbach DM. Burn injury in infants and young children. SurgGynecolObstet 1980; 150:651-6.

Forbes BA, Sahm DF, Weissfeld L, Eissfeld AS. Bailey and Scott.s Diagnostic Microbiology. 11th Ed. Ohio: Mosby; 2002. pp. 865–80.

Freydiere AM, Guinet R and Boiron P. 2001. Yeast identification in the clinical microbiology laboratory: phenotypical methods. *Med Mycol*., 39: 9-33.

Gupta N, Hague A, Lattif AA, Narayan RP, Mukhopadhyay G, Prasad R. Epidemiology and molecular typing of Candida isolates from burn patients. Mycopathologia. 2005;158:397–405. (PubMed)

Gupta N, Haque A, Lattif AA, Narayan RP, Mukhopadhyay G and Prasad R. 2004.Epidemiology and molecular typing of Candidaisolates from burn patients. Mycopathologia 158:397-405.

Horvath EE, Murray CK, Vaghan GM, Chung KK, Hospenthal DR, Wade CE, *et al*. Fungal wound infection (not colonization) is independently associated with mortality in burn patients. *Ann Surg*., 2007;245:978–85. (PMC free article)(PubMed)

Introduction in Prevention of HospitalAcquired Infections—a Practical Guide.G. Ducel, J. Fabry, and L. Nicolle, Eds., WHO, Geneva, Switzerland, 2nd edition, 2002.

KamatU., A. Ferreira, R. Savio, and D. Motghare,"Antimicrobial resistance among nosocomial isolates in a teaching hospital in Goa," *Indian Journal of Community Medicine*, vol. 33, no. 2, pp. 89–92, 200.

Leung AY, Chim CS, Ho PL, Cheng VC, Yuen KY, Lie AK, Au WY, Liang R and Kwong YL.2002. Candida tropicalisfungaemia in adultpatients with hematologicalmalignancies: clinical features and risk factors. *J Hosp Infect*, 50: 316-319.

Lionelli, GT, Pickus EJ, Beckum OK,Decoursey RL, and Korentager RA. 2005.A three decade analysis of factors affecting burnmortality in the elderly. Burns 31:958–963

Malini R Capoor *et al*. Fungal infections in burns: Diagnosis and management Volume 43 Issue 3 Page 37-42 Year 2010

Mathews MS, Samuel PR and Suresh M. 2001. Emergence of Candida tropicalis as themajor cause of fungaemia in India. Mycoses 44:278-280.

Moline, LJR. 1999.Fungi. In: practical medicalmicrobiology. Edited by: Collee JG, MarmionBP, Fraser AG and Simmons A. (14th edition)London, UK.p697-711.

Mousa HA. Aerobic anaerobic and fungal burn wound infections. *J Hosp Infect*., 1997; 37:317–23. (PubMed)

Mousa HA. Fungal infection of burn wound in patients with open and occlusive treatment methods. *East Mediterr Health J*., 1999;5:333–6. (PubMed)

Murray C, Loo F, Hospenthal D, Cancio L, Jones J, Kim S, *et al*. Incidence of fungal infections and related mortality following severe burns. Burns. 2008;34:1108–12. (PubMed)

National Safe Kids Campaign 2002. Burn injury fact sheet. http://www .safekids.ca. (Online)

NCCLS 2004. National Committee of Clinical and Laboratory Standards. Performance standard for antimicrobial susceptibility testing; 14th informational supplement. NCCLS document M100-S14, M27- A2. 2nd ed. Wayne, Pa: Reference method for broth dilution testing of yeast approved standard. West Valley, Pennsylvania, USA.

Roth JJ and Hughes WB. 2004. The essential burn unit handbook. Quality Medical Publishing,St. Louis, Mo.

Saffle JR, Davis B and Williams P. 1995. Recent outcomes in the treatment of burn injury in the United States: a report from the American Burn Association Patient Registry. *J. Burn Care Rehabil*., 16:219–232

Schofield CM, Murray CK, Horvath EE, Cancio LC, Kim SH, Wolf SE, *et al*. Correlation of culture withhistopathology in fungal burn wound colonization and infection. *Burns*, 2007;33:341–6. (PubMed)

Tsoutsos D, Tsati E, Metaxotos N, Keramidas E, Rodopoulou S, Ioannovich J. Extensive burn injury complicated by Mucor mycosis: A case report. Ann Burns Fire Disasters. 2001; 16:1–2.

U.S. Department of Health and Human Services1993. Injury mortality: national summary of injury mortality data, 1984–1990.U.S. Department of Health and Human Services, Washington, D.C.

Walsh *et al*. Treatment of Aspergillosis: Clinical Practice Guidelines of the Infectious Diseases Society of America CID 2008:46 (1 February)

Washington, An overview of nosocomial infections, including the role of the microbiology laboratory. Clin. Microbial Rev. 1993 Oct; 6(4): 428–442.

Wibbenmeyer L, Danks R, Faucher L, AmelonM, Latenser B, Kealey GP and Herwaldt LA. 2006. Prospective analysis of nosocomial infection rates, antibiotic use, and patterns ofresistance in a burn population. *J Burn Care Res*.

World Health Organization. Available from: violence injury_prevention/media/news/13_03_2008/en/ (Last accessed on 2008 March 13).

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