www.jmscr.igmpublication.org
Impact Factor 5.84
Index Copernicus Value: 71.58
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v5i10.52

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Fungal Infection in Burns – A Prospective Study in Rural India

Authors
Dr Ramu.K[1], Dr Avinash Gurujala[2]
[1]Associate Professor in General Surgery, R.V.M Institute of Medical Sciences and Research Centre, Laxmakkapally Village, Mulugu Mandal, Medak Dist., Telangana – 502279
[2]Senior Resident in General Surgery, R.V.M Institute of Medical Sciences and Research Centre, Laxmakkapally Village, Mulugu Mandal, Medak Dist., Telangana – 502279
Corresponding Author
Dr Avinash Gurujala
Email: *dravinash2011@gmail.com*, PH NO - 9959624241
Address: House no. 6-13-6, Gurubabadi road, Namdevwada, Nizamabad-503001

Introduction

The risk of developing fungal infections in burn patients are high compared with other patients[1]. This is due to the destruction of dermal layer of skin, which is a protective barrier and associated depression of cellular and humoral immune responses[2]. In low to middle income countries, the rate of infections was higher compared to high income group of countries because of lack of resources. Burn wound infection is the most devastating trauma and a serious public health issue[3]. As a result of effective and easy availab-ility of antibiotics, the incidence of bacterial infections in burns patients were reduced and the rise of fungal infections have been witnessed[4].

The main risk factors for fungal infections in burns patients are burned total body surface area and perturbed immunity. The use of wide spectrum of antibiotics will cause eradication of natural bacterial flora and promotes the fungal infections[5-7]. Other predisposing risk factors are old age, uncontrolled diabetes, central venous catheters and Foley's catheters.

Fungal infections are difficult to diagnose because of their similarity to bacterial infections and also due to shortage of mycology laboratories. The incidence of fungal infection is around 6% to 44% in various burn centres around the world[9]. The mortality rate due to fungal infection was 5.3% in a study conducted by Clinton Murray[9]. The most common fungal species found in burns patients were Candida species, with the prevalence rate of 13 to 31.8%[10-12]. Now there is a changing pattern of fungal infection with the isolation of Non-albicans *Candida* species, *Fusarium* spp, *Aspergillus*, and Zygomycetes which are more difficult to treat[10-12].

Aim

To assess the fungal infections frequency in thermal burn patients in relate to total body surface, degree of burns, age of wounds, to assess common fungal pathogens and mortality.

Materials and Methods

We conducted a prospective study on 100 patients admitted with 20-60% thermal burn wounds in surgical department during period of august 2016 to July 2017. We have taken consent from each patient. Ages of the patients are from 18yrs to 60yrs. We have excluded pregnant woman, lactating mothers, patients with pre-existing immune disorders.

In thermal burn patients, the wound is cleaned with normal saline and betadine, followed by dressing. We give broad spectrum antibiotics and high protein diet. Under local anaesthesia pus swab and scrapings were taken at the first week, second week and third week and sent to microbiology department. The scrapings and pus for fungal culture were taken under the eschar, from multiple sites (at least 3 sites) and multiple times (at least three times per week).In the microbiology department scrapings were examined by direct microscopy and culture studies are done on Sabouraud's dextrose agar medium with and without chloramphenicol. Chi square test was used for statistical analysis

Results

In our study the incidence of fungal infection in thermal burn patients is about 24%. Out of 100 patients 24 people were positive for fungal infection. 14 patients were identified by direct microscopy and 24 patients were positive on fungal culture. So fungal culture is better than direct microscopy, but it took at least 6weeks of time to get report.

Table-1: Relation of percentage of burns with direct microscopy and fungal culture

% of Burns	NO. of patients	Positive on direct microscopy	Positive on fungal culture
20-30	34	0	0
31-40	22	1(4.54%)	3(13.63%)
41-50	20	5(25%)	9(45%)
51-60	24	8(33.33%)	12(50%)

The above table shows the increase incidence of fungal infection with the percentage of burns. In the patients with 51-60 % of burns, the incidence is 50%. In patients with 20-30% burns, the incidence of infection is zero. So it shows that total body surface area, is the risk factor for fungal infection.

Table-2: Relation of degree of burns with direct microscopy and fungal culture

Degree of burn	NO. of patients	Positive on direct microscopy	Positive on fungal culture
First degree	32	0	0
Second degree	38	4(10.5%)	7(18.42%)
Third degree	30	10(33.33%)	17(56.67%)
Total	100	14(14%)	24(24%)

The above table shows that, the chances of fungal infection were more with third degree burns than first degree burns. The fungal infection in first degree burns patients is zero. So it proves that the degree of burns is the risk factor for fungal infection.

Table - 3: Relation of post burn time and fungal infection

Post Burn Week	NO. of fungal positive cases
First week	0
Second week	10(41.66%)
Third week	14(58.33%)
Total	24

The above table clearly shows that increase in the post burn time, increases the incidence of fungal infection.

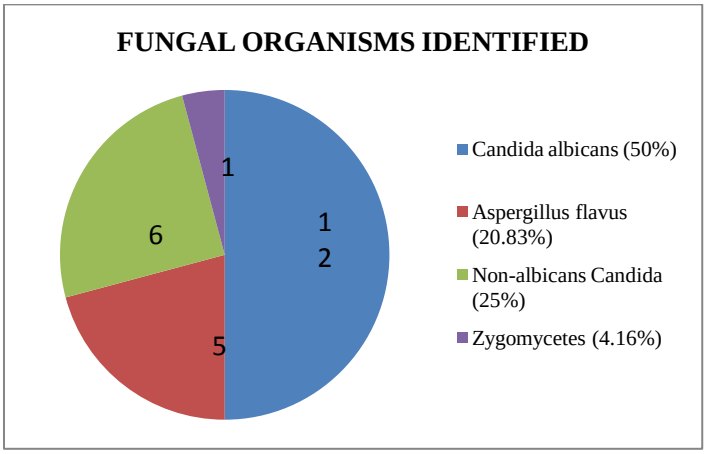

Fig-1 Pie chart showing fungal organisms identified in culture

The most common fungal organism identified in culture medium is Candida albicans. The incidence of aspergillus flavus, non-albicans

candida and zygomycetes are 20.83%, 25% and 8.33% respectively.

Table-4: Relation of fungal organism and mortality of patient

Fungal organism	NO.of cases	Mortality
Candida albicans	12	2(16.67%)
Aspergillus flavus	5	1(20%)
Non-albicans *Candida*	6	1(16.67%)
Zygomycetes	1	1(100%)

The highest percentage of mortality (100%) is seen in patient infected with zygomycetes infection. Zygomycetes fungal infection is rare and dreadful infection. The mortality in candida albicans, aspergillus flavus and non-albicans candida are 16.67%, 20% and 16.67% respectively.

Discussion

Emerging fungal infections in burn injuries represent a major challenge in the management of burns. Injudicious use of antibiotics in burns patients causing the emergence of fungal infections.

In our study the incidence of fungal infection is 24%. In the study conducted by Mousa et al., the incidence of fungal infection is 20%[11]. In a multi-centre review, conducted by Ballard et al., the incidence of fungal infection is 6.3%[5]. In a study conducted by Sharma et al., the incidence of fungal infection is 26%[13]. Burn wounds provide good nourishment and colonization of fungi, which leads to higher incidence of fungal infection around 20%[14].

This study shows the increase of incidence of fungal infection with increase in total body surface area with fungal infection in 50% of the burn patients having 51-60% TBSA involvement. There are no fungal infections in patients with 20-30% burns. In the review study done by Ballard et al., 435 patients out of 6918 patients developed fungal infection had burns of 34.8+ 22.7% TBSA[5]. Our study incidence rates were similar to the study done by Bruck et al., who had incidence of 46.9% in patients with 30-59% TBSA[15]. With this interpretation we can conclude that it is better to do fungal culture studies in 40-60% burns and can start fungal treatment empirically.

This study shows that maximum fungal infections were observed in third degree burns with the incidence of 56.67%. the incidence in second degree burns is 18.42%. In the study conducted by Bruck et al., the incidence in second and third degree burns is 16.7% and 58.8% respectively[15]. In our study the, the incidence of fungal infection is 58.33% in third week of post burn period and 41.66% in second week of post burn period. In the study conducted by Bruck et al., the fungal colonization increases after first week and maximize around third and fourth week[15]. In the study conducted by Ibrahim et al., the incidence of fungal infection is 36% by the end of fourth week of admission[16].

The most common fungal organism identified in our study is candida albicans. In the studies conducted by Ibrahim et al., Branski et al., Mundhada et al., the candida albicans is the most common fungal infection. In our study, the mortality rate in fungal infection patients is 20.83%. In the study conducted by chamania et al., the mortality rate in all burns patients due to sepsis is 19.6%[2]. In our study, we encountered a rare fungal organism zygomycetes, the mortality rate is 100% in this organism as the patient had 55% burns and third degree burns.

Conclusion

The emergence of fungal infections and difficult to diagnose them clinically pose a major threat in the management of burn patients. Precautions to be taken in the management of burns are do culture tests in burns above 40% and third degree burns, judicious use of antibiotics, maintain immune competence and earliest closure of burn wound if possible. The antifungal should be used appropriately and it should be targeted therapy. Further studies should be done to make guidelines for identifying fungal infections and its management.

References

1. Jarvis WR: Epidemiology of nosocomial fungal infections, with emphasis on candida species. Clin Infect Dis, 20: 1526-30, 1995.
2. Chamania S, Hemvani N, Joshi S. Burn wound infection: Current problem and unmet needs. *Indian J Burns*. 2012;18-22.
3. Church D, Elsayed S, Reid O, Winston B, Lindsay R. Burn wound infections. *Clin Microbiol Rev*. 2006;19:403–34.
4. Jithendra K, Pathapati RM, Nadakuduru P, Buchineni M, Pasupuleti S, Sateesh S. Identification of fungal pathogens in burns patients with reference to *Candida*. *Journal of Evidence based Medicine and Healthcare*. 2015; 2:1-8.
5. Ballard J, Edelman L, Saffle J et al.: Positive fungal cultures in burn patients: a multicenter review. J Burn Care Res, 29: 213-21, 2008.
6. Moore EC, Padiglione AA, Wasiak J et al.: Candida in burns: risk factors and outcomes. J Burn Care Res, 31: 257-63, 2010.
7. Luo G, Peng Y, Yuan Z et al.: Yeast from burn patients at a major burn centre of China. Burns, 37: 299-303, 2011.
8. 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.
9. 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.
10. Capoor MR, Sarabahi S, Tiwari VK, Narayanan RP. Fungal infections in burns: Diagnosis and management. *Indian J Plast Surg*. 2010;43(Suppl S1):37-42.
11. Mousa HA. Fungal infection of burn wound in patients with open and occlusive treatment methods. *East Mediterr Health J*. 1999;5:333-36.
12. Rosanova MT, Brizuela M, Villasboas M, Guarracino F, Alvarez VL, Santos P, et al. *Fusarium* spp infections in a paediatric burn unit: nine years of experience. *Braz J Infect Dis*. 2016;20(4):389-92.
13. Sharma S, Bajaj D, Sharma P. Fungal Infection in Thermal Burns: A Prospective Study in a Tertiary Care Centre. *Journal of Clinical and Diagnostic Research : JCDR*. 2016;10(9):PC05-PC07. doi:10.7860/JCDR/2016/20336.8445.
14. Jefferson Lessa Saores de Macedo, Joao Barberino Santos (2005): Bacterial and Fungal colonisation of Burn wounds. Mem Inst Oswaldo Cruz. Rio de Janerio 100 (5): 535–539.
15. Bruck HM, Nash G, Foley FD, Pruitt BA. Opportunistic Fungal infection of burn wound with phycomycetes and *aspergillus*. A Clinical-pathological review. *Arch Surg*. 1971;102:476.
16. Ibrahim NH, Amer TA. Frequency of bacterial and fungal infections of burn wounds at cairo university burn centre. *Egyptian Journal of Medical Microbiology*. 2008;17:573-82.
17. Branski LK1, Al-Mousawi A, Rivero H, Jeschke MG, Sanford AP, Herndon DN. Emerging infections in burns. *Surg Infect* (Larchmt). 2009;10:389-97.
18. Mundhada SG, Waghmare PH, Rathod PG, Ingole KV. Bacterial and fungal profile of burn wound infections in Tertiary Care Center. *Indian J Burns*. 2015;23:71- 55.