Original Research Article

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Bacteriological profile and antibiotic sensitivity patterns of burn wound in delayed presenting cases of burn at a tertiary care centre in India

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ABSTRACT

Background: In developing world, there is a wide gap between the number of burn patients and resources of management. Patients reports to tertiary centre late. So in our study, we have assessed the late presenting cases of burns, their epidemiological data, bacteriological profile and antibiotic sensitivity patterns of burn wounds.

Methods: This is a prospective study conducted in Jawaharlal Nehru Medical College and associated hospital, Aligarh Muslim University, Aligarh from December 2015 to November 2017, where all the delayed presenting (>5 days) cases of burn involving 20% to 60% body surface area having no other comorbidity and age ranging from 5 years to 60 years were included and evaluated.

Results: In our study, total 104 patients were included. Total 281 swabs were found to be culture positive, out of which 243 were monobacterial dominant. The *Pseudomonas aeruginosa* was found in 29.22% cases, *E.coli* in 23% cases, *Klebsiella pneumoniae* in 20.16%, *Citrobacter* in 9.88% cases, *MRSA* in 04.53%, MSSA in 5.35% cases. *P.aeruginosa* was mainly sensitive to piperacillin + tazobactum in 74.64%. *Escherichia colli* was sensitive to piperacillin + tazobactum in 75% cases, to collistin in 73.21% cases.

Conclusions: Burn injuries are very common specially in developing countries where dependence over the traditional way of cooking is more. Use of antibiotic as per bacterial culture and sensitivity report, early surgical intervention and proper burn wound care at tertiary care centre reduce the morbidity and mortality of burn patients.

Keywords: Burn, Bacteria, Antibiotic, Sensitivity

INTRODUCTION

Burn injuries represent one of the most important health problems faced by both developing as well as developed nations today.^{1,2} An intact skin surface is vital for body fluid preservation and homeostasis, thermal regulation and for prevention of infection. Skin has also neurosensory, immunological and other metabolic functions. Burns results into loss of skin and render it to various infections, heat loss and immune-suppression.

Burn wound management has improved drastically over the years and which greatly improved the survival rate of patients. Despite of advances in the use of antimicrobial therapy and use of escharotomy and tangential excision, bacterial infection and resultant complications remain a major factor in burn morbidity and mortality.³⁻⁵ Burn wounds at the onset are considered sterile because the heat kills the microorganisms in and around the burnt skin as well. Within 48 hours of burn injury, normal skin flora colonises the burn wound. *Staphylococcus aureus* and *Streptococcus pyogenes* are the most common

normal skin flora residing deep within the sweat glands and hair follicles surviving the thermal injury. Within 5 to 7 days, contamination from exogenous or endogenous source occurs thereafter. Gram negative bacteria colonizes the burn wound after few days of injury. Fungal infections occur later due to use of broad spectrum antibiotic therapy. Common microorganisms that usually isolated from burn wounds are Staphylococcus aureus, pyogenes, E. coli, Klebsiella, Pseudomonas aeruginosa, Citrobacter sp., Proteus etc. In India, over 1,00,000 people are affected by burns annually and over 20,000 of them die according to rough estimates. Children are more susceptible to burn related injuries and male children are at higher risk of injury and mortality than female children. Microorganisms develop resistance rapidly with continuous use of topical antibiotics, so their efficacy is variable.

In developing world, there is a wide gap between the number of burn patients and resources of management. Limited functional specialized burn units, exists so even severe burn patients do not get specialized care of burn units. Patients reports to tertiary center late due to the lack of knowledge, lack of accessibility to tertiary center or inadequate and improper treatment elsewhere. So in our study, we have assessed the late presenting cases of burns, their epidemiological data, bacteriological profile and antibiotic sensitivity patterns of burn wounds.

Objective

To evaluate the bacteriological profile and antibiotic sensitivity pattern of burn wound in delayed presenting cases of burn at a tertiary care center in India.

METHODS

This is a prospective study conducted in Jawaharlal Nehru Medical College and associated hospital, Aligarh Muslim University, Aligarh from December 2015 to November 2017, where all the delayed presenting (>5 days) cases of burn involving 20% to 60% body surface area having no other comorbidity and age ranging from 5 years to 60 years were included and evaluated. New borns, pregnant women and nursing mothers were also excluded from this study. Initial assessment was done by history. physical examinations and necessary investigation. Patients were resuscitated and optimized with the standard protocol. Local wound care in the form of wound cleaning by washing with normal sterile saline, dressing with topical application of 1% silver sulfadiazine was done and chemoprophylaxis was given. On the day of admission surface swabs were taken from all the admitted burn patients. Figure 1 shows the materials needed for surface swab collection. During the change of dressings, multiple surface swabs were collected from multiple sites specially having deep burn and discharge. Samples were collected weekly for four weeks or until the burn wound has been excised or all burn wounds were healed. The swabs were transported

immediately within 1hr to microbiology lab where samples were plated over the blood agar, MacConkey agar. After incubation period of 24 hours to 48 hours at 37 degree Celsius, isolates were identified using conventional protocol and conventional antibiotic sensitivity testing was done.



Figure 1: Showing materials required for surface swab collection.

Data was entered and analyzed by using Statistical Package for Social Sciences (SPSS 12.0 version) for windows.

RESULTS

In our study, total 104 burns patients were included who had presented delayed (>5 days) to us with age ranging from 5 years to 60 years, with total body surface area involvement from 20% to 60%, without any comorbidity (Table 1). Total 37 patients (35.58%) were male and 67 patients (64.42%) were female with mean age of 28.10±19.4 years. Female to male ratio was 1.81:1 (Figure 2).

Table 1: Showing age range, gender and mode of burn patients in our study.

	No. of patients (%)
Age range (in years)	
5–15	30 (28.85)
16–30	32 (30.77)
31–45	20 (19.23)
46–60	22 (21.15)
Gender	
Male	37 (35.58)
Female	67 (64.42)
Mode of burn	•
Flash Thermal	70 (67.30)
Scald	26 (25.00)
Electric	8 (07.69)

We have divided the patients based on age into four groups starting from 5 years of age. Maximum number of patients were presented in group range of 16 years to 30

years. Total 32 patients (30.77%) were found in this group. 30 patients (28.85%) were found in group of age range from 5 years to 15 years (Figure 3).

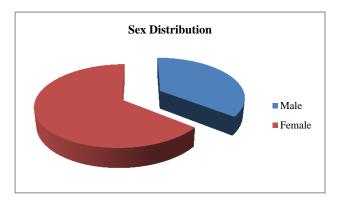


Figure 2: Pie chart representation of sex distribution in our study.

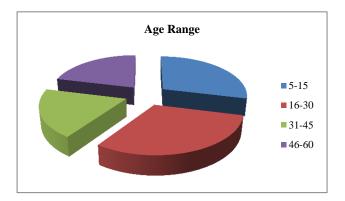


Figure 3: Pie chart representation of percentage of patients in each age group range.

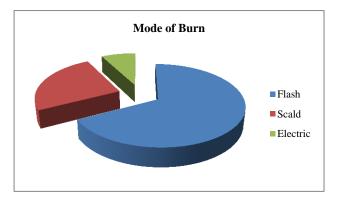


Figure 4: Pie chart representing number of patients with type of burn.

Most common cause of burn was flash thermal burn in 70 patients (67.30%) followed by scald burn in 26 patients (7.69%). Eight patients (7.69%) were presented with electric burn (Figure 4).

Total 281 swabs were found to be culture positive, out of which 243 were monobacterial dominant. The *P. aeruginosa* was found in 29.22% cases, *E. coli* in 23%

cases, *Klebsiella pneumoniae* in 20.16%, *Citrobacter* in 9.88% cases, *MRSA* in 04.53%, *MSSA* in 5.35% cases (Figure 8).

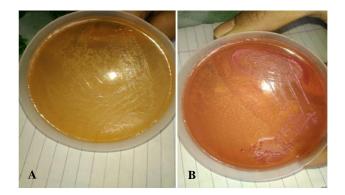


Figure 5: (A) *Pseudomonas* on Mackonkeys agar; (B) *E. coli* on mackonkeys agar.

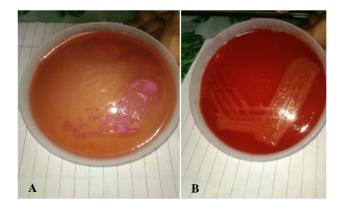


Figure 6: (A) *Klebsiella* on Mackonkeys agar; (B) *Staph. aureus* on blood agar.



Figure 7: Showing growth of Proteus sp.

P. aeruginosa (Figure 5A) was mainly sensitive to piperacillin + tazobactum in 74.64%, to imipenem in 66.10%, to ciprofloxacin in 43.67% cases. *E. coli* (Figure 5B) was sensitive to piperacillin +tazobactum in 75% cases, to collistin in73.21% cases, Amikacin in 69.64%. Imipenem in 53.57% cases and levofloxacin in48.21% cases (Table 2).

Table 2: Shows	s various microrganism	and their antihiotic	sensitivity profile
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Antibiotic	E.coli (n=56)	P.aer. (n=71)	Citrobacter (n=24)	<i>K.pneu.</i> (n=49)	Proteus (n=19)	MRSA (n=11)	MSSA (n=13)
Amika.	39	7	10	31	9		
Aztreon.	-	18					
Cefepime	-	-					
Ceftazid	-	9		23			
Colistin	41	19					
Gentam	-	-		R			
Levoflox	27	4		34	6		
Imipen	30	47	19	34	17		
Pip.+Taz.	42	53	13	38	14		
Amox+Clv	-					-	4
Cefixim	-						
Cotrimox	33						
Polymix.	-	28		11	•		
Ciproflox		31		12			7
Cefopara.		23		27	13		
Linezolid						10	13
Fusidic A						9	12
Chloramp						8	9
Vanco.						11	13

Table 3: Shows number of patients, duration of hospital stay and their outcome of treatment.

% of burn No. (n=104)		Duration of stay (in days)		Mortality (n=17)	LAMA	Discharge
70 OI DUI'II	No. (n=104)	Mean	Range			
20-30	58 (55.77%)	5.47	4 - 9	5	2	51
31–40	36 (34.61%)	8.72	6 - 13	8	1	27
41–50	9 (08.65%)	11.44	3 - 19	3	0	4
51–60	1 (00.96%)	3	3	1	0	0

Klebsiella pneumoniae (Figure 6A) was found sensitive to piperacillin + tazobactum, to levofloxacin and imipenem by 69.39% and to cefoparazine in 55.10 cases. Citrobacter was found sensitive to imipenem in 79.17% cases, to piperacillin + tazobactum in 54.17%, and to amikacin in 41.67% cases.

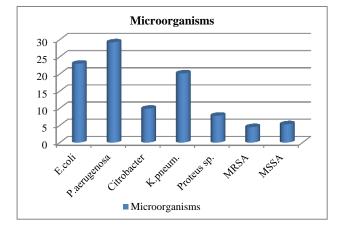


Figure 8: Chart representing the type of bacteria and their percentage in our study.

Proteus sp. (Figure 7) was found to be sensitive to imipenem in 89.47% cases, to piperacillin + tazobactum in in 68.42% cases, to amikacin in 47.37% cases. MRSA was sensitive to vancomycin in 100% cases, to linezolid in 91% cases, to fusidic acid in 81.82%, to chloramphenicol in 72.73% cases. MSSA (Figure 6) was found to be sensitive to linezolid and vancomycin in 100% cases and to fusidic acid in 92% cases.

We have grouped the patients according to percentage of body surface area involvement into four groups. In group having 20% to 30% total body surface area involvement, 58 patients (55.77%) were present having mean duration of hospital 5.47 days. Out of which 87.93% patients were discharged after successful treatment. 36 patients have 31% to 40% total burn body surface area involvement with duration of hospital stay ranged from 6days to 13 days. 75% percent patients were discharged after successful treatment (Table 3).

9 patients (8.65%) were presented with 41% to 50% of total burn body surface area with mean duration of hospital stay of 11.44 day. 44.44% patients were successfully discharged. A single patient was presented

with 6 day delay with involvement of 54% total burn body surface area involvement. In initial 6 days, patient was managed locally by untrained personnel. Patient expired after 3 days of admission.

DISCUSSION

Burn is a devastating form of trauma affecting both developed and developing countries. In our study, incidence of burn injuries is more in females (64.42%) as compared to males (35.58%), probably because females work more in kitchen and thus more exposed to thermal injuries. One more reason for increased incidence of female patients in delayed presenting cases of burn is because in developing countries families are less concerned about the females health. Higher incidence in females is in conformity with a study done by Rao et al who reported low incidence in males (43.1%) in comparision to female (56.9%) patients but in contrast to a study done by Ekrane and Kalantar et al.^{6,7}

We have included the patients whose age ranges from 5 years to 60 years. In our study, mean age of presentation was less as compared to a study done by Rimedika et al in which mean age was 41.3±17 years. This difference is may be due to our selected age range and we have not included the extremes of age.

An our study, most affected age group range was from 16 years to 30 years and this correlates with the study done by Chaudhary et al. It may be due to active involvement of this group in indoor and outdoor work.⁹

According to Liu et al, flame burn was the most common cause of burn injury followed by scald burn. In our study, the cause of burn was flash thermal burn in 67.30%, followed by scald burn in 25% and electric burn in 7.69% cases. This also correlated with a study done by Shahzad et al of Pakistan. ^{10,11}

In our study *P. aerugenosa*, *E. coli*, *Klebsiella sp.*, *Citrobacter sp.*, *P. vulgaris* are the most common gram negative bacteria whereas Staphylococcus aureus is the only gram positive bacteria isolated from burn wound. The same microorganisms were found in a study carried out by Patil et al, which revealed the *Pseudomonas sp.*, *Acinetobacter*, *Proteus mirabilis*, *Klebsiella sp.*, *Citrobacter*, *E. coli*. ¹² So gram negative bacterial prevalence is very high in our study in delayed presenting cases of burn. This is mostly due to the local practices in villages such as use of gention violet, cow dung, tooth pastes and mud over the burn wound.

In our study, *P. aeruginosa* was the most common organism isolated from the burn wound, which is in accordance with many published studies showing mostly sensitive to piperacillin+Tazobactum, Imipenem and Ciprofloxacin. ¹³⁻¹⁸

E. coli was the second (23%) most common organism isolated in our study, which was mainly sensitive to piperacillin + tazobactum, Collistin and Amikacin. The increased incidence of E. coli infection was mainly due to application of gention violet, cow dung, mud over burn wound in villages.

Klebsiella sp. constituted the other common isolated organism and it is conforming to other published studies.¹⁹

Gram positive organism isolated was *S. aureus*. This bacteria used to colonise the wound in the first 48 hours but in our study patients were late presenting cases of burn, so the incidence of *S. aureus* infection was less. There is variable antibiotic sensitivity except Vancomycin and Linezolid to which they are 100% and 91% sensitive respectively.

In our study, we found a variable pattern of antibiotic sensitivity and more frequent positive cultures because the patients were managed at home by local untrained personnel in most of cases. They used to apply gention violet, cow dung, desi ghee, mud and presented late when wound failed to heal. The total percentange of expired patients was 16.34%. These patients have large burn body surface area involvement and presented late to us.

CONCLUSION

Burn injuries are very common specially in developing countries where dependence over the traditional way of cooking is more. Use of antibiotic as per bacterial culture and sensitivity report, early surgical intervention and proper burn wound care at tertiary care center reduce the morbidity and mortality of burn patients. The trained personnel and hospitals are less in comparison to population in developing countries like ours. Traditional rituals which are commonly practiced add to the problem. All these factors can be reduced by increasing awareness, literacy and reach of trained health care facilities to even remote areas of country.

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REFERENCES

- 1. World Health Organisation. Burn prevention: success stories and lessons learned.
- 2. Santucci SG, Gobara S, Santos CR, Fontana C, Levin AS. Infections in a burn intensive care unit: experience of seven years. J Hosp Infect. 2003;56:6–13.
- 3. Neriman A, Nursen G, Sevinç Y, Ramazan K. Burn wound infections in a medical hospital burn unit in Bursa, Turkey. International Journal of Caring Sciences. 2014;7(3):776.

- 4. Gowri S, Vijaya AN, Rajesh P. Epidemiological study of burn injuries admitted in two hospitals in North Karnataka. Indian J Community Med. 2010;35(4):507–12.
- 5. De Macedo JLS, Santos JB. Bacterial and fungal colonisation of burn wound. Memorial Institute of Oswaldo Cruz. 2005;100(5):535–9.
- 6. Rao SR, Lakshmi LJ, Pavani S, Kawle V, Prakash SJ. Bacteriological profile, Antibiogram of burn wound isolates and detection of MRSA and ESBL production at tertiary care hospital, Hyderabad. World J Pharm Pharmaceutical Sci. 2014;3(10):1691-8.
- 7. Ekrami A, Kalantar E. Bacterial infections in burn patients at a burn hospital in India. Indian J Med Res. 2007;126(6):541-4.
- Rimdeika R, Jankunas V, Pilipaityte L and Mikuzis M. The changes of characteristics of burn injuries and treatment data of burned adults in Kaunas University of Medicine Hospital in 1981-2001. Medicina (Kaunas). 2004;40:238-45.
- 9. Chaudhary P, Shakya C, Pokhrel SR, Shrestha B. Prospective study on bacterial isolates with their antibiotic susceptibility pattern from pus (wound) sample in Kathmandu Model Hospital. Int J Med Biol Sci. 2015;1(1):15-22.
- 10. Liu EH, Khatri B, Shakya YM, Richard BM. A 3 year prospective audit of burns patients treated at the Western Regional Hospital of Nepal. Burns 1998;24:129-33.
- 11. Shahzad MN, Ahmed N, Khan IH, Mirza AB, Waheed F. Bacterial profile of burn wound infections in burn patients. Annals of Pakistan Institute of Med Sci. 2012;8(1):54-7.
- Patil P, Joshi S, Bharadwaj R: Aerobic bacterial infections in a burns unit of Sassoon General

- Hospital, Pune. Int J Healthcare Biomed Res. 2015;3(3):106-12.
- 13. Japoni A, Kalani M, Farshad Sh, Ziyaeyan M, Alborzi A, Mehrabani D, et al. Antibiotic-resistant bacteria in hospitalized patients with bloodstream infections: analysis of some associated factors. Iran Red Crescent Med J. 2010;12:164-72.
- Noorbakhsh Sabet N, Japoni A, Mehrabani D, Japoni S. Multi-drug resistance bacteria in Qom hospitals, Central Iran. Iran Red Crescent Med J. 2010;12:501-3.
- Hussien IA, Habib KA, Jassim KA. Bacterial colonization of burn wounds. J Baghdad Sci. 2012;9:623-31.
- 16. Oncul O, Ulkur E, Acar A. Prospective analysis of nosocomial infections in a burn care unit, Turkey. Indian J Med Res. 2009;130:758-64.
- 17. Mehta M, Dutta P, Gupta V. Bacterial isolates from burn wound infections and their antibiograms: A eight-year study. Indian J Plast Surg. 2007;40:25-8.
- 18. Al Laham NA, Elmanama AA, Tayh GA. Possible risk factors associated with burn wound colonization in burn units of Gaza strip hospitals, Palestine. Ann Burns Fire Disasters. 2013;26:68-75.
- 19. Nasser S, Mabrouk A, Maher A. Colonization of burn wounds in Ain Shams University burn unit. Burns. 2003;29:229-33.

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