

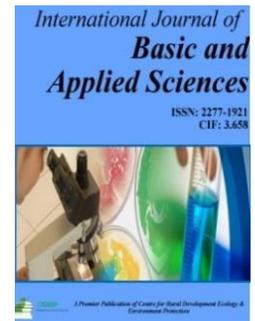
Vol. 10. No.2. 2021

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Contents available at:

www.crdeepjournal.org

International Journal of Basic and Applied Sciences (ISSN: 2277-1921) (CIF:3.658 ; SJIF: 6.823)
 (A Peer Reviewed quarterly Journal)



Full Length Research Paper

Bacterial Profile of Hospital Acquired Infection (HAI) in Burn Unit at MBS Hospital and Kota Medical College, Kota, Rajasthan, India.

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ARTICLE INFORMATION

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Article history:

Received: -01-06-2021

Accepted: 08-06-2021

Published: 10-06-2021

Key words:

Burn, Bacterial profile, Mortality, Nosocomial infection, Wound infection.

ABSTRACT

Introduction-Nosocomial infection/Hospital Acquired Infections (HAI) are common in burn patients as the exposed skin provides a suitable environment for the growth of microbes. Wound infections are one of the most common sites of nosocomial infections in burn patients with a prevalence of about 60%, followed by bloodstream infections (20%), urinary tract infections (20%) and pneumonia (10%). Burn wound infections can lead to scarring, bacteremia, sepsis, and multi-organ dysfunction, contributing to 75% mortality in burn patients. Methods- A retrospective study was conducted in the burn unit at MBS Hospital and Kota medical college Kota, Rajasthan. One hundred burn patients were investigated for a bacterial profile of burn wound infections. Specimen was collected from the surface area of burn ward and wound swab of burn patients. The organisms were isolated. Results- Gram-negative organisms were found to be the most widespread. The most common isolate was Pseudomonas spp. (37%), E.coli (26%), Klebsiella spp. (14%), Staphylococcus aureus (12%), Acinetobacter spp.(8%), Enterobacter spp. (2%) and Proteus (1%). Conclusions-Pseudomonas was the commonest cause of infection in burn patient in our study followed by E.coli.

Introduction

Nosocomial infection/Hospital Acquired Infections (HAI) are common in burn patients as the exposed skin provides a suitable environment for the growth of microbes. Nosocomial infection is a major cause of morbidity and mortality in burn patients. Wound infections are one of the most common sites of nosocomial infections in burn patients with a prevalence of about 60%, followed by bloodstream infections (20%), urinary tract infections (20%) and pneumonia (10%) (Ekrami *et al.*, 2007). Burn wound infections can lead to scarring, bacteremia, sepsis, and multi-organ dysfunction, contributing to 75% mortality in burn patients (Alkaabi *et al.*, 2003; Shrinivasan *et al.*, 2009). Hence these studies are important for providing adequate and effective treatment of the cases thereby decrease the morbidity and mortality. Burns provides a suitable site for bacterial multiplication and are more persistent richer sources of infection than surgical wounds, mainly because of the larger area involved and longer duration of patient stay in the hospital (Agnihotri *et al.*, 2004). Burn injuries affect the skin to a large extent (Norman *et al.*, 2004). Burns are caused by scalds (hot liquids), heat, radiation, open flame, electricity and hot water bottles. The occurrence of nosocomial burn infections depends on several factors such as the burn severity, immune status, prolonged stay, invasive procedures and overcrowding leading to cross infections (Mehta *et al.*, 2007).. The rate of nosocomial infections is higher in burn patients due to various factors like nature of burn injury itself, the immune compromised status of the patient, invasive diagnostic and therapeutic procedures and prolonged ICU stay (Pruitt *et al.*, 1998). The exposed skin following thermal injury is prone to infection and can be contaminated with resistant organisms serving as a source of prolonged infection affecting other burn patients (Falk *et al.*, 2000). In every hospital set up, the incidence and organisms isolated will be different. The infecting microorganism may belong to aerobic as most commonly isolated aerobic microorganism include *Staphylococcus aureus*, Coagulase-negative staphylococci (CoNS), *Enterococci*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Enterobacter species*, *Proteus mirabilis*, *Candida albicans* and *Acinetobacter* (Tayfour *et al.*, 2005; Rajendra *et al.*, 2013). *Pseudomonas aeruginosa* has emerged as a predominant member of the burn wound flora and in the absence of topical therapy is cultured from the burn injuries of 70% patients by the third week (Church *et al.*, 2006). In the present study, 75% burn patients die in a burn ward in one year study. It's one of the most problem is in burn ward are not proper fumigated that's why

nosocomial infection cause death in burn patients. The aim of the present study to determine the pattern and extent to surveillance of nosocomial infection in burn wound patients in MBS hospital, Kota.

Material and methods

Sampling from burn ward

For identified the nosocomial infection in burn patient the 15 air samples were collected using sterile swabs from all areas of MBS Hospital Kota burn ward, hydrotherapy room, dressing room and equipment of burn ward during 15 day period and to rule out the possible transmission from environment to the patients.

Sample collection from the patient

A swab from the patient burn wound was collected after cleansing it with sterile normal saline. Effective serous or pus discharge is collected in two swabs. First pus swab was used for presumptive diagnosis with staining and second swab is used for culture isolation. All samples were labeled properly and immediately transported to the Microbiology laboratory. Swab taken from different sites was inoculated on Nutrient agar, Blood agar, and MacConkey agar. These culture plates were incubated at 37°C under aerobic condition for 24 hours. Isolation and identification of isolates are done as per standard guidelines.

Identification of isolates organism

All the samples were cultured on Blood agar, Mac-Conkey agar and Nutrient agar plates and was incubated overnight at 37°C, depending upon the organism suspected they were subcultured on various selective media. The bacteria were further identified by colony morphology, Gram's staining, and conventional biochemical tests.

Results & discussion

A total of a 100 samples were analyzed 45 (45%) from female and 55 (55%) from male patients were processed during this study period from Jan 2016 to Dec 2016 at the microbiology laboratory of MBS central lab kota. In sex wise distribution of surveillance of aerobic bacterial infection from wound isolates among male patient is highest (55%) followed by a female (45%) as shown in (Table-1).

Table:- 1: Sex-wise distribution of culture samples

Sex	Total samples	Percentage
Male	54	55%
Female	46	45%
Total	100	100.00%

Incidence of the burn was higher in females because females mostly spend their time in the kitchen where accidents happen but in our study male ratio is higher than female. Highest incidence in our study was flame burn. This may be due to socioeconomic reasons in our society. In age wise distribution there is 100 samples of wound infection. Out of 100 samples surveillance is higher in the age group of 20-40 that is 41% and followed by other age group like 40-60 age group (19%), 10-20 age group (17%), 60-80 age group (16%) and lowest age group is 0-10 (7%) as shown in (Table-2).

Table :- 2: Age wise distribution of culture samples

Age (in year)	Male	Female	Percentage
0-10	5	2	7%
10-20	8	9	17%
20-40	20	21	41%
40-60	12	7	19%
60-80	10	6	16%
Total	55	45	100%

In the present study age group most affected by burn injury was between 20 and 40 years. This was consistent with the study conducted by Sapna (Sapna *et al.*, 2015) in which the most common age was 20-30 years(14%) which is more than the study of Manikandan (Manikandan *et al.*, 2003). Distribution of culture sample according to their gram reaction, Out of 100 samples, 88 isolates were gram-negative bacilli (GNB) which is most common and 12 isolates were gram-positive cocci (GPC) as shown in (Table-3)

Table:- 3: Distribution of culture sample according to their gram reaction

Organisms	Cases	Percentage
Gram positive cocci	12	12%
Gram negative bacilli	88	88%
Total	100	100%

In our study, we demonstrated that infections by gram-negative organism were the most common isolates of burn while gram-positive organism dominates the scene of the infection after. The prevalence of non-fermenting Gram-negative bacteria in our study, namely

Pseudomonas aeruginosa and *E. Coli* was found to be 37.00% and 26.00%, respectively. Few other Indian studies involving burns patients have shown wide isolation rates of *Pseudomonas aeruginosa* ranging from 18.2 to 59%. Our result is comparable to the Tamil Nadu based study done in 2011 where the prevalence of *Pseudomonas aeruginosa* in burn wound infections was 28%; however, *Acinetobacter* was very low prevalence in our study that is 8%.

Results of the previous studies from Varanasi, Mumbai, and Delhi corroborate with our findings. (; Singh *et al.*, 2003, Anupurba *et al.*, 2006 ; Srinivasan *et al.*, 2009). According to organisms wise distribution of culture sample out of 100 samples, *Pseudomonas* was the most common organism that is 37 (37%) in our study. Followed by *Escherichia coli* that is 26%, *Klebsiella* 14%, *Staphylococcus aureus* 12 %, *Acinetobacter* 8%, *Enterobacter* 2% and *proteus* 1% as shown in (Table-4).

Table:- 4: Organisms wise distribution of culture sample

Organisms	No of isolates	Percentage
<i>Pseudomonas</i>	37	37%
<i>E.coli</i>	26	26%
<i>Klebsiella</i>	14	14%
<i>Staphylococcus aureus</i>	12	12%
<i>Acinetobacter</i>	8	8%
<i>Enterobacter</i>	2	2%
<i>Proteus</i>	1	1%
Total	100	100%

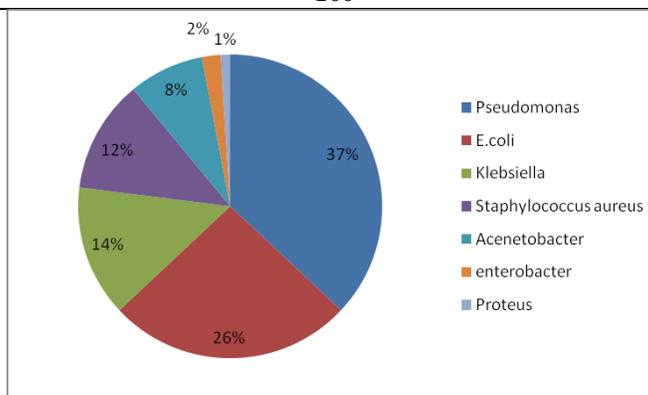


Fig -1: Organisms wise distribution of culture sample

Discussion

In other study, very high culture positivity 95% was found in the samples from burn patients. In our study *Pseudomonas aeruginosa* was the main culprit. *Staphylococcus aureus* was found to be the most common isolate on day 3 while *Pseudomonas aeruginosa* on day 7. Prevalence of *Pseudomonas spp.* in the burn wards may be due to the fact that organism thrives in a moist environment (Falas *et al.*, 2008). The present study has shown that *Pseudomonas aeruginosa* and *E.coli* are the most common isolates in burn injuries, *Klebsiella spp.* was the third most common isolate, followed by *Staphylococcus aureus* ; *Acinetobacter spp.*, *Enterobacter spp.* and *Proteus*. In contrast to other studies (Rastegar *et al.*, 1998). *Acinetobacter* and *enterobacter* and other was not a big threat in our study.

We Discussed with other study we analyzed out of 100 sample *Pseudomonas spp.*(37%)was the predominant spp. whereas the percentage of *pseudomonas spp.* which is higher than Patil *et al.*, 2015 (27%), Jawed *et al.*, 2013 (19.33%) and Mohammed *et al.*, 2018 (11.47%) found in survey, but its percentage of *pseudomonas spp.* is less then the research of Naz Parveen *et al.*, 2016 (67.62%), Manikandan *et al.*,2013 (42.9%), Neda *et al.*, 2017 (42.1%) and percentage of *pseudomonas spp.* is very close to this study(Latika *et al.*, 2017(38%). Percentage of *E.coli* (26%) was very higher than the research of Manikaran *et al.*, 2013(5.7%), Mohammed Idres *et al.*, 2018(5%), Jawed Ahmed *et al.*, 2013 (2.25%), and Latika Sharma *et al.*, 2017 (1%). The number of *Klebsiella spp.* 2013 (2.8%), Jawed ahmed *et al.*,2013 (8.4%), and Latika *et al.*, 2017 (8%).

The percentage of *Staphylococcus aureus* is (12%) in our research which is greater than the study of Mohammed Itres *et al.*, 2018 (1.6%) but very less than Manikandan *et al.*, 2018((24.3%), Jawed *et al.*, 2013 (57.98%), Latika *et al.*, 2017(35%) and very close to Patil *et al.*, 2015 (14.81%) study.

Percentage of *acinetobacter spp* is 8% which is higher than Latika *et al.*, 2017 (5%), but its percentage is very less than Naz *et al.*, 2016 (72.05%), Neda *et al.*, 2017(18.4%). The number of *Enterobacter spp.* is 2% which is less than the research conducted by Jawed *et al.*, 2013 (2.25%) but its very close to our study. The percentage of *proteus spp.* is 1s% which is greater than the other research of Jawed *et al.*, 2013, Latika *et al.*, 2016, Manikandan *et al.*, 2013 as shown in (table 5).

Table-5 Comparison of the percentage of isolated bacteria from other reported literature

References	<i>Pseudomonas</i> <i>spp.</i>	<i>E.coli</i>	<i>Klebsiella</i> <i>spp.</i>	<i>Staphylococcus</i> <i>aureus</i>	<i>Acinetobacter</i> <i>Spp.</i>	<i>Enterobacter</i> <i>Spp.</i>	<i>Proteus</i> <i>Spp.</i>
Manikandan <i>et al.</i> ,2013	42.9%	5.7	2.8%	24.3%	-	-	8.6%
Patil <i>et al.</i> , 2015	27.61%	-	16.04%	14.81%	-	-	-
Mohammed <i>et al.</i> , 2018	11.47%	5%	29.5%	1.6%	-	-	-
Neda <i>et al.</i> ,2017	42.1%	-	-	-	18.4%	-	-
Naz <i>et al.</i> ,2016	67.62%	-	-	-	72.05%	-	-
Ahmed <i>et al.</i> ,2013	19.33%	2.25	8.4%	57.98%	-	2.25%	4.20%
Latika <i>et al.</i> ,2017	38%	1%	8%	35%	5%	-	3%
Present study	37%	26%	14%	12%	8%	2%	1%

We clearly indicate that the wound infection is the most common cause of nosocomial infections. Despite significant improvement in the survival of burn patients, infectious complications continue to be the major cause of morbidity and mortality. Although, control of invasive bacterial burn wound infection, strict isolation techniques and infection control policies have significantly minimized the occurrence of burn wound infection. Similarly, Lari *et al* at Tohid Burn Center in Tehran, reported wound infection to be the main cause of nosocomial infection. (Rastegar *et al.*, 2005). We described *Pseudomonas aeruginosa* as a common cause of nosocomial infection. Similarly, Amin *et al* explained this pathogen as a common cause of nosocomial infection at Taleghani burn hospital [Amin *et al.*, 2004]. This is in agreement with prior reports from other parts of Iran (Rastegar *et al.*,2005).s Furthermore, the frequency of *Pseudomonas aeruginosa* infection has increased during recent years in our center. The control of emergence and spread of antimicrobial resistance among the most common human bacterial pathogens is probably one of the most important challenges for scientific and medical communities. Burn isolates are the best candidates for the study of pathogenic bacterial species, in particular, those that are responsible for human colonization such as *Pseudomonas aeruginosa* and *Staphylococcus aureus*.

Conclusion

To conclude in the present study *Pseudomonas spp.* was the major cause of burn wound infection in MBS hospital Kota and *E coli* is the second most isolated species. Thus our study such as that burn units are contaminated with multiple organisms and it was not properly fumigated. So proper fumigation is required in burn ward to reduce the rate of nosocomial infection and decrease the death percentage of burn patients. Our results may cover the way for providing useful guidelines to choose effective antimicrobial therapy.

Acknowledgment

In this study was supported by the central lab (microbiology) department of New Medical college and MBS hospital Kota. and especially thankful to Dr. Naveen Saxena (Medical superintendent in MBS hospital and Kota medical college.) for their support.

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