ORIGINAL ARTICLE

Pattern and Extent of Hospital Acquired Wound Infections in Burns Patients in A Tertiary Care Hospital (Mayo Hospital Lahore)

SAAD JAVED, MULAZIM HUSSAIN SYEED, GHULAM MUHAMMAD, *HAROON RAFIUL ISLAM*
Department Of Microbiology KEMU/Mayo Hospital Lahore.
Department of surgery, King Edward Medical University/Mayo Hospital, Lahore
Correspondence to Dr. Ghulam Muhammad, Assistant Professor Surgery, Email: gmkemu@yahoo.com

ABSTRACT

Objectives: 1).To determine the extent of hospital acquired wound infections in burns patients and type of organisms involved, in a tertiary care hospital. 2). To see the mode of burns with relation to age, gender and occupation.
Study design; Descriptive cross-sectional.
Study setting and duration: Burns unit and West surgical wards Mayo hospital Lahore from Jan. 2009 to Nov. 2009.
Material and methods: A convenient sample of 106 patients, admitted directly to Mayo hospital within 12-24 hrs of burns, from Jan. to Nov. 2009 was taken as study subjects. Referred cases and those who came after 24 hrs. Of burns were not included. The researcher himself filled a self-structured questionnaire. Most of the information was recorded from history sheet.. Duration between date of admission and culture sent was also recorded. Data was analyzed on SPSS, percentages and proportions were calculated and Chi-square test was applied where cross-tabulation of variables was done. P value < 0.05 was considered significant.
Results: All 106 patients had age between 16-75 yrs. Maximum patients (65%) were in age group of 26-50 yrs, the productive age group. Male and female ratio was 59: 47. Majority 71.7% were married & 27.4% were single. Among females 76.1% were housewives & 12.8% students while among males unskilled laborers, skilled, students & businessmen were 23%, 28%, 27% & 25% respectively. Mean surface area with burns for all patients was 41.01% while 41.5% had deep burns and 58.5% had superficial. Regarding mode of burns 86.6% had accidental, 11.5% suicidal and only 2% had homicidal burns. Mean time duration between day of admission and culture sent was 4.64±1.72 days and 79% cultures were sent within 3-5 days of admission. Common organisms isolated as single were staph aureus(15.1%), pseudomonas (14.2), proteus 8.5 and E.coli 6.6% respectively. 51.98% of the cultures showed multiple organisms in different combinations. Most common combination was of pseudomonas & E.coli (14.2%). Pseudomonas, E.coli, proteus and staph aureus were repeated as single or in combination with others as 49%, 28%, 27% & 26% respectively. Statistical test chi-square was applied after cross tabulation between age and sex of the patients and incidence of burns. Both calculations showed statistically non-significant results ($p > 0.05$).
Conclusion: Hospital acquired wound infection among burns patients occurred between 3-5 days of admission. Most common single organism isolated on culture was Staph Aureus and then Pseudomonas. In combination pseudomonas, staph aureus, E.coli, proteus and klebsiella were the most commonly isolated organisms. It was concluded that incidence of burns was more common among productive age group and it was commonly accidental.
Key words; Burns patients, hospital acquired wound infections, Mayo Hospital

INTRODUCTION

Patients who suffer severe burns are at higher risk for local and systemic infections. In recent years, emerging resistant pathogens have forced burn care provider's world wide to search for alternative forms of treatment. Multidrug-resistant Staphylococcus aureus, Pseudomonas aeruginosa, Acinetobacter spp., and various fungal strains have been the major contributors to the increase in morbidity and mortality rates. Multi-drug-resistant S. aureus remains the major cause of gram-positive burn wound infections worldwide. Treatment strategies include rigorous isolation protocols and new types of antibiotics where necessary[1].

Burns are one of the most common and devastating forms of trauma. Patients with serious thermal injury require immediate specialized care in order to minimize morbidity and mortality. Significant thermal injuries induce a state of immunosuppression that

predisposes burn patients to infectious complications. A current summary of the classifications of burn wound infections, including their diagnosis, treatment, and prevention, is given. Early excision of the eschar has substantially decreased the incidence of invasive burn wound infection and secondary sepsis, but most deaths in severely burn-injured patients are still due to burn wound sepsis or complications due to inhalation injury. Burn patients are also at risk for developing sepsis secondary to pneumonia, catheter-related infections, and suppurative thrombophlebitis. The introduction of silver-impregnated devices (e.g., central lines and Foley urinary catheters) may reduce the incidence of nosocomial infections due to prolonged placement of these devices. Improved outcomes for severely burned patients have been attributed to medical advances in fluid resuscitation, nutritional support, pulmonary and burn wound care, and infection control practices[2].

Burn wound infection is problematic because it delays healing, encourages scarring and may result in bacteremia, sepsis or multiple-organ dysfunction syndrome (a.k.a. organ failure) whereby organs from several systems are unable to maintain homeostasis on their own, requiringimmediatemedicalattention[3].

Bacteria and fungi are the most common pathogens of burn wounds. These microbes form multi-species biofilms on burn wounds within 48 – 72 hours of injury. Organisms originate from the patient's own skin, gut and respiratory flora, as well as from contact with contaminated health care environments and workers[3,4]. Gram-positive bacteria are some of the first to colonize burns, followed quickly by gram-negative . Fungal infection tends to occur in the later stages after the majority of bacteria have been eliminated by topical antibiotics[3]. Two bacterial species, methicillin-resistant *Staphylococcus aureus* (MRSA) and *Pseudomonas areuginosas* will be examined in depth in this page as they are two of the most prevalent infective agents. These two species have proven particularly difficult to treat because they posses a large number of virulence factors and antimicrobial resistance genes[4].

Pseudomonas aeruginosa is an important life-threatening nosocomial pathogen in burn units. The aim of this study was to determine nosocomial infections in the Tohid Burn Center in Tehran, Iran. Materials of this study were samples of burn wounds of 582 patients. Burn wound samples were taken on admission day, 3 and 7 days after admission. Frequency of culture positive on admission day, 3 and 7 days after admission were 15, 66, and 88%, respectively[5].

A 11months prospective study conducted in burns unit Sheraz, Iran with collaboration of burns unit Austria, attempted to assess the incidence of nosocomial infection in the Ghotbeddin burn center of Shiraz. One hundred six female patients met the inclusion criteria. All patients presenting with no signs and symptoms of infection within the first 48 hours of admission were included. Ninety-one (85.8%) acquired at least 1 infection (44.7 per 1000 patient-days), including 91 with burn infection, 28 with urinary tract infection, 56 with pneumonia, and 30 with bloodstream infection, which gives 446.7, 137.5, and 275, and 147.3 infections per 1000 patient-days, respectively[6].

Paediatrics burn unit in Armond-Trousseau hodpital, Paris, France, included 169 children staying for more than 2 days from January to December 2005. NI criteria were derived from the 1988 CDC criteria. A surveillance system was developed and included calculation of NI rates by 1000 patient or device days. The overall incidence was 12.4%, incidence density was 8 per 1000 days of care. Incidence of burn wound infection was 1.8% of patients for a rate of 1.1/1000 patients-days while the rate of other infections related to urinary catheter, pneumonia, central venous catheter and blood stream infection was higher. The conclusion was that burn wound infection rate in children hospitalized for burn injury was significantly lower than the rate described for adult burn patients. However, UTI are more frequent in the pediatric population[7].

In 1-year study conducted in Brazilian burn unit, bacterial and fungal infections presenting among 287 burned patients were registered. The median total body surface area burned was 14% (range 1–100%). The median length of hospital stay was 12 days (range 1–86 days). Eighty-six patients had in all 148 infections. Most common microorganisms were coagulase-negative staphylococci and methicillin-sensitive staphyiococcus aureus[8].

Burn patients are at risk for acquiring infection because of their destroyed skin barrier and suppressed immune system, compounded by prolonged hospitalization and invasive therapeutic and diagnostic procedures[9].

MATERIAL AND METHODS

A cross-sectional study was conducted among burns patients who were admitted directly through emergency and surgical OPD, within 12-24 hrs. of incidence independent of superficial or deep burns. Convenient sample size of 106 patients was calculated by Epi –info version 10 by using total no. of burns patients admitted during year 2008, prevalence of burns as 8%, 10% margin of error and 95% confidence interval. All the patients fulfilling above criteria, from Jan. 2009 to Nov. 2009 were included in the study. Required information was

collected from the history sheet and by asking the patients if conscious. A semi structured questionnaire was used for this purpose. Researcher himself recorded all the information, ensuring the privacy and confidentiality and also obscuring the ethical consideration. Results of culture/sensitivity report were also recorded.. Data compilation and analysis was done by SPSS. In all statistical analysis p-value <0.05 was considered significant.

RESULTS

One hundred and six (106) admitted cases of burns were included in the study. Minimum age of subjects was 16 years and maximum 75 years. Mean age of patients was 34.95±12.9 with a median of 32.50 and mode of 40 years. 22.6% of the subjects were between age 16 – 25 years, 65.1% between 25 – 50 years and 12.3% of the subjects were between age of 50-75 years. Fifty-five (55.7%) of the subjects were male and 44.3% were females. Twenty-seven (27.4%) of the subjects were single, 71.7% were married and 0.9 % was divorced. Seventy-six (76.17%) of the female patients were housewives, and rest 11.03 % was self-employed and 12.8% were students. Among male patients28.08 % were Skilled Blue Collar workers (industrial worker, electrician, driver, farmers), 23.72% were Unskilled Blue Collar (laborer / janitors), 27.1% were students, and 25.42% of the subjects were business men, 1.06% were white collar office workers, 1.06% were unemployed and 2.05% subjects were retired.

Fifty six (56.6%) of the subjects had burns on 25 -50% surface area of the body, 39.6% had 50 -75%, and 3.8% of the subjects had burn area < 25% of the body surface but burns were deep. Fifty eight (58.5%) of the subjects had superficial burns and 41.5 % had deep burns. All 106 (100%) of the subjects came directly to the hospital within 12 hrs of incidence.

Eighty six (86.8%) of the subjects had an accidental burn injury, 11.3 % committed suicide and 1.9 % had a homicidal attempt.

Seventy nine point two (79.2%) cultures were sent within 3-5 days of burns, 15.2% between 6-9 days and 5.6 % were not available. Mean duration between culture send and incidence of burns was 4.69 days±1.72 with a median and mode of 4 days. Minimum duration was 3 days and maximum was 9 days. Seventy nine(79.2%) of the cultures sent were reported within 24-72 hrs. 15.2% within 4 -5 days, 5.6% of the culture reports were not available.

Wound culture of all 106 patients was sent but 96 reports were available and all of the above showed isolation of one or as a combination of different organisms.

As far as the organisms isolated on culture were concerned, 14.2 % of cultures had Pseudomonas, 8.5% Proteus, 15.1% had Staph. Aureus, 6.6% of cultures had E.Coli, 3.8 % had Others (Citrobacter, Enterobacter), 6.6% of cultures had Pseudomonas and Proteus, 2.8 % had Pseudomonas and Staph Aureus, 14.2 % Pseudomonas + Ecoli, 3.8% Pseudomonas + Klebsiella, 3.8% had Proteus & E.Coli, 1.9% had Proteus + Diphtheria, 0.9% of cultures had Staph. Aureus + E.Coli, 0.9% of cultures had Staph. Aureus + Klebseilla, 1.9% of cultures had E Coli, Klebseilla, 3.8 % of cultures had Pseudomonas, Proteus, Staph Aureus, 0.9% Pseudomonas, Proteus & E.Coli, 0.9 % had Pseudomonas, Staph. Aureus & E.Coli, 0.9 % of cultures had Pseudomonas, Staph Aureus & Klebseila, 0.9% had Pseudomonas, E.Coli, Klebseilla, 0.9% of cultures had Proteus, Staph Aureus, E.Coli, 0.9% of cultures had Proteus, E.Coli, Klebsiella, 4.7% of cultures were not available (LAMA / Expired), 0.9% of cultures were not ordered. Forty six poit seven (46.7%) cultures were summarized as multiple response (number of times of repetition as single or in combination) were Pseudomonas, Ecoli, Proteus, Staph.Aureus, Klebsiella, citrobacter / Enterobacter and Diphtheroids showed multiple response as 49%, 28%, 27%, 26.4%, 3.8% and 1.9% respectively.

Cross tabulation was done between Mode of injury and age and gender of respondents but none of them had significant statistical relationship.63.0 % of the accidental injuries were between 25 -50 years. 22.8 % of the accidental injuries were among age group 1 – 25 years and 14. 1 % of the accidental injuries were among age group 50 -75 years.75.0 % of the suicidal injuries were between 25 -50 years. 25.0 % of the suicidal injuries were among age group 1 – 25 years and 100.0 % of the homicidal injuries were among age group 25 - 50 years. Chi-Square test was used to check any statistical difference between age and mode of injury. (X^2 = 3.077, P > .05). 54.3 % of the accidental injuries were in male. 45.7 % of the accidental injuries were among female. 58.3 % of the suicidal injuries were among male and 41.7 % of the injuries were among female. 100.0 % of the homicidal injuries were among males. Chi-Square test was used to check any statistical difference between age and mode of injury. (X^2 = 1.692, P > .429).

Table Pattern and extent of hospital acquired wound infections in burns patients, other variables and statistical analysis (n=106).

Variables		`Patients with Burns		Statistic		P value
		Frequency	(%)	Mean	Median	
Age (yrs.)	16 – 25	24	(22.6)	34.95 ± 12.96	32.5	P = 0.545
	26 - 50	69	(65.1)			
	51 - 75	13	(12.3)			
Sex	Male	59	(55.7)			
	Females	47	(44.3)			
Marital status	Single	29	(27.4)			P= 0.429
	Married	71	(71.7)			
	Divorcee	01	(0.9)			
Occupation (females)	House wives	36	(76.17)			
	Self-employed	06	(11.03)			
	Students	05	(12.80)			
Occupation (males)	Unskilled labor/janitors	14	(23.72)			
	Skilled technicians./drivers	17	(28.08)			
	Office workers	01	(1.06)			
	Business men	15	(25.42)			
	Students	16	(27.11)			
	Unemployed	01	(1.06)			
	Retired	04	(2.05)			
Surface area of burns	25 - 50 %	60	(56.6)	Mean = 40.01 ± 5		
	51 – 75%	42	(39.6)			
	< 25% but deep	04	(3.8)			
Type of Burns	Superficial	62	(58.5)			
	Deep	44	(41.5)			
Mode of Burns	Accidental	92	(86.6)			
	Suicidal	12	(11.5)			
	Homicidal	02	(1.9)			
Duration between culture send & burns incidence (days)	3 -5 days	84	(79.2)	Mean duration= 4.64+ 1.72 days		
	6 – 9 days	16	(15.2)			
	Reports not available	06	(5.6)			
Type of organism cultured as single	Pseudomonas	15	(14.2)			
	Proteus	09	(8.5)			
	Staph Aureus	16	(15.1)			
	E. coli	07	(6.6)			
	Citrobacter/enterobacter	04 (51)	(3.8) (48.2)			
	Combination of two or three of above mentioned organisms	45	(51.98)			

.

DISCUSSION

Burn is a common injury and is on the rise in our society because the safety measures in the industries are not taken properly. The most common cause of burns is accidental.

Males are effected more commonly then females. In our study 55.7% individuals were males and 44.3% were females which is comparable to Clinton Murray et all study carried out at uniformed university hospital USA[4]. In this study the mean age was 35 years this result is almost the same as Clinton Murray et al.[4] In this study the married young people are affected more as mean age if this study was 35 years and mostly individuals get married by this age.

In this study it was observed that people from all walks of life whether students, skilled, unskilled, business men or retired sustained burns and no group was immune to these injuries we expect that similar groups of people would have been involved internationally but no study has focused on this point. In this study the mean area of burn was 35% while another study by Barnski et all conducted at university of Texas observed that mean area of burn was 40% so our results are comparable with the above study.

In this study 86.8% individuals sustained accidental burns while a study conducted carried out by Clinton Murray et al had comparable results[4]. In our study 12% individuals had suicidal burns and 2%

had homicidal burns because of domestic and social reasons.

In this study the most common organism isolated was staph Areus 15.1% followed by pseudomonas 14%, proteus 8%, E Coli 6.6%a and miscellaneous 3.8%. In 52% patients mixed pattern of infection was seen in another study conducted by Soares de Macendo et al at Brazilian Burn unit had the observation that most common organism was staph aures.[8] In our study the percentage of mixed infections were 52% while a study carried out by Sanyal S .C et al department of microbiology, Burns and Plastic surgery at Ibn sina hospital Kuwait had mixed infection rate of 14%. In our setup mixed infections were more common because facilities of isolated burn units are lacking.[10]

CONCLUSIONS

Considering the high incidence of nosocomial infections in our center, implementation of improved infection control practices and policies is required, and a comprehensive education campaign for all health care workers is urgently needed

REFERENCES

1. Branski LK, Al-Mousawi A, Rivero H, Jeschke MG, Sanford AP, DN. Emergi Infections in Burns. Surg Infect (Larchmt). 2009
2. Church D, Elsayed S, Reid O, Winston B, Lindsay R. Burn wound infections. Clin Microbiol Rev. 2006 Apr;19(2):403-34
3. Church, D., Elsayed, S., Reid, O., Winston, B., Lindsay, R. (2006) Burn Wound Infections. Clinical Microbiology Reviews, 19 (2), 403 – 434.
4. Murray, C., Hospenthal, D.R. (2008). "Burn Wound Infections". *emedicine* http://emedicine.medscape.com/article/213595-overview (Accessed 14 Apr 2009).
5. A Lari. Nosocomial infections in an Iranian burn care center *Burns*, Volume 26, (8); 2007: 737-40. Incidence and outcome of nosocomial infections in female burn patients in Shiraz,Iran *American Journal of Infection Control*, Volume 32: (1); 23-26
6. Moissenet DH, Duforcq JB, Granados M, Marsol P, VU-Thien *Antimicrob Agents Chemother Intersci Conf Antimicrob Agent Chemother.* 2005 Sep 17-20; 40: 41. Armand-Trousseau hospital, Paris, France
7. Soares de Macedo JL, Santos JB .Nosocomial infections in a Brazilian Burn Unit Burns. 2006 Jun;32(4):477-81.
8. A Mehardad, SH Reza, K Parastoo, A Ojan. Incidence and outcome of nosocomial infections in female burn patients in Sheraz Iran. Burns, vol. 27; (9) 2007: 540- 44.
9. Sanyal S.C., Mokaddas E.M., Gang RX, Bang R.L. MICROBIOLOGY OF SEPTICAEMIA IN BURN PATIENTS. Annals of Burns and Fire Disasters - vol. XI - n. 1 - March 1998