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BURN WOUND INFECTION;
SIGNIFICANCE OF RULE OF NINE IN MICROBIAL SURVEILLANCE

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ABSTRACT… Background: Burn injuries are common and major health problem throughout the world. The burn wound represents as a favorable area for opportunistic colonization of microorganisms with exogenous and endogenous origin. In burns patients infections arise from multiple sources. Burn wounds become initially colonized and infected with Gram positive bacteria, mainly Staphylococci, that are superseded during the second week by Gram Negative bacteria. **Objectives:** it is a microbial surveillance retrospective study; that aimed to evaluate the significance of Rule of nine in diagnosis of aerobic bacterial burn wound infection and carried out in between June 2007 to September 2011 in the Department of Pharmaceutics, University of Karachi. **Study Design:** Descriptive retrospective study. **Materials:** A total of 118 patient irrespective of age, sex, date and time of burn, date and time of hospital admission, interval between time of burn and hospital admission, degree and percentage (%) of burn and duration of hospital stay (when specimen collected) were registered for this study. All patients were divided into two groups (A and B). **Results:** Out of 58 patients of group A isolation rate per patient was 1.1 while in group B it becomes 3.0. According to TBSA the isolation rate in group B rises with rise in TBSA. Most prevalent organism in these patients was found S. aureus(23%) P.aeruginosa(21%). **Conclusions:** Burn patients are incubator for variety of aerobic bacteria and rate of isolation of these organisms increase with rise in TBSA. The wounds of these patient must required continuous microbial surveillance that may reduce the rate of mortality

Key words: Burns, TBSA, Infection, Rule of nine

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INTRODUCTION

Burn injuries are common and major health problem throughout the world. Burn is one of the major types of injury and it is estimated that 1% peoples in the world affected by serious burn injury during their life. it is also estimated that burn injury accounts 1% of total disease those comes in hospital for treatment, unfortunately majority (>95%)of burn injuries occurs in developing countries and resulting in significant morbidity, disability, and mortality[1-5].

After initial period of shock, Infection of burn injuries is common complication, and is a major cause of death in burn patients. It is estimated that more than 70% deaths occurs in burn patients due to infection and these patients remain at risk of death until unless burn wound does not heal completely[6].

Tissue destruction in burns is diagnosed by two different ways together.

1. The total burn surface area is measured in percentage by rule of nine or by Lund and Browder estimation protocol.
2. The total skin and tissue loss in depth of burn wound measured by clinical experience.

This injury is characterized by coagulation necrosis of the cells, thrombosis of the blood vessels, accumulation of fluid and cellular infiltrate. Cellular damage occurs as protein is denatured by rising temperature while accumulation of fluid resulted by release of series of chemical mediators[4,7].

Significant burn injuries induce a state of Immunosuppression including Suppression of non specific immunity as well as Suppression of specific immunity[8].

Burn wound sepsis is an imbalance in the

normal equilibrium between bacteria and host immune defense, resulting in numerical increase in bacteria[9]. The burn wound represents as a favorable area for opportunistic colonization of microorganisms with exogenous and endogenous origin[6].

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Immune suppression and prolong hospital stay are two basic factors which play important role in development of nosocomial infection, along with these factor burn patients[10-11].

In burns patients infections arises from multiple sources. Burn wounds become initially colonized and infected with Gram positive bacteria, mainly Staphylococci, these Gram Positive bacteria such as Staphylococci are found during first post burn days that are superseded during the second week by Gram Negative bacteria. Pseudomonas aeruginosa may be the dominant isolate from burn wound colonization and infection. Following 2nd week of burns[11].

The resistance pattern of bacteria against antimicrobial drugs is increasing day by day[12]. The particular level of resistance of bacteria against antibiotics varying from one location to any other and resistance of bacteria against antibiotic becoming global problem[6].

MATERIAL AND METHODS

This study was conducted between June 2007 to September 2011 in the Department of Pharmaceutics, University of Karachi All the information concerning the patients i.e. sex, date of admission, type and date of specimen collection, number of visitors per day, history of given antibiotics etc. were recorded on a Performa specially designed for this study.

A total of 118 patient irrespective of age, sex, date and time of burn, date and time of hospital admission, interval between time of burn and hospital admission, degree and percentage (%) of burn and duration of hospital stay (when specimen collected) were registered for this study. All patients were divided into two groups (A and B). The percentage of burn in all patients was assessed by Lund and Browder's criteria and the degree of burn was determined by clinical observation.

Including criteria for group B was Total burn surface area more than 9% and more than 24 hours post burn time.

From the patients of group A single swab was collected from the infected wound irrespective of total burn surface area while from the patients of group B, more than one swabs were collected from every 9% burns by using rule of nines 13 (Weirdo.B.C 2013).

Specimens of burn wound swabs for culture were collected from registered patients with their prior consent.

Commercially available sterilized Swabs used to collect the specimen.

Following media were used to isolates and perform sensitivity of different pathogens.

Blood Agar and Mac-Conkey's Agar used as primary culture media.

Nutrient Agar is used to subculture pathogens isolated on carbohydrate containing media prior to performing biochemical and sensitivity tests.

Mueller and Hinton medium used for the determination of sensitivity pattern by Kirby-Bauer technique[14].

A Total of 237 swabs from both (A and B) groups were collected. Swab, were cultured on media without unnecessary delay on Blood agar, Mac-Conkeys agar and incubated at 37°C aerobically for overnight[15].

Following incubation the organisms were identified by their colonial morphology, Gram staining and were confirmed on the basis of concerned biochemical tests.

Sensitivity tests were performed by Kirby-Bauer

method in accordance of NCCLs standards 1998.

RESULTS

Group	No. of patients	No. of isolates	Average isolates per patient
A	58	66	1.1
B	60	180	3.0

Table (I) Shows the comparative average infection per patient in group "A" and "B". In patients of group "A" single swab was collected from the site of infection while in patients of group "B" multiple swabs were collected according to patients TBSA by using rule of nine.

TBSA%	No. of patients	No. of isolates	Average isolates per patient
01-18%	16	32	2.0
19-27%	21	60	2.8
28-36%	18	61	3.4
>36%	05	27	5.4

Table (II) shows comparative analysis of frequency of isolation of bacteria with average infections per patient in accordance of different TBSA in patients of group "B.

ORGANISMS	Group A (66 Isolates %)	Group B (180 Isolates %)	Overall (246 Isolates %)
Staphylococcus aureus	19 (29%)	38 (21%)	57 (23%)
Staphylococcus epidermidis	01 (1.5%)	10 (5.5%)	11 (4.5%)
Enterococci	00 (00%)	03 (1.6%)	03 (1.2%)
Enterobacter	05 (7.5%)	18 (10%)	23 (9.3%)
E. coli	04 (06%)	09 (05%)	13 (5.3%)
Proteus Spp;	06 (09%)	33 (18%)	39 (16%)
Klebsiella Spp;	05 (7.5%)	15 (08%)	20 (08%)
Citrobacter Spp;	04 (06%)	5 (03%)	09 (3.6%)
Serratia Spp;	01 (1.5%)	11 (06%)	12 (05%)
Providencia Spp;	05 (7.5%)	2 (01%)	07 (03%)
Pseudo.aeruginosa	16 (24%)	36 (20%)	52 (21%)

Table (III) Comparative and collective percentage vise prevalence of different bacteria isolated from burn wounds of patients belongs to group "A" and "B".

DISCUSSION

Burn injuries are open wounds on body surface; those remain in contact with environment. The size and numbers of wounds plays very important role in colonization as well as in infection by variety of microorganisms those grow and multiply in aerobic condition. In present study one specimen was collected from infected site irrespective of total burn surface area in one group of patients, in which rate of isolation of bacteria per patient was only 1.1, while in other group of patients from whom more than one specimen were collected by using rule of nine in association of their total burn surface area, that shows an overall rate of isolation of aerobic bacteria was 3.1 isolates per patient (Table-I)

Extensive Burn wound always considered as contaminated wound and immunity of burn patients always considered as suppressed immunity, therefore isolated bacteria must considered as infective agents either they produce any clinical or sub clinical picture of infection at the time of sample collection.

In present study it was also observed that one fold rise (every 9% rise in total burn surface area, if considered, as one fold rise) in total burn surface area also increase the rate of isolation of bacteria per patient.

Present study reveals that variety of aerobic bacteria were responsible for colonization and as well as infection of burn wounds. In present study, It was observed that more or less 30% infections of burn wound caused by Gram positive (including Coagulase positive, Coagulase negative Staphylococci and Enterococci) bacteria, while

more or less 70% infection of these wounds caused by Gram negative (including Oxidase positive P.aeruginosa and Oxidase negative coli form) bacteria (Table III)

In Gram negative bacteria, prevalence of Oxidase negative Coliform bacteria (those were over all 50% of all isolates) was more or less 70% while the prevalence of Oxidase positive, Gram negative P. aeruginosa (those were over all 21% of all isolates) was more or less 30%.

In present study the overall prevalence of Staph. aureus in burn wound infections was 23% in burn patients, that is in correlation with several[16-23].

Ps aeruginosa survive well in the hospital environment. Once it is established within a unit, it can persist for a long time and persist as an infection risk for patients admitted in this unit. Staff member's hands can become contaminated and becomes the source for the transfer of this pathogen among patients[25].

In present study prevalence of Pseudomonas aeruginosa was (21%) in burn patients is in accordance of study conducted by Santucci et.al2003.

In the present study, most prevalent organisms causing infection in burn patients belong to family Enterobacteriacae. Among them the most common isolates were Proteus species (9-18.4%) followed by Enterobacter species (7.5-10%) The reason for this predominance of Enterobacteriacae in wound infections may be the colonization of the wound by patient's own gastrointestinal bacterial flora as well highly unhygienic condition of burns ward as well as burn patients, lack of knowledge and implication of infection control measures.

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