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Original Research Article

Microbiological profile of urinary tract infection in patients with burn injuries

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ABSTRACT

Background: As per WHO around 1,95,000 people died every year due to burn injuries. After initial 72 hours, Infections are the most common cause of death in patients with burn injuries and urinary tract infection was second most commonly reported infectious complication. This study was tried to determine the pattern of microorganisms responsible for urinary tract infection.
Methods: After matching inclusion and exclusion criteria, total 55 patients were taken for this institution based prospective observational study. Samples were collected on day 7 and cultured aerobically in MacConkey agar and 5% blood agar and antibiotic susceptibility testing was done on Muller Hinton agar using Kirby-Bauer disc diffusion method.
Results: 29.1% samples were positive for microorganisms, of which *Escherichia coli* was most common isolated organism, it is found in 18.2 % of study population. nitrofurantoin was found to be most effective antibiotic against *Escherichia coli.*
Conclusions: Gram-negative cocci were most prevalent organisms, causing urinary tract infection in patients with burn injuries. *Escherichia coli* was most common isolated organism and nitrofurantoin was most effective against it. Overall piperacillin/tazobactam has height sensitivity.

Keywords: Urinary tract infection, Burn injury, Microbiological profile, Antibiotic sensitivity, UTI

INTRODUCTION

Burns, one of the most common and devastating forms of trauma, which is caused by application of heat or chemical substances to the external or internal surface of the body which causes destruction of tissues.[1] As per the world health organization, burns account for an estimated 300,000 deaths annually, majority (>95%) of which occur in developing countries, with the Southeast Asia region contributing to 57% of the deaths.[2] It has been estimated that about 75% of the mortality associated with burn injuries is related to sepsis especially in developing countries.[3] The most commonly recovered pathogens depend on the site of burn wounds and reflect the hospital's nosocomial pathogens. Normally, first 24 hours all burn wounds are sterile so there is no need for antibiotic therapy, and antibiotics prophylaxis should be avoided as prophylaxis does not reduce chances of infection.

Sterility should be maintained during all procedures like catheterization, IV Line and Ryle's tube etc. The 2016 USA National burn repository report found that 7 of the 10 most frequent complications occurring in the burn patient were of an infectious aetiology, with pneumonia, urinary tract infection (UTI), and cellulitis topping the list.[4] Deaths due to hypovolemia and hyperosmolar shock are uncommon now due to the advancement of resuscitation methods in burn patients, but sepsis is now the commonest cause of death following burn injuries.

The second most commonly reported infectious complication in patients with burn injuries is urinary tract infection. Urinary tract infection complicated the hospital course of 3.4% of patients with burn injuries.[5] This risk is likely associated with genital area burn, prolonged hospitalization and the frequent need for Foley catheterization.

Objectives

The objective of this study is to find out the microbiological profile of urinary tract infection in patients admitted with burn injuries and to determine antibiotic susceptibility of these organisms. This will help us for selecting proper empirical systemic antibiotic therapy for early management of urinary tract infection and its consequence and taking step to reduce incidence, thus reduce the morbidity and mortality of patients with burn injuries.

METHODS

This is an institution based, prospective, observational study has been carried out in department of general surgery department from March 2019 to August 2020. The study population comprised of total 55 patients, satisfying below mentioned inclusion and exclusion criteria. The primary data for this study were patient's details and investigation reports, collected in predesigned case record form.

Sample size

Sample size is determined using following formula with adding 10% extra.

$$n = Z^2P\ (1 - P)/\mathrm{d}^2$$

Where, n=sample size; Z=confidence level=1.96 (for confidence interval 95%); P=expected prevalence=15%; d=precision=0.01

$$n = \{1.96\times1.96\times0.15\times (1\text{-}0.15)\} \div (0.01\times0.01)= 48.9$$

We add 10% extra, So;

$$n = 50+5 = 55.$$

Inclusion criteria

Inclusion criterion for current study was patients of any genders, having burn injury more than 20% of TBSA.

Exclusion criteria

Exclusion criteria for current study were patients having burn injuries other than thermal burn i.e., electric burn, chemical burn and patients who have diabetes mellitus, HIV infection or any immunosuppressive disease or receiving immunosuppressive therapy in the preceding 6 months.

Study technique

This study has been conducted after getting ethical approval from institutional ethical committee and proper written informed consent from each patient or legally acceptable representative of patient after explaining the study procedure to them in their own vernacular language. Foley's catheter tips, used for in situ urinary catheterization, was collected into sterile containers, then these samples were transported to the Institutional microbiology laboratory for culture and sensitivity. Samples were inoculated over two agar plates aerobically; MacConkey agar and 5% blood agar at 37^0C for 24 to 48 hours. After that the plates were examined for bacterial colonies and growth was identified. Plates with no growth were discarded. Antibiotic sensitivity testing of these isolates was done on Muller Hinton agar using Kirby-Bauer disc diffusion method. Antibiotic susceptibility has been decided according to CLSI (formerly NCCLS) guideline by measuring zone of inhibition.

RESULTS

Distribution of age and sex

Out of 55, total 38 patients were female and 17 were male and majority (total 16 patients) belongs to age group between 21 to 30 years.

Table 1: Distribution of age and sex of study population.

Age (years)	Male	Female	Total	%
Up to 10	3	2	5	9.1
10-20	1	2	3	5.5
20-30	2	14	16	29.1
31-40	5	9	14	25.5
41-50	2	4	6	10.9
51-60	1	4	5	9.1

Distribution of isolate

Total 16 culture reports were found positive for isolates. *Escherichia coli* was most common isolated organism in this study. It was found in 18.2 % of study population, Other Organisms found in this study were *Proteus mirabilis*, *Staphylococcus aureus* and *Klebsiella pneumoniae* found in 5.5%, 3.6% and 1.8% of study population respectively. Distributions of isolates are shown in (Table 2, Figure 2).

Antibiotic susceptibility of isolates

The most effective antibiotics found in this study was amikacin,followed by piperacillin /tazobactam and

nitrofurantoin. Amikacin was sensitive against 16.3 % of isolated bacteria. 60% of *Escherichia coli* found in this study were sensitive to nitrofurantoin. The most resistant antibiotics found in this study was cefuroxime it was resistant against 18.4 % of isolated bacteria.Distribution of antibiotic susceptivility of isolated organisms are shown in (Figure 3).

Table 2: Distribution of isolated organisms.

Isolated Bacteria	N	%
Escherichia coli	10	18.2
Klebsiella pneumoniae	1	1.8
Proteus mirabilis	3	5.5
Staphylococcus aureus	2	3.6
No growth	39	70.9
Total	55	100.0

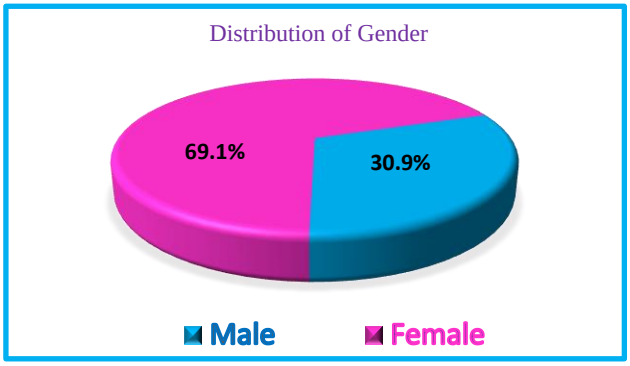

Figure 1: Pie diagram showing distribution of gender.

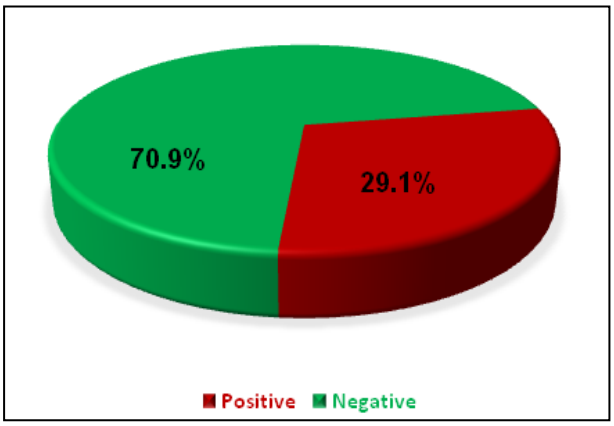

Figure 2: Distribution of culture reports.

DISCUSSION

Distribution of gender and age

Incidences of burn injury in females were more than males. The incidence in male and female was 30.9 % and 69.1% respectively. Female has high incidence of burn injuries probably due to occupational hazards of working in kitchens. 54.5% of patients belong to age group between 21 to 40 years. The youngest patient admitted with burn injuries was 9 months old and the oldest patient was 77 years of age. The mean age of the patients was 34.8 years of age.

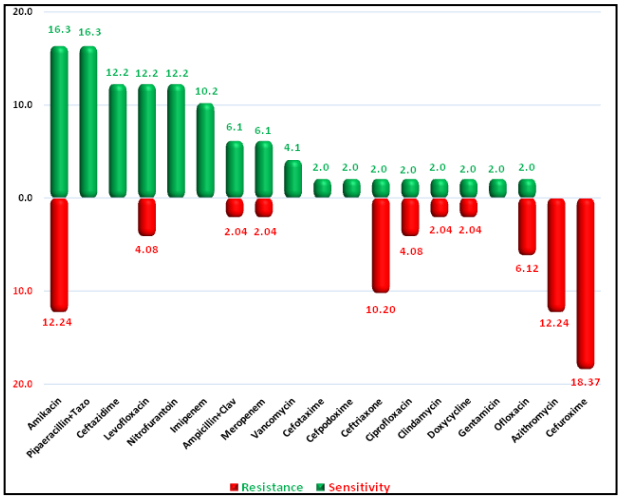

Figure 3: Distribution of sensitivity and resistance of antibiotics.

In a study by Bhama et al it was found that the incidence of burn injuries was maximum in female (85.16%) and majority of patients belong to age group of 21-30 years (24.14%).[6,7] Similar results were seen by Chakraborty et al[7] who reported that 56.6% of the cases were of 20-39 years age. Likewise, Jaiswal et al stated that most of the cases were between 21-30 years of age.[8] In contrast, Ramakrishnan et al and Ekrami et al reported that the incidence was higher in males in their studies.[9,10]

Pattern of microbial infection

Total 29.1% culture reports were found positive for isolates, of which *Escherichia coli* was most common isolated organism, it was found in 18.2 % of study population, followed by *Proteus mirabilis*and *Staphylococcus aureus* found in 5.5% and 3.6% study population respectively. *Klebsiella pneumoniae* was least common isolated organism. Similar result was found in a study by Leseva M and Zozikov.[11] According to their study the major causing agents doing urinary tract infection in patients with burn injuries were *Escherichia coli* (19.2%) and *Proteus mirabilis* (13.9%).

Pattern of antimicrobial sensitivity

The most effective antibiotics found in this study was amikacin, followed by piperacillin/tazobactam and nitrofurantoin. Amikacin was sensitive against 16.3% of isolated bacteria. Nitrofurantoin was most sensitive antibiotic against *Escherichia coli*. It was sensitive against 60% of isolated *Escherichia coli*. piperacillin/tazobactam was sensitive against percent of isolated bacteria. The most resistant antibiotics found, was cefuroxime. It had resistance of 18.4% against isolated bacteria in this study.

Limitations

Small number of samples is taken for limited duration of time for this study.Some factors influence incidence of urinary tract infection in burn patients such as genital area burn, in situ foleys catheterization, prolong hospital stay, etc, but those parametersare not counted in this study.Antibiotics susceptibility pattern of individual microorganism is not shown in this study.

CONCLUSION

Gram-negative cocci were most prevalent organisms, causing urinary tract infection in patients with burn injuries. *Escherichia coli* was most common isolated organism and nitrofurantoin was most effective against it. Overall piperacillin/tazobactam has height sensitivity. This study will help us for selecting empirical systemic antibiotic therapy for early management of urinary tract infection before the results of urine cultures become available.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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