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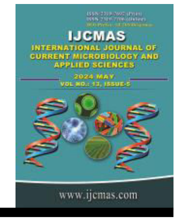

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Determine the Rate of Surgical Site Infection among Intensive Care Unit and Post Surgical Ward Patients in a Tertiary Care Hospital and their Antibiotic Susceptibility Pattern

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A B S T R A C T

Surgical site infection (SSI) is defined as a proliferation of pathogenic microorganisms which develops in an incision site either within the skin and subcutaneous fat (superficial) and musculofascial layers (deep) or in an organ or cavity, if opened during surgery. SSIs account for 20% to 25% of all hospital acquired infections worldwide. The rate of HAIsis markedly higher in many developing countries. The present study aimed at obtaining the incidence of SSI and to evaluate the risk factors as well as to formulate an antibiotic policy for patients posted for any surgery in Tirunelveli medical college hospital. To determine the rate of surgical site infection among patients admitted in Intensive surgical care unit and post surgical ward in a tertiary care hospital.2. To isolate the pathogens and find the antibiotic susceptibility pattern. The Study Population and Size is 50. The Study Period is March 2017 to August 2017**.** Department of Microbiology**.** The Study Sample was collected from patients who developed SSI. Two wound swabs were collected aseptically a. Gram stain microscopy using first swab.b. Inoculation on culture media using second swab c. Identification of the isolates by standard biochemical test. d. Antimicrobial susceptibility testing by Kirby Bauer disk diffusion method. Ethical clearance from institutional ethics committee Tirunelveli medical college. Surveillance for SSIs in each centre will determine the rate of SSIs, distribution of micro organism and antimicrobial susceptibility pattern of the isolates. Empirical treatment of the SSIs can be made using these relevant data which will ensure reduced patient stay, morbidity, cost per day in the hospital.

Introduction

Surgical site infection (SSI) is defined as a proliferation of pathogenic microorganisms which develops in an incision site either within the skin and subcutaneous fat (superficial) and musculofascial layers (deep) or in an organ or cavity, if opened during surgery (Bagnall *et al.,* 2009). Hospital acquired infections are one of the major health problems throughout the world.

Pathogens that are able to survive in the hospital environment for long period and resist disinfection are particularly more important for HAIs (Mangram *et al.,* 1999). The number of surgical patients in developing countries is increasing but surgical care given to the patients is poor. The rate of HAIsis markedly higher in many developing countries (Mangram *et al.,* 1999; Gelaw *et al.,* 2013).

SSIs account for a high proportion of the total number of HAIs and have a great impact on patients health care cost, morbidity, and mortality (Gelaw *et al.,* 2013; Amare *et al.,* 2011). SSIs account for 20% to 25% of all hospital acquired infections worldwide (Thu *et al.,* 2006). The rate of HAIsis markedly higher in many developing countries (Mangram *et al.,* 1999; Gelaw *et al.,* 2013). The present study was aimed at obtaining the incidence of SSI in our set up and to evaluate the risk factors as well as to formulate an antibiotic policy for patients posted for any surgery in our hospital.

The main purpose of the study is to determine the rate of surgical site infection among patients admitted in Intensive surgical care unit and post surgical ward in a tertiary care hospital. And to isolate the pathogens and find the antibiotic susceptibility pattern

Materials and Methods

The present prospective study was conducted in the Department of Microbiology at Government Tirunelveli Medical College and Hospital, Tirunelveli. The study period was from March 2017 to August 2017. Institutional ethics committee approval was obtained prior to the start of the study.

Sample Size

Information and clinical samples which were relevant to the study were collected from the study subjects during the study period. A total of 50 patients who developed SSI during the study period (300 surgeries) were included in the study. All eligible surgical patients were subjected to daily surveillance for the development of infection. This was done according to the clinical criteria for surgical site infection development in CDC SSI classification system (superficial incisional SSI, deep incisional SSI, and organ/space SSI) (Bagnall *et al.,* 2009; Agarwal, 1972; Berard and Gandon, 1964). Patients who were involuntary to give consent were excluded.

Specimen collection and processing

Two wound swabs were collected aseptically from the patient included in the study. One swab was used for Gram stain and the other for culture. All the collected swabs were processed for detection of aerobic bacteria without delay in the following manner.

a. Gram stain microscopy using first swab.
b. Inoculation on culture media using second swab (Blood agar, Mac Conkey agar).
c. Identification of the isolates by standard biochemical test.
d. Antimicrobial susceptibility testing by Kirby Bauer disk diffusion method as per CLSI guideline (Performance Standards for Antimicrobial Susceptibility Testing, 2017).

Results and Discussion

Out of 300 surgery 50 patient developed surgical site infection (16.7%). Samples were collected from 50 patients and cultured. Among them 25 cases were culture positive (50% 25/50) while 25 cases were culture negative (50%, 25/50).

Among the 50 SSIs, 25 showed growth of colonies. *Staphylococcus aureus* was the predominant organism isolated from the surgical sites followed by *Pseudomonas* and *Klebsiella.* The pathogens isolated were *Staphylococcus aureus* (10), *Pseudomonas aeruginosa* (7), *Klebsiella species* (4) *Escherichia coli* (2), 1 CONS and 1 *proteus spp.*

In patients with emergency surgery the infection rate was 72% (36/50), while in patients operated electively the rate was 28% (14/50).

Out of the 50 surgical site infection 13 were superficial incisional SSI, 25 were Deep incisional SSI, 12 were organ space surgical site infection. *Pseudomonas* spp and *staphylococcus aureus* were found to be the most prevalent organisms in superficial and deep incisional SSI, while *klebsiella* was the most prevalent organism in deep tissue organ/space SSI.

Antibiotic susceptibility testing showed that all the strains of *Staphylococcus aureus* were resistant to penicillin, sensitive to tetracycline, gentamicin and amikacin and 50% of the isolates resistant to ciprofloxacin. Both the *staphylococcus aureus* and

CONS isolates were sensitive to cefoxitin, meaning that none of the strains were methicillin resistant.

All the *Pseudomonas aeruginosa* isolates were sensitive to ceftazidime, amikacin and imipenem. Five isolates resistant to ciprofloxacin (44.44%), 2 isolates resistant to gentamicin (77.78%)

Most of the *K. Pneumonia* isolates were sensitive to amikacin. Three of the four isolates were resistant to cefotaxime and ciprofloxacin (42.85%).

The results of the study reveals that most of the organism were sensitive to amikacin but showed low sensitive to cephalosphorins and fluoroquinolones.

The present study was carried out in 50 patients who underwent various surgeries. The rate of SSI varies greatly worldwide and from hospital to hospital. The rate of SSI varies from 2.5% to 41.9% as per different studies (Mangram *et al.,* 1999). The present study shows SSI rate 16.7% (Agarwal *et al.,* 1972) have shown that incidence of SSI in India is between 4-30%.

In this study SSIs have occurred more in emergency surgery than in elective surgery. Many studies shown that emergency cases land up in SSI more than elective ones (Reichman and Greenberg, 2009; Agarwal, 1972; Berard and Gandon, 1964; Tripathy and Roy, 1984; Cruse, 1992).

Staphylococcus aureus was the predominant organism isolated from the surgical sites followed by Pseudomonas and Klebsiella in the present study. *E.coli* and Proteus were the other organisms isolated from SSIs Lilani *et al.,* (2005) and Mahesh *et al.,* (2010) also found preponderance of *Staphylococcus aureus* and Pseudomonas in SSIs in their studies. Many studies have reported *Staphylococcus aureus* as the commonest isolate from the postoperative wound infection. *Staphylococcus aureus* forms the bulk of the normal flora of skin and nails. Hence, it is the commonest organism found in most of the SSIs. The high incidence of gram-negative organisms also in the postoperative wound infections can be attributed to be acquired from patient's normal endogenous micro flora (Prabhakar and Arora, 1979; Malik *et al.,* 2011; Mangram *et al.,* 1999).

Successful management of patients with bacterial infection depends on early identification of bacterial pathogens and selection of an effective antibiotic against the organism. Antibiotics are one of the pillars of modern medical care and play a major role as both the prophylaxis and treatment of infectious diseases.

The issues of their availability, selection, and proper use are of critical importance to the global community (Mangram *et al.,* 1999; Gelaw *et al.,* 2013). The results of the study reveals that most of the organism were sensitive to amikacin but showed low sensitive to cephalosphorins and fluoroquinolones. This could be due to the over use of this drugs in this region. SSI is major risk in surgeries in spite of use of modern surgical and sterilization technique and use of prophylactic antibiotic during surgery. SSI represent substantial burden of disease not only on patient but also on health care services in terms of morbidity, mortality and the economic costs.

The consequences of SSIs greatly impact patients and the healthcare systems. Prevention of a SSI requires a multipronged approach, with emphasis on optimizing preoperative issues, adhering religiously to strict protocols during the intra operative period and addressing and optimizing metabolic and nutritional status in the post-operative period (Sapana *et al.,* 2017).

Table.1 Procedure wise SSI distribution

Emergency procedure	36
Elective procedure	14

Table.2 Distribution of infections according to surgical site

Surgical site	Infection rate
Superficial	13
Deep	25
Organ Space	12

Table.3 Culture positivity among SSI

Culture positive		Culture Negative
Gram Positive	11	25
Gram Negative	14	
Total	25	

Table.4 Distribution of isolates

Staphylococcus aureus	**10**
Pseudomonas species	7
Klebsiella species	4
E.coli	2
CONS	1
Proteus species	1

Surveillance for SSIs in each centre will determine the rate of SSIs, distribution of micro organism and antimicrobial susceptibility pattern of the isolates. Empirical treatment of the SSIs can be made using these relevant data which will ensure reduced patient stay, morbidity, cost per day in the hospital.

Author Contribution

E. Manimala: Investigation, formal analysis, writing—original draft.

Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethical Approval Not applicable.

Consent to Participate Not applicable.

Consent to Publish Not applicable.

Conflict of Interest The authors declare no competing interests.

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