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Original Research Article

Comparison of microbial flora between hospital-acquired and community- acquired wound infections

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Abstract

Wound infection is one of the important causes of morbidity and mortality among patients. This study is planned with the objective to determine and compare the frequency of different bacterial pathogens in hospital acquired wound infections and community acquired wound infections. The study has been performed in surgery department of Ayub Teaching Hospital Abbottabad in 2012. All the fresh cases presented with superficial soft tissue infections (SSTIs) in the surgical outpatient departments were included in the study as community- acquired infections. The cases that developed SSTIs 48 hours or more after admission in the hospital were considered as hospital –acquired SSTIs. After thorough history and clinical examination pus swabs/pus specimens were collected from the patients and were sent for culture. One hundred consecutive pus swabs/aspirates were taken from outdoor patients and other 100 specimens were obtained from admitted patients in different surgical units. Out of 100 patients with hospital acquired infections, 86 were male whereas out of 100 patients with community acquired wound infection, 67 were male. MRSA (Methicillin-resistant Staphylococcus aureus) was the most common organism in both groups. Both community and hospital Acquired wound infections are more common in male. Elderly age groups of patients were more affected from hospital acquired wound infections.

Keywords: Wound infection, hospital acquired wound infection, community acquired wound infection

INTRODUCTION

Wound healing is a historical problem since 4000 years but the work of Joseph Lister and Louis Pasteur has revolutionized the modern surgical world. Louis Pasteur pioneered concept of "germ theory of disease". Joseph Lister coined concept of "antisepsis and sterility" which helps prevent infections (Imran et al., 2018).

Wound infections are responsible for rising treatment cost, length of hospital stay and significant morbidity and mortality (Negi, 2015). Bacterial resistance to antibiotics has led to emergence of dangerous, resistant strains within the past twenty years (Fair and Tor, 2014). Lister used the term "antisepsis" for the measures to prevent infection. Nowadays the preferred term is "asepsis" but research work of Lister provided a solid base for to-day's surgery (Newsom, 2008). The introduction of antibiotics was a major step in the treatment of infections. Common sense of surgical team and their discipline attitude towards surgical procedure and patient are still more effectives ways to control wound infection (Howard, 2010).

According to Pal and Pal, 2008 the risk of sepsis and its severity are very much increased by local and general factors; uncontrolled diabetes, leukemia and presence of devitalized tissue.

Wound infection rate in clean surgical procedure is up to 10% of patients depending upon breadth of surgical

procedure, immunity of patient and expertise of surgeon. (Spelman, 2002).

Wound Infection confers a great test for the clinicians and a reason of patient misery (White and Cutting, 2008).

Haphazard use of medicines to treat wound infection is an international issue that may contribute in slowed wound healing and evolution of multi drug-resistant microbes (Basu *et al.,* 2009).

MRSA was more commonly found in hospital staff and admitted patients. It was the most common cause of wound infections after surgery. Multi drug resistance has been observed among these MRSA strains which have narrowed management choices (Tambekar *et al*., 2007; Chambers, 2003).

Hospital-acquired infections prolong hospital stay of the patient, length of treatment, readmission, and revised surgery; prolong vacations from work and on reserves of hospital and community. (Spelman, 2002).

Wound microbiology has justifiably achieved a high profile (White and Cutting, 2008).

Around 100 *Pseudomonas aeruginosa* microbes were detected in burn wound infections in a teaching hospital in Peshawar, Pakistan during 2005-6 (Ullah *et al*., 2009).

Antibiotic treatment is usually started in every wound without evidence of any infection to avoid wound infection. This protocol has resulted in emergence of multi drug-resistant strains like MRSA, vancomycin-resistant *Staphylococcus aureus* (VRSA), and beta lactamase- (ESBL) producing microbes (Colsky et al., 1998; Barie *et al*., 2006).

Therefore to prevent development of multidrug resistant strains and to avoid lavish consumption of state resources timely identification and differentiation of hospital and community acquired wound microbial flora and its sensitivity to a particular drug is highly desirable.

MATERIALS AND METHODS

Permission was sought from Ayub Teaching Hospital ethical committee to conduct this study in the hospital. Informed consent was taken from all patients included in the study. The study has been performed in surgery department of Ayub Teaching Hospital Abbottabad.

All the fresh cases presented with superficial soft tissue infections (SSTIs) in the surgical outpatient departments were included in the study as community-acquired infections. The cases who developed SSTIs 48 hours or more after admission in the hospital were considered as hospital –acquired SSTIs.

After thorough history and clinical examination pus swabs/pus specimens were collected from the patients and were sent to the department of pathology for culture. The specimens were processed using standard techniques of inoculating these on blood and MacConkey media. The same were incubated at 37.2 ^{o}C for 24-48 hours.

The cases which presented as community- acquired infections and were admitted to surgical wards but pus collection delayed for more than 48 hours were excluded from the study to avoid confusion of community- acquired infection and hospital acquired SSTIs.

One hundred consecutive pus swabs/aspirates were taken from outdoor patients and other 100 specimens were obtained from admitted patients in different surgical units of Ayub teaching hospital Abbottabad. The hospital acquired microbes were collected from the patients who remained in hospital for at least four days and there were no evidence of infection in them.

The collected specimens were nurtured on Mac Conkey's media. Cultured plates were nurtured at 37.2°C up to 24 hours.

After 24 hours of incubation, the inoculated plates were reviewed for vegetation. Microbes were identified by following recommended protocols.

Sample technique was consecutive non-probability

A brief clinical feature of a patient with wound was recorded on a proforma. Pus/exudates were taken with a sterile swab from the center of the ulcer and were sent to a standard microbiology laboratory for culture and sensitivity.

Superficial, devitalized tissue removed by curettage from chronic wounds, were also investigated for microbial content. These specimens were transferred to microbiology laboratory within one hour with clinical description of the wounds. In the laboratory specimen initially were plotted on blood agar and Mc Conkey's media. Cultured plates were kept at 37.2°C up to 24 hours. Microbes were isolated through gram staining and standard biochemical tests. All the data was collected by the investigator herself on a proforma.

Data were entered on a computer using SPSS 20 and analyzed.

RESULTS

Out of 100 patients with hospital acquired infections, 86 were male and 14 were female. Forty five patients were in range of 50-69 years age as shown in Figure 1. Fever and discharge from the wound were presenting symptoms in 28 patients while 72 patients were suffering from pain, fever and wound discharge. Out of 100 patients 72 were having pus discharge from their wound while in 28 patients there was devitalized tissue in wound. *Pseudomonas* and MRSA (Methicillin Resistant *Staphylococcus aureus*) were the most common organisms (each 24%) isolated from hospital acquired wound infections as shown in Table 1. Seventy one patients were managed in the ward and 29 patients were in ICU (intensive care unit). They were followed by *Klebsiella* (19%), Staphylococcus sp (14%), E-coli (11%) and Proteus (8%).

Out of 100 patients with community acquired wound

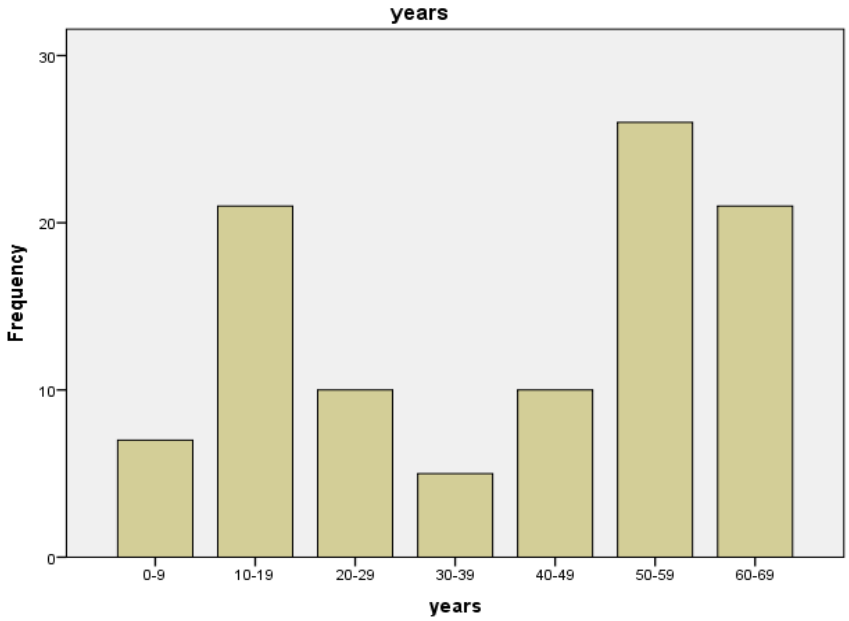

Figure 1. Age (years) patterns of patients with hospital acquired infections

Table 1. Microbes isolated from Hospital- Acquired wound infections

sn	Microbes Isolated	Number (%)
1	Escherichia col	11(11)
2	Klebsiella	19(19)
3	MRSA (Methicillin-resistant Staphylococcus aureus)	24(24)
4	Proteus	8(8)
5	Pseudomonas aer	24(24)
6	Staphylococcus aureus	14(14)
Total		**100**

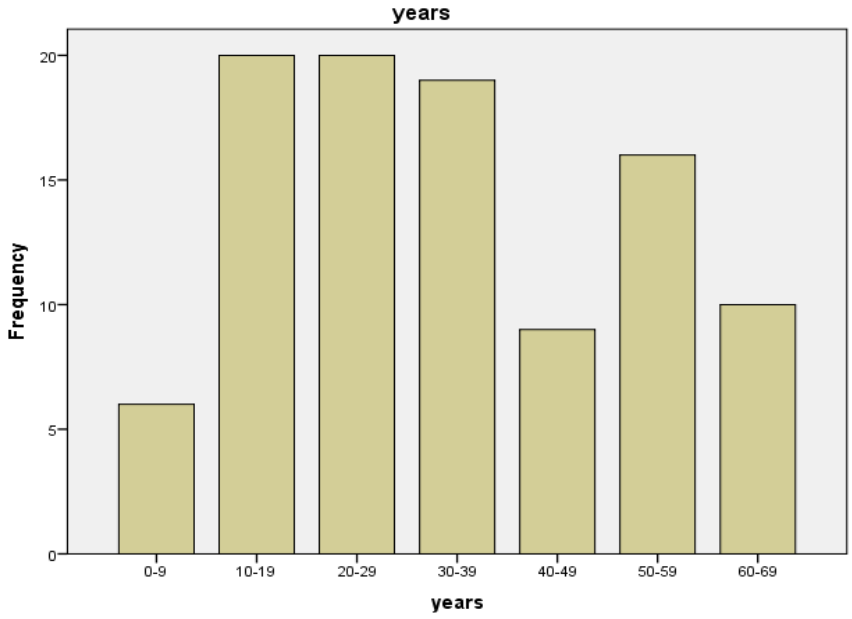

Figure 2. Age (years) structure of patients with Community- Acquired Wound Infection

Table 2. Pattern of the microbes isolated from Community Acquired wound infections.

sn	Microbe Isolated	Number (%)
1	Anaerobic cocci	1(1)
2	Escherichia col	12(12)
3	Klebsiella	22(22)
4	MRSA	1(1)
5	Proteus	13(13)
6	Pseudomonas aerogenosa	1(1)
7	Staphylococcus	41(41)
8	Streptococcus	9(9)
Total		**100**

infection, 67 were male and 33 were female. Ages of 40% patients were in range of 10-29 years as shown in Figure 2. Out of these 100 patients, 86 presented with pus discharge from the wound and 14 were having debris or devitalized tissue in wound. Fever and discharge from the wounds were presenting symptoms in 38 patients. Sixty two patients were suffering from pain, fever and discharge from the wound. Pus or debris from the wounds of 83 patients was collected in OPD (outpatient department) and specimen for culture from 17 patients was taken in ward within 48 hours of admission. Methicillin-resistant *Staphylococcus aureus* was the most common (42) microbe isolated from the wound as depicted in Table No 2.It was followed by *Klebsiella* (22%), *Proteus* (13%), *E-coli* (12%) and *Streptoococcus* (9%).Only a single specimen yielded MRSA and so was the case for anaerobic cocci and *Pseudomonas aerogenosa.*

DISCUSSION

Both community and hospital acquired wound infections were more common in male (67%) and (86%) respectively. Patients within age group 10-29 years were most commonly(40%) affected by Community acquired wound infections while hospital acquired wound infections were more common in older age group, 51-71 years age group(44%).

Staphylococcus aureus was the most common microbe (41%) isolated from the wounds of community acquired wound infections while pseudomonas (24%) and MRSA (24%) were the most common microbes in hospital acquired wound infections.

Hospital-acquired infections are a serious global problem for clinical practitioners and financial experts. Upto10% of all hospital admissions suffer from hospital acquired infection which creates about five to six billion US dollars extra burden on economy of United states of America (Hanan et al, 2006)

(Hanan et al, 2006) reported HAI prevalence rates were 8% in their study. Around 18% were having wound infection in intensive care unit and six percent patients were infected in wards. Their findings correspond to many other studies results from other countries where most of the hospital acquired infections occurred in intensive care unit (Jarvis, 2003). This is expected as intensive care unit patients are mostly seriously sick and are passing through major surgical procedures. Wound infection rate in general surgery ward was 5.7%. These findings correspond to our results. Twenty-nine percent of our patients with hospital acquired infections were from intensive care unit.

Azzam and Dramaix reported wound infection rate of seven percent in hospital acquired wound infections in a hospital of Lebanon (El-Hagrassy, 1998).

In another multicenter study the incidence of *Staphylococcus aureus* was between 3.2% and 47.2%. During the same period, Williams et al.,(1960) in a collaborative study in 21 hospitals showed *Staphylococcus aureus* to occur in 60% of the post operatively infected wounds.

Antimicrobial resistance is more prevalent among bacteria in the nosocomial setting than, among bacteria causing community acquired infection (Curcio, 2010).

Gram-negative microbes are responsible for most HAIs but a research conducted in Jeddah, showed that MRSA has been found in 33% wound infections in two big hospitals (Madani et al., 2001). MRSA was isolated in 24% of our hospital acquired wound infections, which are closer to findings of the foresaid research.

MRSA has emerged as a leading hospital acquired microbe internationally. It has increased from three percent to 30 % in big cities of USA in last forty years (Salgado, 2003).The rising rate of MRSA as a community acquired infection has put enormous financial burden on health care system. Bukharie et al. (2001) have reported a 15 times rise in MRSA wound infections in community in a three year study performed in eastern region of Saudi Arabia. In Australian hospitals MRSA has been a primary microbe since 1980s (Spelman, 2002). Although MRSA bacteremia incidence has declined over the past decade but still it is as-sociated with poorer clinical outcomes compared. (Hassoun A, 2017)

Although our findings are almost similar to other international studies but our sample size was relatively

smaller. Our study was a single Centre study. Therefore larger and multicenter studies are required to further validate the findings of our study and to develop recommendations for the decision makers so that effective preventive measure could be taken to avoid complication of surgical site infections.

CONCLUSIONS

Both community and hospital Acquired wound infections are more common in male than female. Elderly age groups of patients were more affected from hospital acquired wound infections than community acquired wound infections.

Staphylococcus aureus was the commonest organism isolated from the wounds of community acquired wound infections while MRSA and *Pseudomonas aerogenosa* were the most common microbes isolated from hospital acquired wound infections.

Disclosure

There is no conflict of interest and no funding is involved in this study.

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