ORIGINAL ARTICLE

Wound Infection in Orthopaedic Surgery: A Cross Sectional Study at Tertiary Care Teaching Hospital in Dhaka

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Abstract:

Infections after operative procedures caused by multiple organisms appears with pain, fever, poor wound healing, antibiotic prolongation, need in-patient longer stays and increased expenses. It increases both morbidity and mortality. A cross-sectional descriptive study was conductedat Orthopaedics ward in Holy Family Red Crescent Medical College, a tertiary care teaching hospitalin Dhaka, Bangladesh for 3-month period to identify the frequently causative bacteria of wound infections and days of appearances of such infections. Total135 samples from patients with mean age of 35.77±14.38 were analyzed. Patient history and clinical findings were collected in a data collection form during the study. Fifty-sixpus samples or wound swabs were collected from infected operated area and culture and biochemical tests for aerobic bacteria were done. Total of 21 from 36 samples were growth positive cultures (58.33%) and 15 were growth negative (41.66%). Most frequent organismcausing post-operative wound infection (POWI) was Pseudomonas aeruginosa,29.57% of positive isolatesandtheir post-operative days of appearences was mostly 6-10 days with82.7% frequencies. Surgical site infection is an unsettled ongoing problem which, although, cannot be completely rusticated.However, adequatepreventivestrategies against the most commonly isolated organism and proper care of wounds may reducethe occurrences of such infection.

Introduction:

Surgical site infection (SSI) previously termed postoperative wound infections are second most frequently reported infections of all hospital acquired infections and are amajor cause of morbidity and account for 70-80% mortality.[1,2] The incidence is even higher in certain high risk patients.[3] Based on a survey data there were over 290,000 infections in hospitalized patients in the US in the year 2002 of these, SSI wasestimated to be directly responsible for 8205 deaths in surgical patients that year.[4]

Post-operative wound infection may be in any anatomical distribution that was opened orhandled during anopen surgical procedure other than the incision itself. Orthopaedic surgicalsite infection needs a microbial inoculum at the surgical site in a susceptible host and factors determining such infection include: virulence and inoculum of infective agent, pre-operative removal of hair, especially with instruments capable of causing

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skin abrasion, inadequate skin preparation contaminated with bacteria, vascularity and condition of the tissue being invaded, immunocompromised hosts, patient age, length of surgery, hypothermia and co morbidities e.g. diabetes and obesity, presence of dead or foreign tissue and no prophylactic antibiotics before 4-hour of breach of tissues, the 'decisive period' or incorrect choice of antibiotics, even poor-quality implant materials.

Infections that develops within 30 daysor within 1 year of a prostheticimplant and supplemented by one of the following: diagnosis by a surgeon or attending physician; an abscessor the evidence of infection identified during reoperation or by radiologic or histopathology examination; asceptically obtained organ or space fluid or tissue, the culture of which resulted in bacterial isolates; or purulent drainage from a drain placed through a stab wound into the organ or space.[6]
Patients having a SSI, compared with those who do not, stays in the hospital twice as long days, are more likely to delay recovery, increases morbidity - have a 6 times higher rate of readmissions, two times more mortality and may produce the tremendous economic burden likely extra resources for investigations, management and nursing care.[7,8] The value of wound infections, in both economic and human terms, should not be misjudged.[9] On an average, patients with a SSI stay about 6-10 days more in the hospital than if the wounds heal without infections.[10] This additional stay almost doubles the hospital cost.[11] Different groups of microorganisms like bacteria, fungi and protozoa causes SSI.[12] However, different microorganisms can exist in polymicrobial colonies especially in the peripheries of wounds and in chronic wounds.13Both theaerobic as well as anaerobic are causative microorganism.14Multi and single centered studies revealed that the majority of organisms causing SSI are Gram positive cocci e.g. staphylococcus aureus and gram negative bacilli e.g. E. Coli, Klebsiella, Pseudomonas and enterobacter spp.[15,16]
This study was carried out to determine the bacterial etiology of wound infections and to know number of days of occurrence and means for the prevention of post-operative wound infection.

Materials and method:
This was a record based, cross sectional, descriptive study conducted for a 3-month period carried out in the Orthopedics wards of Holy Family Red Crescent Medical College Hospital. This included all postoperative in-patients who were undergone different Orthopedics surgeries and were on antimicrobial therapy at that period of collection of wound swabs from postoperative infected wounds. All samples were collected with sterile swab sticks. The samples were inoculated on Blood Agar, MacConkey Agar and Dextrose Agar plates. Smears were made from the swab sticks on clean glass slides for Gram stain. The bacterial isolates were identified using standard bacteriological procedures, including Gram stain, motility test, microscopic examination, and biochemical tests as catalase test, coagulase test, slide coagulation test, tube coagulation test, oxidase test (cytochrome oxidase), mannitol fermentation test, citrate utilization test, urease test.[17]

Observation and results:
During our study, we found open reduction and internal fixation (ORIF) cases with a highest rate about 34.07% among the 135 patients (Table 1). Among them,36 cases found to be infected with different bacterial growth wherein 21 cases were growth positive (58.33%) and 14 cases were growth negative (41.67%).

Among the 36 infected cases, , postoperative day of appearance of wound infection was mostly on 6-10 days and rate of appearance of wound infection was 26.67%.Pseudomonas aeruginosa were found in 17 specimens (29.57%). Then second most common organism was Klebsiella (11.08%) and third most common pathogen was Proteus (9.54%). The least common pathogen responsible for wound infection was Escherichia coli (6.56%) and Enterococcus (4.31%). No growths were found in 14 cases (23.79%).

Table 1: Distribution of Orthopaedic procedure

Procedure	Frequency	Percentage
ORIF	46	34.07%
Surgical toileting	35	25.92%
Close reduction	12	8.89%
K wire fixation	9	6.67%
Application of external fixator	7	5.18%
Above knee amputation	03	2.22%
Others	23	17.03%
Total	N=135	100.00

Table II: Post-operative days of appearences of wound infection (in percentage): (n=36)

Days	Frequency (%)
Within 05 days	3 (8.33)
Within 06 -10 days	26 (72.22)
Beyond 10 days	7 (19.44)

Figure-1: Pie diagram showing percentage distribution of postoperative wound infection.

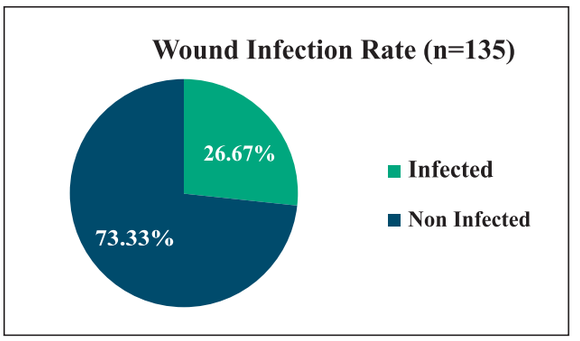


Figure-2: Pie diagram showing percentage distribution of growth of organism.

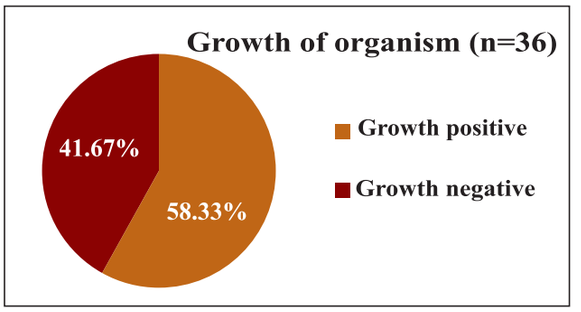
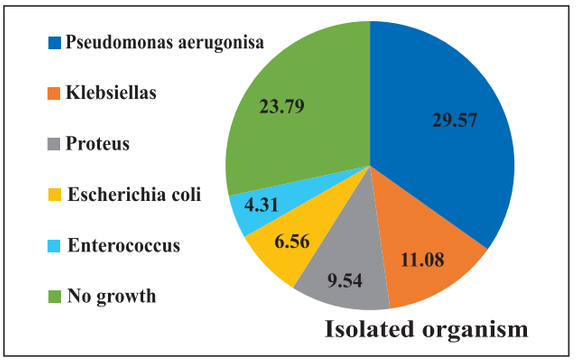


Figure-3: Pie diagram showing determination of organism in post-operative wound infection.



Discussion:

Among the 135 orthopaedics cases, open fractures of different bones were highest and the rate was 34.07%, lacerated wound which needed

surgical toiletingwas second highest (25.92%), and other cases were found to be less frequent (Table 1) which correlates with a study indicating the truth that wound communicating the exterior hastens highest chance of SSI.[18,19]

In present study, among the 135 cases 36 cases were infected, rate of infection was 26.67% (Fig 1). Studies done atdifferent parts of the developed world evaluated that SSI developed in 3-7.5%, even somewhere 1% with all operations in a health centre which was dissimilar to our study.20-22 However, the problem is especially great in developing countries where hospital costs are high. Post-operative wound infection rates have been reported to be 2—5 times higher in developing countries than in developed countries. The incidence of these infections has been estimated to be 2.6% and 2.9% by the Centre for Disease Control and Prevention (CDC), USA and the UK Nosocomial Infection Surveillance respectively.23 These dissimilarities point out the contamination level by nursing or other healthcare personnel as the most important risk factor for wound infection.This is because of their improper asceptic practices during dressing or handling of the patient in a health care setting of a developing country like us.

In this study, Growth positive cases 21 (58.33%) were more than growth negative cases 15 (41.67%) (Fig 2). Another study done at department of orthopedic surgery, Asian heart institute and research centre, India found predominant microorganism was Gramnegative bacteria Acinetobacter among 852 SSI cases that was not similar to our present study.[24]Procedural variables that may affect SSI like prehospital time and management after the fracture or the wound before admission,duration of surgical scrub, preoperative hair removal, skin antisepsis protocol during preoperative skin preparation, sterilization of instruments and environment, foreign matter in the surgical site, pre and post-operative blood glucose level, obesity was not established at any time during our study. But the time of development of such postoperative infections was determined. It was found that 72.22% patients got theirsign symptoms of infectionlike fever, abscess, serous or copious purulent discharge on or within 6th -10th post-operative days (Table 2). In an earlier study in India, over 50% of 862 patients developed SSI within 14 days of surgery, 12.5% of SSIs were diagnosed during follow-up after discharge and majority of the cases had superficial incisional SSI which corelated with our study.[24]

In this study, the most common organism causing postoperative wound infection was Pseudomonas aeruginosawith a high frequency of 29.57%. Then second most common organism was Klebsiella,11.08%and third most common pathogen was Proteus9.54%. The least common pathogen responsible for wound infection was Escherichia coli, 6.57% and Enterococcus, 4.31% (Figure 3). This predominance of Pseudomonas bacteria in SSI is consistent with reports from other studies conducted in logos, nigeria.[25] Although the individual immune status of subjects used for this study was not ascertained at any time during this study, the high rates of infected wounds may be due to a decline in immunological competence among study patients. Also, the fact that isolated bacteria had good resistance to antibiotics and common disinfectants used due to cross infections. The findings therefore infer that these organisms with their mode of invading and days of appearance of signs symptoms are important determinants of healing in surgical wounds.

Conclusion:

This study concluded that modulating wound infection would be a crucial issue, major concern for any hospital. The main culprit for the SSIis the minor looking organisms like Pseudomonas aeruginosa, Klebsiellae, Proteus spp., Escherichia coli, Enterococcus spp. etc.

. Although complete demolition of SSI is not possible however byensuring adherence to surgical care, ike taking the preventive measures and adopting prompt clean surgical procedures and proper care of wounds, the incidence may be limited to minimum.

Frequent assessment of existing hospital infection control programme and feedback to the health care personnel should be the key in limiting SSI and reduce the cost burden for a patient, thus also for the country.

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