Risk Factors of Infection following Orthopedic Surgeries at an Academic Hospital Sari - Iran: A Cross-Sectional Study

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Objective: Nasocomial infections are the group of infections that afflict the patient that are admitted in the hospital. The aim of this study was to evaluate the infection rate after the orthopedic surgeries.
Material and Methods: A cross-sectional study conducted in all of the hospitalized objects at orthopedic ward of Imam Khomeini hospital Sari-Iran during 2012.
Results: Among 1024 patients whom were examined 40 patients had postoperative complications (28 male and 12 female). There were no significant changes between the mean age of men versus women (p=0.64). In this regard there were no differences between the times of hospitalization between these groups (0.78). The mean time of postoperative infections in men was 88.7±72.1 and in women was 86.3±75 (p=0.43). Smoking was the most common risk factor went after by diabetes and hypertension.
Conclusion: The rate of postoperative infections in this center was the same as another part of the world.
Key words: *Infection; Orthopedics; Surgery*

1. Introduction

Nosocomial infections involve the group of patients in hospitals and health centers. Of course, it depends on whether the patient is not infected at the admission time or not. Healthcare related infections are a common cause of death in America (2). Nosocomial infection was not limited to specific individuals and could be established in all patients (3). Among these infections, surgical wound infection is the second most common cause of nosocomial infections in hospitalized patients with a frequency of between 2.8 and 20% concerned with the type of surgery and hospital characteristics (5). In addition, nosocomial infections increase duration of hospitalization from 7.4 to 14.3 days. There are several factors that predispose the surgical site to the infections. Some of them has an independent role during infections and other have dependents. Independent agents are underlying diseases, duration of surgery and wound infection. Non-independent factors include old age, malignancy, malnutrition, immunodeficiency, smoking and infection in other parts of the body (6). Wounds are classified to the clean, clean-contaminated, contaminated and dirty, base upon the severity of infection. The most important pathogens that plays a role in causing infection are microorganisms in the body, which are transferred through contact within the patients or the patients and health care workers (7). The urinary tract is the most common organ involved (8), which is about thirty six percent. The lower respiratory tract is the second site of infection. Wound infections and primary sepsis with 15.8 and 8.3 percent respectively, are the next most common infections (9). Several actions are applied to reduce

hospital infections, such as preventing the indiscriminate use of antibiotics,

hospital environment health, hand washing by medical staff and above all are the personal hygiene by the patients themselves (10). Despite all efforts, complete elimination of these infections is not possible. Based on the researches, the surgical infection rate in Iran is about 8.4 percent that is approximately equal to the estimated global incidence. Therefore, the costs imposed on the Iranian health system is not much different from the western countries (12). This implies that the infection risk factors be identified so that preventive strategies be adopted by future studies. In the present study the risk factors associated with infection due to the mentioned factors in orthopedic surgeries in Imam Khomeini Hospital Sari-Iran are evaluated.

2. Material and Methods

A cross-sectional study conducted to asses all patients admitted to the orthopedic ward of Imam Khomeini hospital Sari-Iran who were candidate for surgery during 2012. The aim of this study was to evaluate all surgical procedures to obtain information on risk factors which have been associated with the postoperative infection. Patients demographic features and other information related to the infection were collected through a questionnaire which validity and reliability have been reviewed and approved before the study. Those patients who did not return after surgery for visit, cancellation of the surgery, lack of postoperative infection criteria and the personal consent, and others had not undergone surgery, were excluded. Based on inclusion and exclusion criteria, a total of 1024 patients were enrolled in the study. Finally 40 patients were infected after surgery among them. Data were analyzed with descriptive statistics such as measures of variability and central tendency using the SPSS software version 18.0. The significance level was determined less than 0.05.

3. Results

In this descriptive study 1024 patients were examined. Among them, 40 patients who were infected after surgery were enrolled, including 28 males with mean age of 34.36 ± 15.21 and 12 female with mean age of 39.46 ± 14.02. Differences in mean age were statistically not significant (P = 0.64)**.** Mean duration of hospitalization in all patients were 19.45±13.48. This factor was about 19.46±12.72 in male as terms of day and 19.44±15.3 in female, which the difference was not statistically significant (P=0.78). The mean days of postoperative infection incidence in all patients were 87.2 ± 65.59 and 88.7 ± 72.11 for males and 86.33 ± 75 for females (P = 0.43) **(Table 1).**

Table 1. Demographic featurs, duration of hospitalization and time of complication onset

	Male (n=28)	Female (n=12)	Total (n=40)	P-Value
Age	34.36±15.21	39.46±14.02	36.1±14.7	0.64
duration of hospitalization (day)	19.46±12.72	19.44±15.3	19.45±13.48	0.78
Complications (days after surgery)	88.7±72.11	86.33±75	87.2±65.59	0.43

Among all documented risk factors, smoking was the most common one. Addiction (Opium) diabetes mellitus and hypertension were observed in three patients each respectively **(Figure 1).**

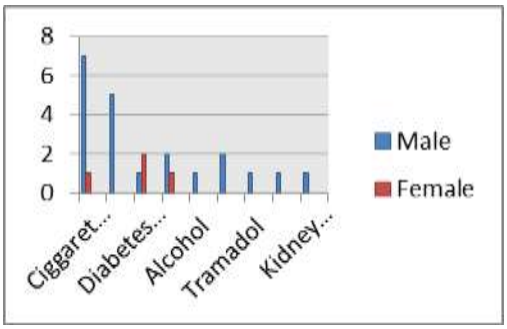

Figure 1. Risk factors of males and females underwent orthopedic surgeries

According to the site of fracture, the most common place of infections in patients was after both bone fracture of the right leg. Right tibial fractures in 5 cases, left femoral bone fractures (4 patients), left tibial bone fracture (4 cases), both bone fracture of the left leg (3cases) and finally amputation (3 cases) were respectively the other sites of infection **(Figure 2).**

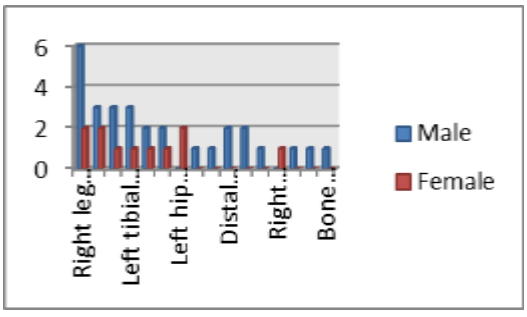

Figure 2. Wound infection site in study population

A variety of surgical procedures performed patients. Among them, external fixator placed for 10 patients (27.7 %), internal fixator fixed in 9 patients (25 %), pinning in 6 cases (16.6 %), plates and screws, reduction, debridement and amputation each one three cases (8.3 %) were performed. Prosthetic hip was performed in two cases (5.5 %)**.**

4. Discussions

According to the statistics of hospital infections in different parts of the world, the percentage is about 3.21% (13). J Schuulman and et al, in their study reported that the hospital infection rate in admitted adults was about 5 % (10). Among all etiology of nosocomial infections, the wound side infection accounted for about 38 % of all cases (13). An important reason to investigate the incidence of nosocomial infections can be: variety of organisms that cause infection, the indiscriminate use of broad-spectrum antibiotics and the importance of prevention, diagnosis and interventions to treat this disease. But the important thing is that hospital infections could increase two fold the mortality and morbidity (13). Such infections account for 88,000 causes of deaths each year in hospitals in the United States (14). Not only athe hospital infections can increase the mortality rate of infection after surgery, but also post-surgery infection specially in orthopedic surgeries have been a major problem in orthopedics, in a way that, this complication severely affected prognosis the surgical procedures (15).

In the current study, we showed that most patients with wound side infection was in the forth decade of age and predominantly were male, which was similar to what reported in literature (16), although some studies reported that, there is not any statistically significant relationship between the age and wound infection (17).

In the present study, the most common side of fracture was in the lower extremities with prevalence of 85 percent and specially 20 percent in tibia. Jenny J Y et al, in their study that was conducted in 1995 showed that the most common site of infection is after lower extremity fractures of the tibia (18). In addition, studies Yokiyama et al (19) and Murray et al (20) also found similar results to our study .

Hojat et al, reported that the fracture frequency and wound side infection was seen predominantly in male. This result was very close to the result of our study (21). Some factors may be associated with the increased incidence rate of infection among men. Shoaib Khan M , et al, in their study showed a significant association between cigarette smoking, diabetes and surgical wound infections (22). Altough the prevalence of diabetes in both genders were similar in the present study, the cigarret smoking was more among men that the women.

In addition to the direct effect of smoking on the respiratory and cardiovascular system of patients, it can increase the risk of ischemia in fractured and swollen extrimities and exacerbate the probability of developing infection. In particular, smoking increases among this patients during the course of treatment and recovery (23).

Moreover to the listed items that are preventable and the treatmentble, there are some factors that are related to the type of trauma. Just the same high expectations which is also mentioned in various studies and literatures, the post-operative infection rate in open fractures and the fractures occurred in the contaminated environment is high. Here in our studies, the results are indicative of most infection incidence (27.7%) in open fractures. All of them managed by external fixator.

The third factor which can affect on infection rate is the services performed befor and after the surgery by medical staff (25). This is not considered in our study that can be one of our limitations.

The hospital emergency department nurses and physicians, who are the front line of dealing with trauma patients should also pay more attention to improve the quality and frequency of open fracture wounds washing and accelerate the onset of prophylactic antibiotic before surgery.

It is appropriate to provide a standard procedure in hospitals deal with such cases to prepare more effective services (26).

The results of this study showed that the rate of wound infections following orthopedic surgerie in Imam Khomeini hospital-Sari is equal to or less than the other clinical centers in Iran. Also according to the confirmed role of smoking that can leads to the reduction in the wounds healing procedure rate and causing secondary infections followed by it, and given that this is a modifiable risk factor for infection, smoking cessation or reduction can reduces these infections in the patients.

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