

Prevalence and Risk Factors of Surgical Site Infection after Surgical Interventions in Orthopedic Department Suez Canal University Hospital

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Abstract

Introduction: Bacterial contamination during surgery causes surgical site infections (SSIs). If surgery is carried out as an emergency, infection risk is higher in all groups. Surgical site infection importance in medico-legal aspects is growing due to its significant morbidity, mortality, and high financial burden on the healthcare system. Surgical site infection ranges from a minor discharging wound with no accompanying issues to a serious condition that could be life-threatening. **Aim:** To assess the prevalence of infection occurring after different orthopedic procedures in Suez Canal University Hospitals, and to assess risk factors accompanied Surgical site infection. **Patients and methods:** Eighty emergency orthopaedic surgery patients from Suez Canal University Hospitals were randomly chosen for an observational prospective cross-sectional study. Surgical Site Infections were discovered by bedside surveillance during hospitalization and follow-up after discharge and categorized according to American Centre for Disease Control (CDC) guidelines as a measure of the quality of healthcare. **Results:** Incidence of surgical site infection in diabetic group was 55% with 11 patients out of 20. Whereas 45% in diabetic group were free of SSI with 9 patients out of 20. Also, in non-diabetic group SSI occurred in 4 patients out of 60, whereas; 56 out of 60 patients had SSI-free rates of 93.4%. A statistically significant difference was found in incidence of SSI between both groups. Staph. & Strept. Strains were the commonly isolated micro-organism, constituting 10 out of 15 positive organisms with 66.6 % in SCUH. Four cases out of 10 had MRSA as they were cefoxitin resistant. **Conclusion:** Diabetes mellitus, long operating times, obesity, smoking, and pre-existing medical conditions, all raise risk of wound infection.

Key words: Surgical site infection, Wound, Antibiotics, Micro-organisms.

Introduction

Hospital acquired infections (HAI) are significant issues that affect a great number of surgical patients. In acute care institutions, surgical site infections (SSI) are frequent complications. 2 to 5 percent of individuals undergoing inpatient surgery develop SSIs⁽¹⁾.

In the US, there are between 160,000–300,000 SSIs per year. SSI is currently the

most prevalent and expensive HAI. By following evidence-based recommendations, it has been projected that up to 60% of SSIs can be avoided⁽²⁾. In hospitalized people, 20% of HAIs are caused by SSIs⁽³⁾.

The associated expenses of SSI differ according to the type of surgical procedure and the type of pathogen that causes infection. Using the Consumer Price Index, it is estimated that SSIs are responsible for

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\$3.5 billion to \$10 billion in annual healthcare costs (4).

Patients with SSI had a 2-11times increased death risk compared patients without an SSI after surgical intervention. Each SSI leads to an extra 7-11 postoperative hospital days. SSI is directly responsible for 77% of mortality in patients with the condition. Total hip joint arthroplasty and knee joint replacement, open reduction and internal fixation of the fractures, external fixation of fractures by means of an external fixator, spinal laminectomy with discectomy are among the frequently done orthopaedic operations. Because an entry portal is created through a surgical incision or a traumatic wound, any of these routes has a possibility of spreading infection (5).

Infections are frequently caused by direct or indirect contamination of the surgical site (6). *Staphylococcus aureus* (*S.aureus*) is the commonly isolated cause responsible for orthopaedic infections (7). These microorganisms often live on human skin, where they are disseminated most frequently by direct touch and airborne routes. But 25% of people have *S. aureus* thriving in their nares (2).

S. aureus is frequently cultured bacteria in osteomyelitis, *S. epidermidis*, is a typical inhabitant of skin, mouth, and nose in human beings and frequently contaminates orthopaedic prostheses because of its strong attraction for plastic (8).

Methicillin-resistant *Staphylococcus aureus* (MRSA) is immune to drugs that contain methicillin, including penicillin, oxacillin, and amoxicillin. MRSA is the most frequent factor in cases of osteomyelitis (8). A surgical wound with a scalpel, a traumatic wound, or a pin site in case of fixation of a fractured bone using an

external fixator, are examples of entry points. When presented to mucosal membranes and surrounding tissues via a surgical wound incision, *Staphylococcus* can spread very quickly. Before entering the operation room, a traumatic open wound typically serves as a portal of entrance and is exposed to debris and pollutants. Because pin sites are left in situ for six to eight weeks following surgery, they provide a continuous point of entry. If surgical implants are contaminated before or during a joint replacement treatment, they can turn into a fomite and contaminate the surgical portal of entry (7). To limit the ability of microorganisms to colonize and multiply, environmental restrictions are put in place. These include the operating room's temperature, humidity, and air flow, as well as minimizing traffic within space (8).

The operating room's temperature should be kept between 18 and 23 degrees Celsius, and its humidity level should be kept between 30 and 60 percent. As most microorganisms do not thrive in cooler and low temperatures and lower humidity, this is under control. Many healthcare institutions employ laminar air movement, to slow down the pace of air exchange from the operating room to the semi-restricted area of outside. Additionally, traffic in operating room must be minimized while an operation is underway to avoid pollutants from being airborne (9). In operating room, disinfectants must be fungicidal, antiviral, antimicrobial, and tuberculocidal. Every morning and after each procedure, an antibacterial solution is used to clean surfaces in operating room, including operating table, back and prep tables, Mayo stands, chairs and floors. To reduce nighttime microbial colonization, terminal cleaning should also be done on all

surfaces, including the walls, lights, floors, and work surfaces. These procedures help to keep the operating room clean for the patient and lessen cross contamination among patients and staff ⁽¹⁰⁾.

Medical examination, lab. testing, pathological examination of tissue sample, microbiological examination of discharges, and imaging studies, can all be used to diagnose deep implant infection ⁽¹¹⁾.

A new imaging procedure for diagnosis of deep infection related to implants is positron emission tomography, or PET-CT. Infections that have not been diagnosed can also be biopsied, but this seldom happens ⁽¹²⁾.

The degree of participation affects how these infections are managed. Localized infections may merely call for antibiotic therapy with the proper drugs, along with irrigation and drainage of the wound. Infected lesions that need systemic treatment must be cultured in order to perform an antibiotic susceptibility test, and first empirical antibiotic should deliberate local incidence of MRSA due to the rising concern around this infection ⁽²⁾. Like how antibiotics and wound drainage are used to treat surface infections, bone and joint infections are treated in a similar manner. Typically, a four-week course of antibiotics is prescribed ⁽⁶⁾.

With the foreign prosthesis still in situ, infections related to inserted prosthesis, such as those in total knee joint arthroplasty and total hip joint arthroplasty, are challenging in treatment. Typically, removal of the prosthesis is advised along with additional antibiotic medication ⁽⁷⁾.

To identify the precise organism and the best treatments, specimens will be obtained from infected wounds.

Aim of the work:

To assess the prevalence of infection occurring after different orthopedic procedures in Suez Canal University Hospitals, and to assess risk factors accompanying Surgical Site Infection.

Patients and Methods:

The Suez Canal University Hospitals served as the site of our observational, cross-sectional study. It included 80 individuals of various ages who lacked any signs of infection, such as fever or an elevated total leucocytic count, as well as any localization of infection based on history, clinical examination or investigations of patients. Individuals with traumatic or infectious emergencies, immunocompromised those (such as those using corticosteroids or another immunosuppressant), or patients showing signs of infection or serious system disease (such as liver cell failure or renal failure) were not included.

Each participant in the study underwent the following:

- Taking a thorough history that includes the patient's personal information, complaints, past medical history, family history, and socioeconomic history.
- Systematic and general examination: Both the preoperative and postoperative examinations (each week) include general examinations with early and late wound assessments.
- Only very necessary laboratory work up were completed urgently to achieve the greatest plan of management. Patients who met inclusion criteria and needed urgent orthopaedic surgery were invited to take part in the trial (before surgery and

repeated if signs of inflammation appeared). Complete blood picture, C-reactive protein before and after surgery, and Liver and Kidney function tests as creatinine, bilirubin, albumin, and Prothrombin time.

- Afterwards swab the surgical site, in case of infection (redness, hotness, swelling, discharge).
- The researcher himself completed the data forms to cover every aspect that needed to be researched.
- The swabs that were collected and delivered immediately to the Lab for culture and sensitivity.
- All patients were closely monitored daily during the postoperative period up until the tenth post-operative day. All through this period, any symptoms or signs of contamination appeared, a proper investigation was initiated to find out the type and difficulty of infection. If there was a pus collection, it must be drained and sent for microbiological testing including culture and sensitivity tests. Each patient received the appropriate antibiotic throughout the preoperative (prophylactic antibiotic in all cases) and postoperative periods.
- After receiving results of microbiological testing, antibiotic was changed as needed.
- Testing for antibiotic vulnerability: Using the Kirby-Bauer method, the following was done for Carbapenem-resistant *Pseudomonas aeruginosa* (CRPA) isolates: The inoculum size was adjusted by comparing the bacterial suspension turbidity to 0.5 McFarland standard to obtain proper density. Three to five isolated colonies from fresh culture on blood agar were transported to a tube including 3 ml saline. Surface of a Muller-Hinton agar (MHA) plate incubated via the bacterial suspension using a swab to streak

the suspension in three different directions, and antibiotic discs were applied on top.

Penicillin (10 mg), Piperacillin-Tazobactam (100/10 mg), Cefepime (30 mg), Aztreonam (30 mg), Gentamycin (10 mg), Amikacin (30 mg), Ceftazidime (30 mg), Ciprofloxacin (5 mg), and Levofloxacin were utilized as antimicrobials

For enterobacteriaceae such as *Klebsiella* spp. and *E. coli* spp., the following medications are recommended: Piperacillin/Tazobactam (100/10 Mg), Cefazolin (30 Mg), Cefepime (30 Mg), Cefoxitin (30 Mg), Aztreonam (30 Mg), Merpinem (10 Mg), Amikacin (30 Mg), Levofloxacin (30mg). Penicillin (10 Mg), Cefoxitin (30 Mg), Clindamycin (2 Mg), Erythromycin (15 Mg), Levofloxacin (5 Mg), Gentamycin (10 Mg), Tetracycline (30 Mg), And Linezolid are the recommended dosages for *S.aureus* (30mg). Vancomycin has a different approach; thus, we didn't use it. With a zone of inhibition of less than 21 mm on the antibiogram, we concluded that cases of MRSA were present.

Package care vulnerability: Preoperative measures include the following: an appropriate antibiotic, a consultation for elevated Glycated haemoglobin, a chlorhexidine showers night before surgery and morning day of surgery, and oral antibiotics.

Handwashing, thorough sterilisation, giving antibiotics before anaesthesia, using the right hair removal technique, the length of the procedure, and maintaining normothermia are all intra-operative considerations. Redosing of intraoperative antibiotics and layering of closure.

After surgery: Stop taking antibiotics after 24 hours and take a shower on day two.

Statistical Analysis:

Utilizing MedCalc version 18.2.1, data entrance, processing, and statistical analysis were performed (MedCalc, Ostend, Belgium). The Kruskal-Wallis, Wilcoxon, Chi-Square, logistic regression analysis, and Spearman's correlation tests of significance were applied. According to kind of data (parametric and non-parametric) collected for each variable, data were presented, and an appropriate analysis was carried out. p-values under 0.05 (5%) were regarded as statistically significant.

Results:

This prospective cross-sectional study was performed to detect incidence, risk factors and causative organisms responsible for SSI following emergency orthopedic operations that was helpful in reducing rate of infections of surgical site. This study was performed from August 2019 to June 2020 in which 80 patients with emergency orthopedic operations were randomly selected from Suez Canal University

Hospitals. These patients will be divided into two groups, diabetic and non diabetic groups. An indicator of healthcare quality, SSI were classified according to American CDC criteria and identified by surveillance during hospitalization and follow-up after discharge from hospital. Table 1 shows that mean age of Diabetic patients was 40.7+10.7 years in comparison to non-Diabetic which was 41.3+10.7 years and there was no statistically significant difference in age between two groups. There was no statistically significant difference in gender between both groups. Special habit observed was smoking. There was statistically significant difference in special habits between the two groups. In diabetic group, out of 20 patients, 13 patients had co-morbidities including (Asthma, Deep venous thrombosis, Hypertension, Rheumatic heart disease, Hepatitis C virus). In non-diabetic group which comprised 60 patients; 32 of them had co-morbidities compared to the diabetic group.

Table (1): Comparison between diabetic and non-diabetic regarding age in Suez Canal University Hospitals							
		Diabetic (20)		Non-diabetic (60)		t- test	p-value
Age(yr)							
▪ Mean $\pm$ SD		41.3 $\pm$ 10.8		43 $\pm$ 19.7			.816
		Diabetic (20)		Non-diabetic (60)		X ²	P value
		Number of patients	%	Number of patients	%		
Sex	Female	12	60%	33	55%	.190	.663
	Male	8	40%	27	45%		
Special habits	Smoking	7	35%	15	25%	.824	.541
	Hashish	4	20%	6	10%		
	free	9	45%	39	65%		
Co-morbidities	Asthma	1	5%	4	6.6%	.931	.691
	OBESITY BMI (35)	6	30%	12	20%		
	HTN-RHD	5	25%	9	15%		
	HCV	1	5%	7	11.7%		
Free		7	35%	28	47.6%		

Table 2 shows that presentation of the patients was classified into diabetic group and non-diabetic group. Different procedures were included in this study,

Trochanteric fractures, fracture femur & fracture both bone leg (Fracture tibia and fibula) were the most encountered procedure in both groups.

Table (2): Surgical characters of enrolled patients.							
		Diabetic (20)		Non-diabetic (60)		X ²	P value
		Number of patients	%	Number of patients	%		
Procedure or diagnosis	Fracture neck femur	0	0	3	5	31.568	0.001*
	Fracture Trochantric	7	35	6	10		
	Fracture femur	3	15	7	11.6		
	Fracture Supra-condylar humerus	2	10	6	10		
	Fracture Humerus	0	0	5	8.3		
	Fracture Both Bone leg	1	5	10	16.6		
	Fracture Bi-malleolar	2	10	10	16.6		
	Fracture Both bone forearm	1	5	7	11.6		
	Fracture tibial plateau	0	0	3	5		
	Fracture supra-condylar femur	3	15	1	1.6		
	Fracture metacarpal bones	0	0	2	3.3		
	O.A knee	1	5	0	0		

Table 3 shows that 80 patients included in current study with implementing all surgical bundle care procedures. The incidence of SSI in diabetic group was 55% with 11 patients out of 20. Whereas 45% in diabetic groups were free of SSI with 9

patients out of 20. Also, in non-diabetic group SSI occurred in 4 patients out of 60, whereas; 56 out of 60 patients had SSI-free rates of 93.4%. A statistically significant difference in incidence of SSI between both groups

Table (3): Incidence of SSI.							
		Diabetic (20)		Non diabetic (60)		X ²	P value
		Number of patients	%	Number of patients	%		
Inflammation	Mild	3	15	2	3.3	3.836	.280
	Moderate	4	20	1	1.6		
	Severe (specific type, necrotizing fasciitis)	4	20	1	1.6		
	No	9	45	56	93.3		

Table 4 shows that there is no statistically significant difference in laboratory

investigations preoperatively between two groups except in FBS it was higher in Diabetics.

Table 5 shows that there is high statistically significant difference in laboratory finding post operatively between diabetic and non

diabetic groups regarding TLC and FBG. Except for HB, CRP which is non-significant Table 6 demonstrates that *S.aureus* was the predominant bacterium detected in 10 out of 15 swabs (66.6%). Four cases out of 10 had MRSA as they were cefoxitin resistant

Table (4): Laboratory finding before operation.

		Mini	Max	Mean	SD
Pre-Operative LAB	S.Creatinine (mg/dl)	0.03	1.4	0.91	0.24
	C Reactive Protien (mg/L)	1.8	7.3	3.55	1.22
	Fasting Blood Sugar (mg/dl)	83	198	118.85	30.07
	Total Leukocytic Count ($\times 10^3/\mu\text{L}$)	3.5	12.7	6.38	1.55
	Haemoglobine (g/dl)	10.3	13.3	11.76	13.54

Table (5): Laboratory finding post operation.

		Mini	Max	Mean	SD
Post-Operative LAB	S.Creatinine (mg/dl)	0.5	12	1.28	1.25
	C Reactive Protien (mg/L)	2	91	5.98	10.38
	Fasting Blood Sugar (mg/dl)	96	231	130.15	25.46
	Total Leukocytic Count ($\times 10^3/\mu\text{L}$)	4	8400	193.63	1172.12
	Haemoglobine (g/dl)	8.9	13.5	11.41	1.19

Table (6): Causative organism in culture.

		Diabetic (20)		Non diabetic (60)		X ²	P value
		Number of patients	%	Number of patients	%		
Causative organism	No	9	45	56	93.3	3.001	.223
	<i>Staph, aureus</i>	7	35	3	5		
	<i>Klebsiellae pneumoniae</i>	1	5	0	0		
	<i>E-coli</i>	3	15	1	1.6		

Table 7 shows that regarding the treatment; the most common was surgical debridement and antibiotic also dressing and antibiotic therapy in diabetic group.

However, in non-diabetic group, the most common treatment was debridement and antibiotic with statistically significant difference in treatment type.

Table (7): Methods of treatment in both groups.							
		Diabetic (20)		Non diabetic (60)		X ²	P value
		Number of patients	%	Number of patients	%		
Treatment	No	9	45	56	93.3	8.713	.012*
	Debridement and antibiotic	6	30	3	5		
	Dressing and antibiotic	5	25	1	1.6		

Discussion:

One of the most prevalent issues related to surgical procedures worldwide, particularly in underdeveloped nations, is SSI ⁽¹³⁾. SSIs are a type of healthcare-acquired infection (HAI) that happens 30 days following surgical procedure or within a year if mechanical or prosthetic inserts are made ⁽¹⁴⁾. SSI is linked to mortality, prolonged hospital stays, and a significant financial impact ⁽¹⁵⁾. SSI has a 10 to 20 percent global incidence rate ⁽¹⁶⁾, and it is the most common kind of HAI in low income and middle-income countries ⁽¹⁴⁾. In Eastern Mediterranean regions, prevalence of surgical site infection was estimated to be 7.9 percent in 2019 ⁽¹⁷⁾.

Because of nature of orthopaedic surgeries and the unique patients who experience this procedure with a variety of conditions and disorders, the risk of SSI is higher in orthopaedic surgeries in comparison to other surgical procedures ⁽¹⁸⁾. Treatment of bone damage has changed significantly due to progress in orthopaedic operative procedures, and many bone illnesses that were formerly managed conservatively are now increasingly being treated surgically.

The incidence of SSI is increased by bigger orthopaedic surgical indications, sophisticated orthopaedic procedure, and implants usage ⁽¹⁹⁾. when infection occurred, patients could endure a longer hospital stay, more discomfort, a heavier demand for medical resources, as well as several negative effects ⁽²⁰⁾.

Important to report risk factors for orthopaedic surgical site infection in health care facilities because patients experiencing orthopaedic surgical procedure are also at risk for developing some complications that raise risk for SSI, like infection of surgical site from normal flora of skin and infection from airborne bacteria originating from staff in operating room and environment of operating room. Orthopedic SSI lengthens hospital stays for patients, doubles rate of readmissions, and triples whole health care expenses ⁽²¹⁾.

Current study was performed to evaluate prevalence of surgical site infection occurring after various orthopaedic procedures in Suez Canal University Hospital and to detect risk factors accompanying with these SSIs due to the high rate of SSI in our hospital, according to

prior studies, according to Ahmed et al. ⁽²²⁾ in the surgery department in Suez Canal Hospitals where the incidence of SSI was 10%. The present study comprised 80 patients undergoing various emergency orthopaedic procedures, excluding individuals with immune-compromised state and those with open fractures.

In current study, it was discovered that the diabetic and non-diabetic patient groups had no statistically significant variations in relation to age, sex. Special habit observed was smoking. There was statistically significant difference in special habits between the two groups. Patients' co-morbidities include Asthma, Deep Venous Thrombosis, Hypertension, Rheumatic Heart disease, Hepatitis C virus, In diabetic group, out of 20 patients, 13 patients had co-morbidities. In non-diabetic group which comprised 60 patients; 32 of them had co-morbidities compared to the diabetic group.

Regarding the association between advancing age and risk of SSI, various research teams have produced conflicting findings. For instance, multiple researchers concluded that growing older was linked to high risk of developing SSI and all other postoperative infections. Elderly people have enlarged prevalence of comorbid diseases, increased severity when affected by acute illness, and a weaker immune response to bacterial infection. Regarding the connection between gender and risk of surgical site infections (SSIs) after orthopaedic procedures, male gender appeared to be a separate risk factor ^(23,24). After total knee joint arthroplasty, risk of deep SSI is increased in men than in women ^(25, 26). Males have an increased risk of SSI because of existence of various risk factors such as HIV and cigarette smoking, which

makes them more susceptible to developing SSI ⁽²⁷⁾.

Regarding smoking's impact, it was found that smoking was a major predictor of SSI after hip and knee replacement surgeries ⁽²⁸⁾ as well as after spinal decompression and fusion procedures ⁽²⁹⁾. This can be related to the effect of tobacco use on tissue oxygenation because it has been discovered that tobacco use reduces tissue oxygenation and causes hypoxia by constriction of the blood vessels, which hinders wound healing ⁽²⁷⁾. Contradictory findings were found in a randomized controlled trial, which demonstrated that smoking had no effect on the development of osteomyelitis after tibial fractures yet had no effect on superficial SSI following orthopaedic surgery for fractures ⁽³⁰⁾.

Preoperative smoking cessation lowers incidence of complications related to wounds, but length of cessation necessary to achieve this reduction is uncertain. Most of the research used 4 weeks minimally of preoperative cessation. Postoperative self-restraint could lower danger of problems. Given the short half-lives of substances like nicotine (about an hour) and carbon monoxide (about four hours), as well as the fact that abstinence increases oxygenation of tissue rapidly, it makes sense that brief preoperative abstinence might be advantageous ⁽³¹⁾.

In terms of the surgical diagnosis or procedure, this study found a statistically significant difference ($p= 0.001$) between the diabetic and non-diabetic patient groups. Trochanteric fractures, femur fractures, and leg bone fractures were the most frequent injuries in both groups.

An earlier investigation on orthopaedic surgery from 1978 found a connection between the occurrence of SSI and the location of the fracture. Following

numerous fractures, humerus, femur, and hip fractures, as well as tendon and peripheral nerve repair, cases with pelvic fractures showed the highest association development of SSI ⁽³²⁾.

The current study found that SSIs occurring in 55 percent of diabetic patients and 6.67 percent of non-diabetic patients. There was no statistically significant difference in the incidence of the various grades of SSIs between diabetic group and non-diabetic group.

In low- and middle-income countries, the most common HAI reported was surgical site infection, and the risk was increased in developed nations ⁽³³⁾. SSI rates were greater in oncology, orthopaedic, general surgery, and paediatric surgery operations in incidence studies ⁽³⁴⁾.

High HAI rates were seen through surveillance at tertiary care institutions in Egypt ⁽³⁵⁻³⁷⁾. In order to characterize the scope and volume of HAIs in nation and to enable inter-hospital comparisons of rates of HAI, it was critical to create a uniform national HAI monitoring program during the past ten years as infection prevention and control operations advanced in Egypt ⁽³⁸⁾.

After adjusting for BMI, a substantial correlation concerning diabetes and SSI was discovered that persisted through different surgical procedures. While studies that accounted for hyperglycemia found a link between pre- and post-operative hyperglycemia and surgical site infection, diabetes mellitus continued an important risk factor in meta-analyses of those trials. Furthermore, in spite of establishment of a patient care path aimed at blood sugar control after surgery and decreasing overall rates of infections, diabetes mellitus is still a major risk factor for development of SSI. According to

reports, the frequency of SSIs following orthopaedic procedures varies significantly depending on the patients being treated, the study's design, surgical procedure, the definition of hospital acquired infection and surgical site infection and the length of the follow-up period ⁽⁴⁰⁾.

It should be highlighted that the focus of our investigation was on urgent procedures, which are known to have a greater incidence of SSIs than elective procedures. The majority of patients who need emergency surgery due to trauma typically have soft-tissue damage before any surgical procedure, which is an important risk factor to develop SSI, according to research ⁽⁴¹⁾.

At the teaching hospital in Iran, a prospective cohort study of 36 months duration was carried out and patient follow-up lasting between one- and twelve-months following surgery. The incidence of SSIs was 3.84 percent in this study, which included 1900 patients who had orthopaedic surgery, which is less than the stated worldwide incidence of 2.6 to 41.9 percent ⁽¹⁵⁾.

An surgical site infection is defined as occurrence of inflammation or discharging pus within 30 days of a surgical procedure wound that had nearly closed ⁽⁴²⁾.

Regarding the kind of discharge, the current study found that SSI appeared in all cases with discharge from the wound, with purulent discharge being the most frequent to emerge in patients of diabetic group and patients of non-diabetic group. As for the discharge type, there was no statistically significant difference between both groups.

The current research found that there was no statistically significant difference between both groups in pre- and post-operative laboratory results, except for

pre-operative FBS and post-operative TLC and FBS, which were greater in the diabetic group.

Whether the patient has diabetes or not, there is a link between hyperglycemia and exposure to surgical intervention, which then hinders healing process of the wound and raises risk of SSI ⁽⁴³⁾.

Increased incidences of infection have been linked to elevated blood glucose in orthopaedic spine surgery ⁽⁴⁴⁾. Furthermore, diabetes could have a larger part in the risk of SSIs than only its ability to lead to hyperglycemia during or after surgery. Diabetes may be a sign of other disorders, such as vascular abnormalities and white blood cell malfunction, which raise risk of infection in a patient. Prevalence of perioperative hyperglycemia and the associated immune suppression are further influenced by different complicated factors, such as physiological stress and exogenous glucose injection, beside patient's history of diabetes ⁽⁴⁵⁾.

According to the current study's findings, Staph and E-coli were most cultured and isolated microorganisms and there was no statistically significant difference between both groups' causal organisms.

Numerous prior investigations found that most common causal organisms of surgical site infection after orthopedic surgical procedure were Staphylococcus aureus and gram-negative bacteria ^(15, 32, 46, 47).

Furthermore, in this study due to their cefoxitin resistance, 4 out of 10 cases had (MRSA).

Debridement and antibiotics were used more frequently as treatment methods in both groups. There was no statistically significant difference in treatment methods between both groups.

Depending on level of involvement, SSI following orthopaedic procedures must be

managed. Localized infections may merely call for antibiotic therapy with the proper drugs, along with irrigation and drainage of the wound. Infected wounds that need systemic treatment must be cultured in order to undertake antibiotic susceptibility testing, and the starting empiric antibiotic should take into account local incidence of MRSA due to the rising concern around this type of infection. Like how superficial infections are treated, infections of bone and joint are treated using antibiotics and wound drainage. Typically, a four-week course of antibiotics is prescribed. With the foreign prosthesis still in situ, infections associated with joint arthroplasty, are challenging to treat. The prosthesis should typically be removed after 4-6 weeks of antibiotic therapy ⁽⁴⁸⁾.

Rate of hospital-acquired infections in hospitals, where millions of infections developed while being treated for other illnesses in 2018, is a key sign of the standard of care delivered ⁽⁴⁹⁾.

Conclusion:

In conclusion, 80 patients included in current study and they were divided into two groups, diabetic group and non diabetic group and it was found that no statistically significant difference in age and gender between both groups. Special habit observed was smoking. There was statistically significant difference in special habits between diabetic group and non diabetic group. Patients' co-morbidities including (Asthma, Deep Venous Thrombosis, Hypertension, Rheumatic Heart disease, Hepatitis C virus), In diabetic group, out of 20 patients, 13 patients had co-morbidities. In non-diabetic group which comprised 60 patients; 32 of them had co-morbidities compared to the diabetic group. Different types of

procedures were included in the study, Trochanteric fractures, fracture femur & fracture both bone leg (Fracture tibia and fibula) were the most encountered procedure in both groups. The incidence of SSI in diabetic group was 55% with 11 patients out of 20. Whereas 45% in diabetic groups were free of SSI with 9 patients out of 20. Also, in non-diabetic group SSI occurred in 4 patients out of 60, whereas; 56 out of 60 patients had SSI-free rates of 93.4%. A statistically significant difference in incidence of SSI between both groups. There is no statistically significant difference in laboratory investigations preoperatively between diabetic and non diabetic groups except in FBS it was higher in Diabetics. But, there is high statistically significant difference in laboratory investigations post-operatively between both groups regarding total leukocytic count and fasting blood glucose. Causative organism; *S.aureus* was most predominant organism detected in 10 out of 15 swabs (66.6%). Four cases out of 10 had MRSA as they were cefoxitin resistant.

Regarding the treatment, the most common was surgical debridement and antibiotic also dressing and antibiotic therapy in diabetic group. However, in non-diabetic group, most common treatment was debridement and antibiotics with statistically significant difference in treatment type.

Surgical site infection is considered as a gauge of the quality of patient care. It is impossible to eradicate surgical site infections, bringing the infection rate down could have positive impacts by decreasing postoperative morbidity and mortality in addition to waste of resources. The D.M., long operating times, obesity, smoking, and pre-existing medical

conditions all increased risk of infection of surgical wound.

By regulating plus lowering glucose levels, it is possible to prevent diabetes mellitus from developing because of these risk factors, and to shorten operational times. The risk factors that could not be prevented were medical conditions, poor cleanliness, and harmful special habits.

Conflict of interest statement:

No conflict of interest.

Ethical approval:

All patients received an explanation of the study, the investigative and surgical procedures, their benefits and drawbacks, the anticipated outcomes, and any potential consequences. If the person responded positively, the case had been chosen for this study. There were no additional investigations or serious risks associated with the trial. The patients' financial burden was not increased by it. The scientific committee and the orthopaedic department council both gave their approval to the study.

Authors, contribution:

All authors equally contributed.

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