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Research Article

**A PROSPECTIVE INVESTIGATION OF HOW INFECTION
PRECLUDING MEASURES ARE EXICUTED
INORTHOPEDICS AND TRAUMATOLOGY****Aamina Farheen, Dr. L. Harikiran**Department Of Pharmacy Practise ,Princeton College Of Pharmacy, Pocharam, Hyderabad,
Telangana 500088.**Abstract:**

Orthopedic trauma is a serious injury to the musculoskeletal system, which includes bones, joints, ligaments, muscles, cartilage, and tendons. It's caused by an external force, such as a fall, accident, or violent attack. Common orthopedic trauma injuries include: fractures, ligament tears, tendon tears, and joint dislocations. Orthopedic trauma can affect anyone, but it's especially common in athletes, car accident victims, and people with brittle or weak bones. The aim of study is to assess the infection associated with orthopedic trauma and significant reduction in surgical site infection. To estimate the rate of infection in orthopedic implant surgery in a public hospital and also to identify causative organisms and risk factors associated with surgical site infections. The patients particular were recorded on a prescribed proforma which included name, age, sex, diagnosis, comorbidity, smoking history, nutritional status, type of implant, skin at risk as variables. All patients were given first generation cephalosporins as a standard practice prophylactic intravenous antibiotics on call to the operating room. Based on the criteria, patients were included in the study after taking informed written consent during postoperative period. Patients were observed for postoperative wound infection till discharge. The follow up will be done up to three months according to a protocol, first visit after two weeks and subsequent visits on monthly basis. Surgical site infections are a considerable problem in orthopedic patients. Our infection rate was quite high and needs proper measures to control it because it had great financial burden on patient and on hospital resources and could lead to increased morbidity and mortality in patients. Pain is a subjective sensation and is difficult to assess.

Keywords: Orthopedic trauma, Comorbidity, Surgical Site Infection, Orthopaedic surgery, Risk factors**Corresponding author:****Aamina Farheen,**Department of of Pharmacy Practice, Princeton college of Pharmacy,
Pocharam, Hyderabad

Mobile:

Email Id: princeton.pharmacy@gmail.com

QR CODE



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INTRODUCTION:

Orthopedic trauma is a serious injury to the musculoskeletal system, which includes bones, joints, ligaments, muscles, cartilage, and tendons. It's caused by an external force, such as a fall, accident, or violent attack.

Common orthopedic trauma injuries include: fractures, ligament tears, tendon tears, and joint dislocations.

Orthopedic trauma can affect anyone, but it's especially common in athletes, car accident victims, and people with brittle or weak bones.

To reduce your risk of orthopedic trauma, you can:

- Wear a seatbelt when driving
- Wear a helmet when biking, skateboarding, or rollerblading
- Wear the appropriate safety gear when playing contact sports
- Stretch and warm up before working out or playing sports
- Wear comfortable, low-heeled shoes with good traction

Surgical Infections is a peer-reviewed medical journal published by Mary Ann Liebert, Inc. It is the official journal of the Surgical Infection Society,^[1] the Surgical Infection Society Europe,^[2] the Surgical Infection Society Latin America, and the Chinese Society of Surgical Infection and Intensive Care.^[3] Surgical Infections "provides information on the biology, prevention, and management of post-operative infections."^[4]

Psychological trauma (also known as mental trauma, psychiatric trauma, emotional damage, or psychotrauma) is an emotional response caused by severe distressing events, such as bodily injury, sexual violence, or other threats to the life of the subject or their loved ones; indirect exposure, such as from watching television news, may be extremely distressing and can produce an involuntary and possibly overwhelming physiological stress response, but does not produce trauma per se. Examples of distressing events include violence, rape, or a terrorist attack.^[5]

Short-term reactions such as psychological shock and psychological denial are typically followed. Long-term reactions and effects include flashbacks, panic attacks, insomnia, nightmare disorder, difficulties with interpersonal relationships, and post-traumatic stress disorder (PTSD).

Physical symptoms including migraines, hyperventilation, hyperhidrosis, and nausea are often associated with or made worse by trauma.^[6]

People react to similar events differently. Most people who experience a potentially traumatic

event do not become psychologically traumatized, though they may be distressed and experience suffering. Some will develop PTSD after exposure to a traumatic event, or series of events.^{[7][8]} This discrepancy in risk rate can be attributed to protective factors some individuals have, that enable them to cope with difficult events, including temperamental and environmental factors, such as resilience and willingness to seek help.

SIGNS AND SYMPTOMS

People who experience trauma often have problems and difficulties afterwards. The severity of these symptoms depends on the person, the types of trauma involved, and the support and treatment they receive from others. The range of reactions to trauma can be wide and varied, and differ in severity from person to person.^[8]

After a traumatic experience, a person may re-experience the trauma mentally and physically. For example, the sound of a motorcycle engine may cause intrusive thoughts or a sense of re-experiencing a traumatic experience that involved a similar sound e.g. gunfire. Sometimes a benign stimulus (e.g. noise from a motorcycle) may get connected in the mind with the traumatic experience. This process is called traumatic coupling.^[9] In this process, the benign stimulus becomes a trauma reminder, also called a trauma trigger. These can produce uncomfortable and even painful feelings. Re-experiencing can damage people's sense of safety, self, self-efficacy, as well as their ability to regulate emotions and navigate relationships. They may turn to psychoactive drugs, including alcohol, to try to escape or dampen the feelings. These triggers cause flashbacks, which are dissociative experiences where the person feels as though the events are recurring. Flashbacks can range from distraction to complete dissociation or loss of awareness of the current context. Re-experiencing of symptoms is a sign that the body and mind are actively struggling to cope with the traumatic experience.

Triggers and cues act as reminders of the trauma and can cause anxiety and other associated emotions.^[10] Often the person can be completely unaware of what these triggers are. In many cases, this may lead a person with a traumatic disorder to engage in disruptive behaviors or self-destructive coping mechanisms, often without being fully aware of the nature or causes of their own actions. Panic attacks are an example of a psychosomatic response to such emotional triggers.^[11]

Consequently, intense feelings of anger may frequently surface, sometimes in inappropriate or unexpected situations, as danger may always seem

to be present due to re-experiencing past events. Upsetting memories such as images, thoughts, or flashbacks may haunt the person, and nightmares may be frequent.^[11] Insomnia may occur as lurking fears and insecurity keep the person vigilant and on the lookout for danger, both day and night. A messy personal financial scene, as well as debt, are common features in trauma-affected people.^[12] Trauma does not only cause changes in one's daily functions, but could also lead to morphological changes.^[13] Such epigenetic changes can be passed on to the next generation, thus making genetics one of the components of psychological trauma.^[14] However, some people are born with or later develop protective factors such as genetics that help lower their risk of psychological trauma.^[15]

Traumatic events are sometimes constantly experienced as if they were happening in the present, preventing the subject from gaining perspective on the experience. This can produce a pattern of prolonged periods of acute arousal punctuated by periods of physical and mental exhaustion. In time, emotional exhaustion may set in, leading to distraction, and clear thinking may be difficult or impossible. Emotional detachment, as well as dissociation (depersonalization or derealization) can frequently occur. Dissociating from the painful emotion includes numbing all emotion, and the person may seem emotionally flat, preoccupied, distant, or cold. Exposure to and re-experiencing trauma can cause neurophysiological changes like slowed myelination, abnormalities in synaptic pruning, shrinking of the hippocampus, cognitive and affective impairment. This is significant in brain scan studies done regarding higher-order function assessment with children and youth who were in vulnerable environments.

Some traumatized people may feel permanently damaged when trauma symptoms do not go away and they do not believe their situation will improve. This can lead to feelings of despair, transient paranoid ideation, loss of self-esteem, profound emptiness, suicidality, and frequently, depression. If important aspects of the person's self and world understanding have been violated, the person may call their own identity into question. Often despite their best efforts, traumatized parents may have difficulty assisting their child with emotion regulation, attribution of meaning, and containment of post-traumatic fear in the wake of the child's traumatization, leading to adverse consequences for the child.^{[16][17]} In such instances, seeking counselling in appropriate mental health services is in the best interests of both the child and the parent(s).

Trauma is hard to speak of by those that experience it. The event in question might recur to them in a

dream or another medium, but it is rare for them to speak of it.^[18]

CAUSES:

Trauma can be caused by human-made, technological and natural disasters,^[19] including war, abuse, violence, vehicle collisions, or medical emergencies.

An individual's response to psychological trauma can be varied based on the type of trauma, as well as socio-demographic and background factors.^[19]

There are several behavioral responses commonly used towards stressors including the proactive, reactive, and passive responses. Proactive responses include attempts to address and correct a stressor before it has a noticeable effect on lifestyle. Reactive responses occur after the stress and possible trauma has occurred and is aimed more at correcting or minimizing the damage of a stressful event. A passive response is often characterized by an emotional numbness or ignorance of a stressor.

There is also a distinction between trauma induced by recent situations and long-term trauma which may have been buried in the unconscious from past situations such as child abuse. Trauma is sometimes overcome through healing; in some cases this can be achieved by recreating or revisiting the origin of the trauma under more psychologically safe circumstances, such as with a therapist. More recently, awareness of the consequences of climate change is seen as a source of trauma as individuals contemplate future events as well as experience climate change related disasters. Emotional experiences within these contexts are increasing, and collective processing and engagement with these emotions can lead to increased resilience and post-traumatic growth, as well as a greater sense of belongingness. These outcomes are protective against the devastating impacts of psychological trauma.^[20]

Stress disorders:

All psychological traumas originate from stress, a physiological response to an unpleasant stimulus.^[21] Long-term stress increases the risk of poor mental health and mental disorders, which can be attributed to secretion of glucocorticoids for a long period of time. Such prolonged exposure causes many physiological dysfunctions such as the suppression of the immune system and increase in blood pressure.^[22] Not only does it affect the body physiologically, but a morphological change in the hippocampus also takes place. Studies showed that extreme stress early in life can disrupt normal development of hippocampus and impact its functions in adulthood. Studies surely show a correlation between the size of hippocampus and

one's susceptibility to stress disorders.^[23] In times of war, psychological trauma has been known as shell shock or combat stress reaction. Psychological trauma may cause an acute stress reaction which may lead to post-traumatic stress disorder (PTSD). PTSD emerged as the label for this condition after the Vietnam War in which many veterans returned to their respective countries demoralized, and sometimes, addicted to psychoactive substances.

The symptoms of PTSD must persist for at least one month for diagnosis to be made. The main symptoms of PTSD consist of four main categories: trauma (i.e. intense fear), reliving (i.e. flashbacks), avoidance behavior (i.e. emotional numbing), and hypervigilance (i.e. continuous scanning of the environment for danger). Research shows that about 60% of the US population reported as having experienced at least one traumatic symptom in their lives, but only a small proportion actually develops PTSD. There is a correlation between the risk of PTSD and whether or not the act was inflicted deliberately by the offender. Psychological trauma is treated with therapy and, if indicated, psychotropic medications.

The term continuous posttraumatic stress disorder (CTSD)^[24] was introduced into the trauma literature by Gill Straker (1987). It was originally used by South African clinicians to describe the effects of exposure to frequent, high levels of violence usually associated with civil conflict and political repression. The term is also applicable to the effects of exposure to contexts in which gang violence and crime are endemic as well as to the effects of ongoing exposure to life threats in high-risk occupations such as police, fire, and emergency services.

As one of the processes of treatment, confrontation with their sources of trauma plays a crucial role. While debriefing people immediately after a critical incident has not been shown to reduce incidence of PTSD, coming alongside people experiencing trauma in a supportive way has become standard practice.^[25]

The impact of PTSD on children is to a degree unknown, but education on coping mechanisms have shown to improve the lives of children who have undergone a traumatic event.^[26]

Moral injury

Moral injury is distress such as guilt or shame following a moral transgression. There are many other definitions some based on different models of causality.^[27] Moral injury is associated with post-traumatic stress disorder but is distinguished from it. Moral injury is associated with guilt and shame while PTSD is correlated with fear and anxiety.

MATERIAL AND METHODS:

This is a prospective study of 84 patients who had open reduction and internal fixation with implants and prosthesis that between STUDY PERIOD. There were 54 male and 30 females in the study.

Inclusion criteria

All closed fractures, patients with osteoarthritis of hip and knee treated with arthroplasty, duration of post-operative superficial surgical wound infection of less than 6 weeks, good condition of surrounding soft tissue and bone stock pre-operatively, a stable implant on radiological examination post-operatively, patient treated with Cefazolin and Garamycin as a perioperative prophylaxis.

Exclusion criteria

All compound fractures, presence of skin infection at the site of incision preoperatively, patient treated with antibiotic prophylaxis other than cefazolin.

Pre-operative evaluation

Pre-operatively patients were assessed of their comorbid conditions like diabetes mellitus, Obesity etc. and were categorized according to ASA class. Blood sugar was monitored preoperatively with periodic checkup and controlled for strict glycemic level during surgery and peri-operative period.

This prospective study was conducted in department of Orthopedics at HYDERABAD ----- HOSPITAL NAME----- . The patients particular were recorded on a prescribed proforma which included name, age, sex, diagnosis, comorbidity, smoking history, nutritional status, type of implant, skin at risk as variables. All patients were given first generation cephalosporins as a standard practice prophylactic intravenous antibiotics on call to the operating room. Based on the criteria, patients were included in the study after taking informed written consent during postoperative period. Patients were observed for postoperative wound infection till discharge. The follow up will be done up to three months according to a protocol, first visit after two weeks and subsequent visits on monthly basis. The diagnosis of infection was based clinical observations and microbiology reports which was done as routine investigations. If the aerobic cultures are negative, anaerobic culture will be considered. Infection will be graded superficial or deep and early, delayed or late. The infection will be considered superficial when it did not penetrate the deep fascia while the deep infection was inside the deep fascia. At least 3 swab samples from the most inflamed areas will be sent for culture to improve yield and minimize diagnostic error in a sterile culture tube. The risk factors assessed includes age, sex, duration of hospital stay, nutrition status, presence of diabetes mellitus, smoking habits, hypertension, anemia,

whether drainage was performed, duration of drainage, Open/closed reduction of fracture.

A generalised linear model was used to determine significant, independent predictors of the risk of Surgical Site Infection, while taking into account the confounding effect of other predictors. Univariate analysis of infection rates for each categorical variable was compared by computing odds ratio risks along with 95% confidence intervals (CI). Length of stay could not be included

in the linear model since it appeared after the outcome of SSI and was therefore not a predictor. The variables included in this study are sex, age (<70 or >70), ASA score (<3 or >3), duration of surgery (<120 min or >120 min), diabetes, obesity, NINS risk index (0, 1, 2) and smoking.

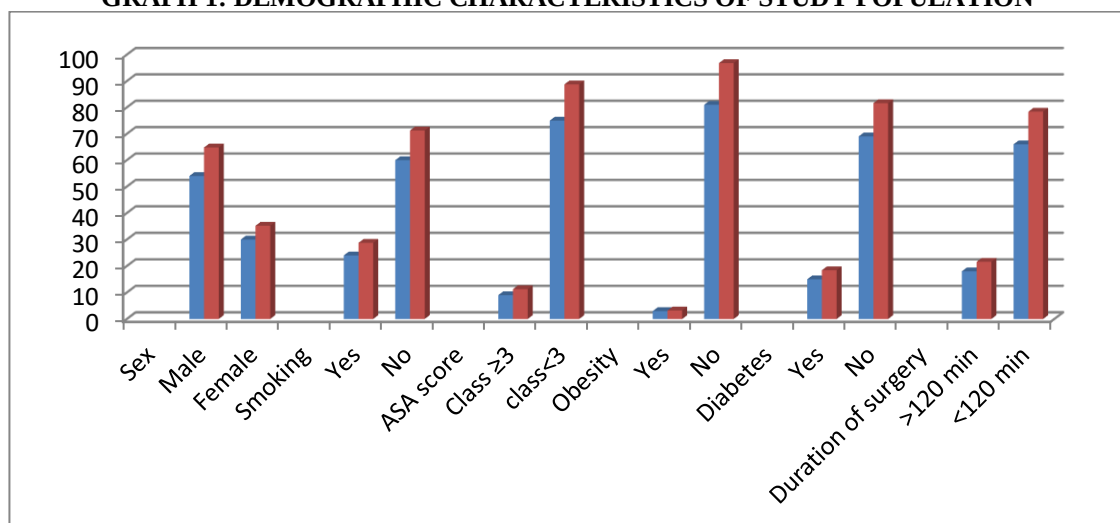
RESULTS AND DISCUSSION:

In the period between January STUDY PERIOD, 84 patients who were operated with implants and prosthesis taken in to prospective study. There were 54 male and 30 females in the study.

TABLE 1: DEMOGRAPHIC DETAILS OF THE STUDY POPULATION

Variables	No.of subjects	Percentage
Sex		
Male	54	64.8
Female	30	35.2
Smoking		
Yes	24	28.75
No	60	71.25
ASA score		
Class ≥ 3	9	11.25
class<3	75	88.75
Obesity		
Yes	3	3.2
No	81	96.8
Diabetes		
Yes	15	18.4
No	69	81.6
Duration of surgery		
>120 min	18	21.6
<120 min	66	78.4

GRAPH 1: DEMOGRAPHIC CHARACTERISTICS OF STUDY POPULATION



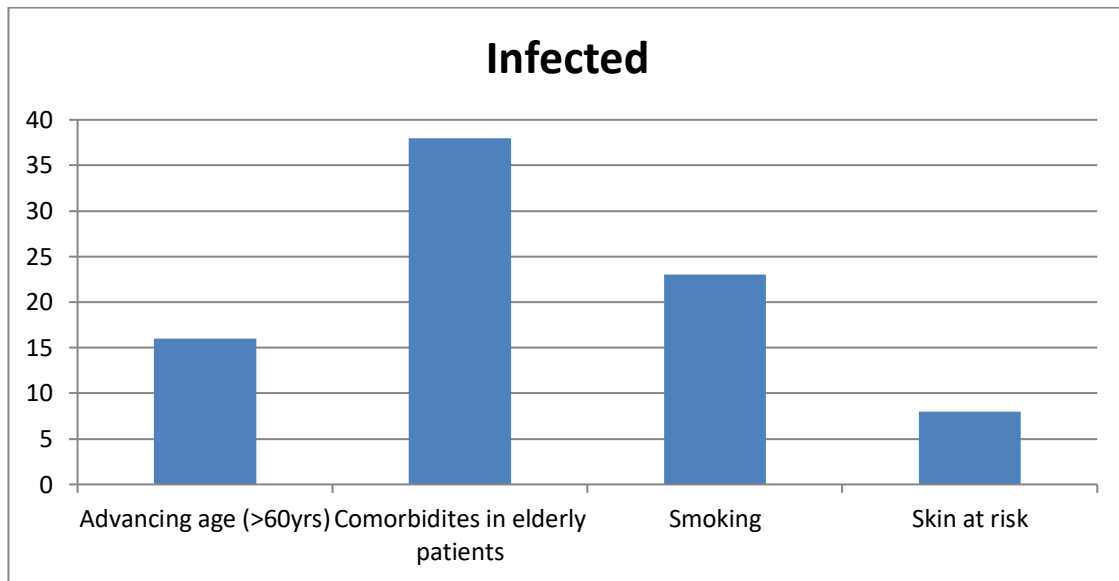
The superficial infection was in 15 (18.18%) patients, while deep infection was in 69 (81.81%) patients. There were 53(63.63%) cases of early infection and 15(18.18%) each in delayed and late stages. The age of the patients was more than 60 years in 53 (63.33%) patients with 38 (45.45%) patient having co-morbidities, 30 to

60 years in 15 (18.18%) patients and below 30 year in 15 (18.18%) patient. The risk factors are shown in Table-2.

TABLE 2: RISK FACTORS IN THE STUDY POPULATION

Risk Factor	Infected	%
Advancing age (>60yrs)	16	18.8
Comorbidities in elderly patients(diabetes, hypertension)	38	45.45
Smoking	23	27.27
Skin at risk	8	9.09

GRAPH 2: RISK FACTORS IN THE STUDY POPULATION

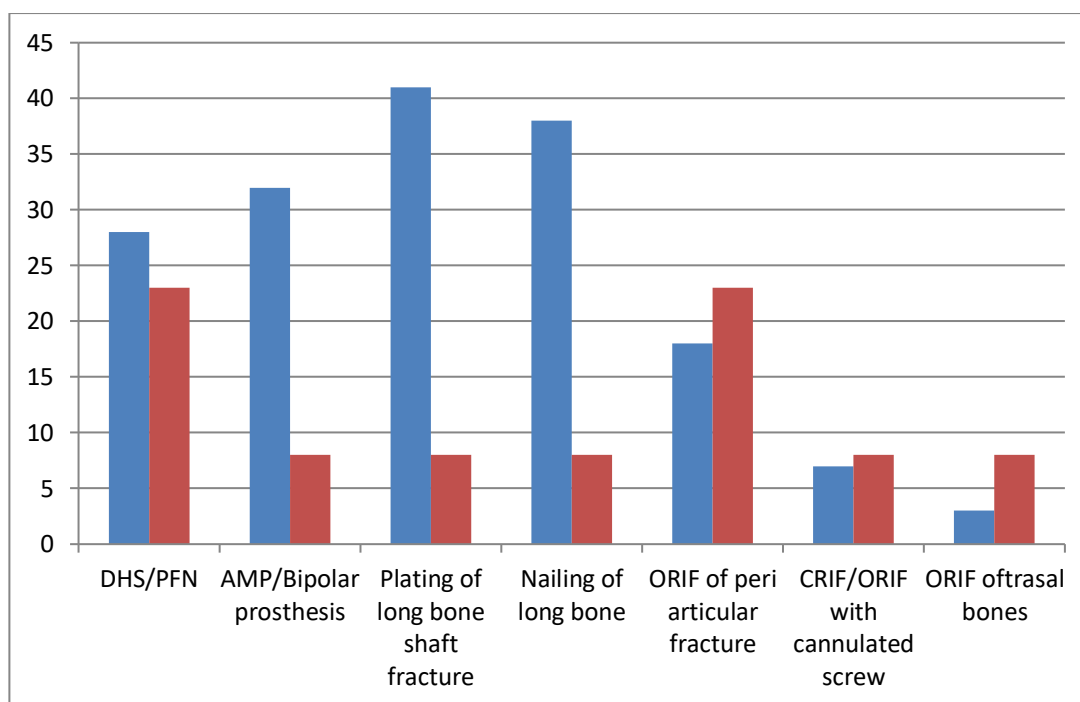


The infection rate in different type of implant is shown in Table-3. Infected cases, implant was removed in patients with ORIF of periarticular fracture and one operated with PFN, while the rest of the patients were treated with intravenous antibiotics and multiple debridement.

TABLE 3: INFECTION IN DIFFERENT TYPE OF IMPLANT SURGERIES

Surgeries	Performed	Infected
DHS/PFN	28	23
AMP/Bipolar prosthesis	32	9
Plating of long bone shaft fracture	41	8
Nailing of long bone	38	9
ORIF of peri articular fracture	23	18
CRIF/ORIF with cannulated screw	10	8
ORIF of tarsal bones	13	9

GRAPH 3: INFECTION IN DIFFERENT TYPE OF IMPLANT SURGERIES



Acetaminophen is an effective analgesic for mild to moderate pain. When used as an opioid adjunct, oral or rectal acetaminophen reduces pain intensity and opioid consumption by up to 30%. Both acetaminophen and NSAIDs act by inhibiting prostaglandin synthesis. Acetaminophen has a very favorable safety profile and adverse effects are rare. Highlights this medication for orthopedic surgeries.

Gabapentin and pregabalin are GABA analogues that can be administered orally. They can be used before and after surgical procedures and have been shown to decrease the requirement for narcotic pain medications. Use of beta-blockers, such as short-acting esmolol, intraoperatively not only blunts the cardiovascular response to surgical stimulus, such as tachycardia and hypertension, resulting in the decreased incidence of adverse cardiac events, but also decreases analgesic requirements postoperatively.

TABLE 4: MANAGEMENT OF POSTOPERATIVE PAIN POST OPERATIVE

Drug class	Dose	Analgesic duration
Acetaminophen	600-1000 mg IV	4-6 hr
Ibuprofen	400-800 mg IV	4-6 hr
Parecoxib	20.-40 mg IV	6-12 hr
Gabapentin	300 mg PO	5-7 hr
Pregabalin	100 mg Po	12 hr
Atenolo	25-50 mh PO	12-24 hr
Metaprolol	100 mg Po	3-6 hr
Clonidine	0.1 mg Po	4.6 hr

DISCUSSION:

The incidence rate of surgical site infections found in the present study is 4.435% which is much higher than accepted standard for postoperative wound infection, which should be less than 1%. Our infection rate is comparable to another study in which the infection rate was 5% and is much lower than other studies by K. S. Dhillon^[145] et al they found infection rate in 6.8% while I.Onche et al

^[146] found 7.5 % and N. E. Ngim et al^[147] found 9.38% infection rate. Marston et al reported 5% superficial and 0.25% deep infection in 413 total hip replacements in ideal circumstances. According to some studies, the overall superficial and deep infection rate is 7.8% and 10% respectively while we reported 0.806 % superficial and 3.629 % deep infection. The rate of postoperative wound infection without prophylactic antibiotic is high as

compared to the use of prophylactic antibiotic. Our infection rate with prophylactic antibiotic is 4.435% which is higher as compared to another study i.e., 3.97%. The difference in incidence rate of SSI in different studies may be related to different inclusion criteria, different surgical set ups and facilities available. In our study, we found that SSIs are more common in patients above 60 years of age. It may be because of low immunity, increasing catabolism, increasing co-morbidities and low wound healing rates in old age patients.

The greatest source of airborne bacteria is the operating room personnel, with ears and beard being the two areas most likely to shed bacteria. The number of bacteria shed by operating room personnel can be decreased by using air exhaust systems or completely covering ears and beards.

[148]

Duration of surgery: When operating room time for orthopedic procedures increases, the rate of infection also increases. Pryor F et al found that surgical time of <1 hour is associated with an infection rate of approximately 0.3%, doubling the surgical time triples the infection rate, a surgical time of 3 hours results in an infection rate of approximately 5%, and 6 hours of surgery has an infection rate of approximately 9%.

Blood loss: In orthopedic surgery, blood loss tends to be substantial because of the nature of muscle tissue and the inability to cauterize bleeding bony surfaces, especially during procedures such as revision hip replacement and spinal surgery. Other factors that can influence the amount of blood loss include anesthetic type, use of medications, and use of fibrin sealant.

Antimicrobial prophylaxis: The use of antimicrobial agents for prophylaxis represents the most effective method of reducing the prevalence of wound infection after orthopedic surgery and should be considered essential to the overall prevention approach. [149-150] The most common organisms are *Staphylococcus aureus* and coagulase negative *Staphylococcus epidermidis*. Therefore either cefazolin or cefuroxime should be used in conjunction with hip or knee arthroplasty, fixation of closed fractures, and most elective orthopaedic procedures.

CONCLUSION:

Surgical site infections are a considerable problem in orthopedic patients. Our infection rate was quite high and needs proper measures to control it because it had great financial burden on patient and on hospital resources and could lead to increased morbidity and mortality in patients. Pain is a subjective sensation and is difficult to assess. A variety of pain assessment tools such as the VAS (verbal analog score), the McGill Pain

Questionnaire, and a brief pain inventory can be used. The Wong-Baker facial grimace scale is useful when patients are unable to communicate their pain intensity. The majority of postoperative pain is nociceptive with a small neuropathic component. Pain management strategies should address both types of pain. In the words of Dr. John Bonica, the father of pain medicine, "Pain is what a patient says it is." Effective pain control requires constant reassessment with individualized strategies.

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