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ASSESSMENT OF USAGE OF ANTIBIOTICS AS SURGICAL PROPHYLAXIS AND ANALYSING THE RISK OF SURGICAL SITE INFECTION (SSI) IN ORTHOPEDIC PATIENTS UNDERGOING TKR AND THR IN TERTIARY CARE HOSPITAL IN NORTHERN MAHARASHTRA

Archi Sunilkumar Patel[1], Devyani Patil[2], Samruddhi Waghchaure[3], Sapna Shinde[4], Sujith Kumar M[5]

[1]Senior Clinical Nurse Specialist- Infection Control, Apollo Hospitals Nashik, India.
[2]5th year PharmD Student, MET's Institute of Pharmacy Nashik, India.
[3]5th year PharmD Student, MET's Institute of Pharmacy Nashik, India.
[4]Assistant Professor, GMC, MPGI and MER, Nashik, India.
[5]Medical Superintendent, Apollo Hospitals Nashik, India.

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Corresponding Author: Archi Sunilkumar Patel, Senior Clinical Nurse Specialist- Infection Control, Apollo Hospitals Nashik, India.
Email: patelarchie96@gmail.com

ABSTRACT

Background: Infections at the surgical site (SSI) are one of the most serious side effects of orthopedic surgeries, especially total knee replacement (TKR) and total hip replacement (THR). The objective of this research is to examine SSI risk variables and surgical antibiotic prophylaxis (SAP) compliance in a Northern Maharashtra tertiary care hospital. Thirty-four female and sixteen male patients were observed for ninety days following surgery in this observational analytical study. Age is a key risk factor, as evidenced by the fact that most patients were over 60. Cefuroxime was shown to be the most frequently provided antibiotic, with 100% adherence to the Turn around Time (TAT) for administration. Due to inadequate post-operative wound care, there was only one instance of SSI reported. The study highlights the importance of SAP compliance and patient education to minimize SSI risks.

Objectives

1) To assess the compliance to surgical antibiotics and their turn around time.
2) To assess the choice of surgical antibiotic.
3) To assess the relation between the comorbidities and the risk of SSI.
4) To assess the relation between the age and gender with respect to risk factor of SSI.
5) To assess the duration of the surgical prophylaxis.

INTRODUCTION

Surgical Antibiotic Prophylaxis (SAP) reduces the microbial burden at the surgical site, which is essential for preventing surgical site infections (SSIs). [1]However, rigorous adherence to established guidelines—such as the right antibiotic choice, administration timing, and therapy

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duration—is necessary for its success. [2]Poor patient outcomes and increased infection rates have been linked to deviations from these guidelines. [3] SSIs are especially common in orthopaedic surgery because of the higher risk of biofilm formation, particularly in implant placement procedures.[4] Optimized surgical techniques, efficient antibiotic stewardship, and focused patient education are all necessary components of a complete approach to address this problem. [5]This study looks at risk variables for SSIs and assesses SAP compliance in patients receiving TKR and THR at a Northern Maharashtra tertiary care hospital. Through the identification of infection risk factors and adherence patterns, this study seeks to offer evidence-based suggestions to improve patient safety and lower the prevalence of SSIs.[6]

Various types of Surgical site infections (SSI's)

A SSI generally occurs in between 90 days post surgery. According to Centers for disease control and prevention (CDC) the SSI's are described in 3 types:-

1)Super Incisional SSI- The infection which occurs at the site where the incision or the cut was made during the surgery is called super incisional SSI.

2)Organ or Space SSI- This type of infection can occur in any area which does not include the skin, muscle and the surrounding tissue which was involved during the surgery. These infections only includes the organ or space between the organs.

3)Deep Incisional SSI- This is the type of infection which occurs at the area of incision made in the muscle or the tissue around the muscles and the implant used during the surgery mostly in orthopedic patients (THR and TKR).

Deep Incisional surgical site infection (SSI) can occur after both Total Hip Replacement (THR) and Total Knee Replacement (TKR).

BACKGROUND

Surgical site infections (SSIs) are a significant concern in orthopaedic procedures, particularly in Total Knee Replacement (TKR) and Total Hip Replacement (THR). [7]These infections, which may occur within 90 days post-surgery, represent a considerable source of postoperative morbidity and healthcare burden.[8] Although the overall incidence of SSIs following primary TKR and THR is relatively low, ranging from 1.69% to 2.82%, the consequences are often severe.[9] SSIs can lead to prolonged hospital stays, reoperations, increased antimicrobial use, and, in severe cases, permanent loss of joint function or mortality. [10] SSIs are generally categorized into three types: superficial incisional, deep incisional, and organ/space infections, based on the site of occurrence.[11] Deep incisional SSIs are of particular concern in TKR and THR due to their association with implantable devices, which are prone to biofilm formation and difficult-to-treat infections. [12]The risk of SSIs is influenced by a range of factors, including

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patient age, comorbidities (e.g., diabetes, obesity), surgical technique, and adherence to infection control protocols.[13] Surgical Antibiotic Prophylaxis (SAP) is a widely accepted and evidence-based intervention for the prevention of SSIs in TKR surgeries. [14]Introduced in the 1970s, SAP aims to minimize microbial contamination at the surgical site.[15] Key guidelines emphasize the importance of timely administration (within one hour before incision), appropriate antibiotic selection (targeting common pathogens), and limited duration of therapy (to prevent resistance). [16]However, compliance with SAP guidelines varies across healthcare settings, potentially impacting its effectiveness. [17] Furthermore, the emergence of antimicrobial-resistant pathogens has added complexity to SSI management. [18]This highlights the critical need for ongoing surveillance, adherence to infection control protocols, and periodic evaluation of SAP practices.[19] In this context, the present study examines the compliance with SAP guidelines and the associated risk factors for SSIs in patients undergoing TKR and THR in a tertiary care hospital in Northern Maharashtra. By analyzing these factors, this study aims to provide insights into improving clinical outcomes and reducing the incidence of SSIs in orthopedic surgeries.

MATERIALS AND METHODS

Study Design:

This was an observational analytical study conducted in the Orthopedics Department of a tertiary care hospital in Northern Maharashtra. The study aimed to evaluate the compliance with surgical antibiotic prophylaxis (SAP) and analyze risk factors associated with surgical site infections (SSIs) in patients undergoing Total Knee Replacement (TKR) or Total Hip Replacement (THR).

Study Duration:

The study was conducted over six months, from January 1, 2024, to June 30, 2024.

Study Population:

The study included 50 patients who underwent either TKR or THR during the study period. The distribution consisted of 34 females and 16 males.

Inclusion Criteria:

Patients undergoing TKR or THR in the Orthopedics Department.

Exclusion Criteria:

Patients undergoing surgeries unrelated to orthopedics.

Data Collection:

Data were collected from patient demographic details (age, gender, weight, and height), comorbidities, surgical history, antibiotic usage, Turn Around Time (TAT), and post-surgical antibiotic therapy. The primary outcomes analyzed were:

- Compliance with SAP guidelines, including timing (TAT).
- Duration of antibiotic therapy.
- Association of age, gender, and comorbidities with the risk of SSIs.

Sample Size:

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A total of 50 patients met the inclusion criteria:
Males: 16
Females: 34

Data Analysis:
Statistical analysis was conducted using Microsoft Excel and GraphPad. Descriptive statistics, including frequencies and percentages, were calculated to summarize demographic data, antibiotic usage, TAT, and the duration of therapy.

Ethical Considerations:
Ethical clearance was obtained from the hospital's ethical committee prior to data collection. Patient confidentiality and informed consent were maintained throughout the study.

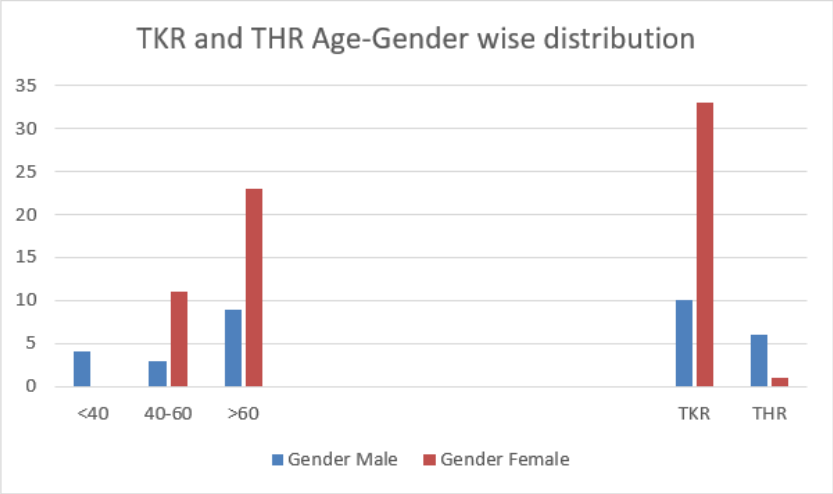
STATISTICAL DATA ANALYSIS

Table No.1

	Gender	
Age(Yrs.)	**Male**	**Female**
<40	4	0
40-60	3	11
>60	9	23

Table No.2

	Male	**Female**
TKR	**10**	**33**
THR	**6**	**1**



Graph No.1

Table No.3

	Surgical Prophylaxis	
	INJ SUPACEF	**INJ AUGMENTIN**
No.of pts.	49	1

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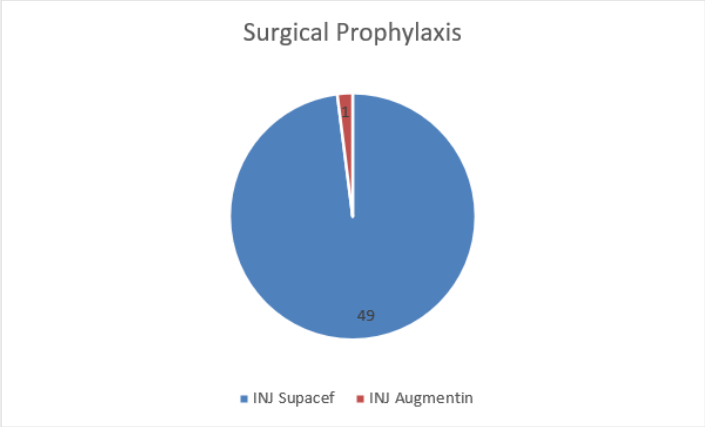
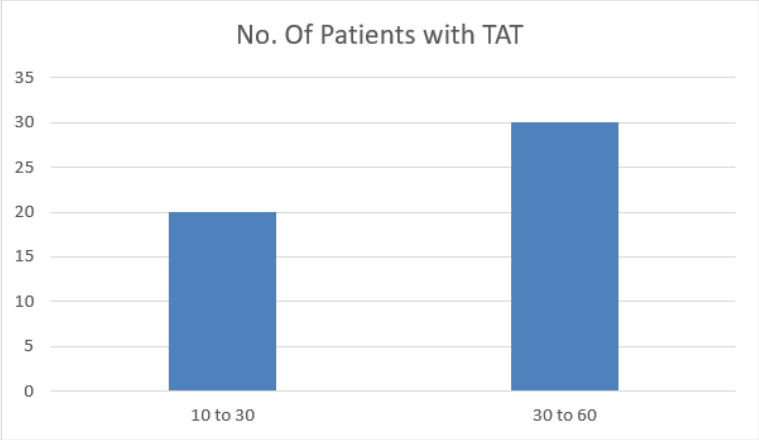


Graph No.2

Table No.4

TAT (min.)	No. Of Patients
10-30	20
30-60	30



Graph No.3

DISCUSSION

The above study done is an observational analytical study which was conducted on the patients of orthopedic department in a tertiary care hospital who have undergone THR and TKR. The patients were selected in the time duration of 6 months from 1 JAN 2024 to 30 JUNE 2024.

Our study included 50 patients from which 34 patients were female whereas 16 patients were male (graph no. 1). The data of patients were collected from the patient demographic details, such as age, gender, past medical history, past surgical history, comorbidities. We also included the antibiotic given for surgical prophylaxis in order to prevent the SSI due to surgical procedures duration of antibiotic given to the patient post-surgery. The TAT (Turn Around Time) was also included in this study.

Further after the collection of data it was seen that out of 34 females, 33 females have undergone TKR surgery and only 1 female has undergone THR surgery. Among the male patients which were 16 in total out of 16 males, 10 males have undergone TKR surgery and remaining 6 males have undergone THR surgery.(graph no.1).

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In this study we have divided the patients into 3 groups based on age factor which are <40, 40-60, >60. According to the age group in <40 group no. of patients found were 3 and in the age group of 40-60, 16 patients were found whereas in the age group of >60 , 31 patients were found to have undergone THR surgery and TKR surgery.(graph no.1)

In this study we analyzed that according to age factor most of the patients undergone THR and TKR are of age >60 which is 31 patients. This shows that age factor can be a huge risk for THR and TKR and can also be prone to SSI.

In this study what we observed that about 99% of the patient which have undergone TKR or THR surgeries have received surgical prophylaxis with the antibiotic as inj Supacef which is an antibiotic called Cefuroxime belonging to the class 3rd generation cephalosporins on the other hand only 1 patient have received Inj Augmentin which was also after the previous administration of Inj Supacef to compensate the antibacterial effect as demonstrated in graph no.2.

In the above study we have also assessed the Turn Around Time (TAT) of the ideal choice of drug during the surgery. We basically assessed the compliance to the surgical antibiotics and their TAT (within 1 hour). So, we categorized the time as per minutes such as 10-30 min and 30-60 min. In almost all of the cases the TAT was within 60 min due to which suggest that the chances of SSI are reduced to minimum as shown in graph no.3.

In this study during assessing different factors we also came across the comorbidities in the patients. The common comorbidities were Diabetes Mellitus and hypertension which may aid in post surgical infection if proper care is not taken.

CONCLUSION

The study indicates the prevalence of TKR and THR surgeries in female patients mostly above the age of 60 yrs. some of which have comorbid conditions like DM and hypertension.In all the cases the TAT was observed which was within 1hr. Altogether each and every patient was given with Inj Supacef and Inj Augmentin in 1 case as surgical prophylaxis in order to prevent SSI.

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