

# Demographic, Comorbidity, and Antibiotic Patterns in Osteoarthritis Patients Undergoing Knee and Hip Replacement

<sup>1</sup>Rushiraj Rakholiya, <sup>1</sup>Sahil Shaikh, <sup>1</sup>Manav Singh, <sup>1</sup>Vatsal Mavani, <sup>2</sup>S P Srinivas Nayak, <sup>3</sup>G S Chakraborty, <sup>4</sup>Jitendra Vagasiya, <sup>2</sup>Mohit Buddhadev

<sup>1</sup>PharmD, Parul Institute of Pharmacy & Research, Parul University, Vadodara, Gujarat.

<sup>2</sup>Assistant Professor, Dept. of Pharmacy Practice, Parul Institute of Pharmacy & Research, Parul University, Vadodara, Gujarat.

<sup>3</sup>Principal, Parul Institute of Pharmacy & Research, Parul University, Vadodara, Gujarat.

<sup>4</sup>Principal, Parul College of Pharmacy & Research, Parul University, Vadodara, Gujarat

**Abstract**—This study focuses on the evaluation of antibiotic therapy in preoperative and postoperative conditions of Total Knee Arthroplasty (TKA) or Total Hip Arthroplasty (THR) in patients with osteoarthritis. The analysis of data from the study reveals that osteoarthritis predominantly affects individuals above 45 years, with an increased incidence after the age of 55. Females represent 64.3% of diagnosed patients, indicating a higher predisposition in women. Primary complaints include knee and hip pain, difficulty in walking, stiffness, and swelling, with walking difficulty and stiffness being prominent. Patients with osteoarthritis commonly exhibit comorbidities, with hypertension and diabetes being prevalent, alongside other conditions such as heart, thyroid, and kidney-related disorders. Among osteoarthritis patients, 71.4% required Total Knee Replacement (TKR), while 28.6% required Total Hip Replacement (THR). Female patients comprised a higher percentage for both TKR (65%) and THR (62.5%). Antibiotic administration pre-surgery primarily involved Inj. Cefuroxime (1.5gm) or Inj. Amikacin (500mg), with 37.5% receiving both. Similarly, during surgery, 64.3% of patients received both antibiotics. Post-surgery antibiotic regimens mirrored the pre-surgery administration. This data provides valuable insights into the demographic distribution, comorbidities, surgical requirements, and antibiotic usage patterns in osteoarthritis patients undergoing TKR and THR surgeries. The findings contribute to a comprehensive understanding for future research and clinical interventions, aiming to enhance patient care and optimize treatment strategies in orthopedic procedures.

**Keywords**— Osteoarthritis, Arthroplasty, Demographics, Comorbidities, Antibiotic Therapy.

## I. INTRODUCTION

Total knee arthroplasty (TKA) or total knee replacement (TKR) is a common orthopaedic surgery that involves replacing the articular surfaces (femoral condyles and tibial plateau) of the knee joint with smooth metal and highly cross-linked polyethylene plastic.[1] TKA aims to improve the quality of life of individuals with end-stage osteoarthritis by reducing pain and increasing function, and was found to improve patients' sports and physical activity.[2,3] Total hip arthroplasty (THA) is one of the most cost-effective and consistently successful surgeries performed in orthopaedics.[2] It provides reliable outcomes for patients suffering from end-stage degenerative hip osteoarthritis. Specifically, it results in pain relief, functional restoration, and improved quality of life.[4] The most common indication for THA includes end-stage, symptomatic hip osteoarthritis (OA). In addition, hip osteonecrosis (ON), congenital hip disorders including hip dysplasia, and inflammatory arthritic conditions are not uncommon reasons for performing THA. Hip ON, on average, presents in the younger patient population (35 to 50 years of age) and accounts for approximately 10% of annual THAs. [5,6] The most common indication for a primary knee replacement, TKA, THA is osteoarthritis. Osteoarthritis causes the cartilage of the joint to become damaged and no longer able to absorb shock.[3] Risk factors for knee osteoarthritis include

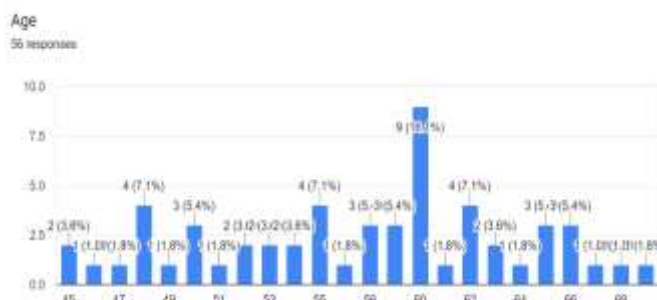
gender, increased body mass index, history of a knee and hip injury and comorbidities. Pain is typically the main complaint of patients with knee and hip osteoarthritis. Pain is subjective, and involves peripheral and central neural mechanisms that are modulated by neurochemical, environmental, psychological and genetic factors. [5] Total knee arthroplasty is more commonly performed on women and individuals of older ages. Dramatic increases in TKA surgeries are projected to occur with an increasing rate of younger TKA recipients under the age of 60.[2] However according to Hawker et al, younger people undergoing TKA for knee osteoarthritis are more likely to have morbid obesity, they smoke, and their expected outcome is to return to vigorous activities, like sport.[6], Approximately 28% of the population  $\geq 45$ -year-old suffer from hip arthritis and this prevalence is expected to increase in coming decades.[6] The American Academy of Orthopaedic Surgeons (AAOS) introduced a new clinical practice guideline (CPG) for adults undergoing surgery to improve motion and relieve pain caused by osteoarthritis of the knee and hip. Better known as “wear-and-tear” arthritis, osteoarthritis of the knee and hip happens when cartilage in the knee or hip joint breaks down from repeated use, hereditary factors, or related diseases.[3] Bone-on-bone contact creates symptoms that can include pain, swelling, and stiffness in the knee, and decreased ability to walk or rise from a sitting position. [6] The CPG, Surgical Management of Osteoarthritis of the Knee and hip, provides guidelines for physicians and patients to consider when making

decisions about knee and hip replacement. The AAOS recognizes that a patient's lifestyle and expectations, along with physician experience, also heavily influence treatment decisions.[7] Among the key CPG recommendations in the report that received a "strong" rating are : Reduction of risk factors such as weight and smoking [6,7], Administration of multi-modal anaesthesia, including local anaesthetic and nerve blockade around the knee joint to decrease pain and opioid use following TKR [7,8], Treatment with tranexamic acid to decrease postoperative blood loss and transfusions following TKR. [7,8,9], Starting rehabilitation, the same day TKR is performed to reduce length of hospital stay. [6,7,10] Following TKA/THA surgery, these complications may occur : Infection [1,2,11], Nerve damage [12], Bone fracture (intra-operative or post-operative) [13], Persistent / chronic pain [13], Increased Falls risk [14], The incidence of deep vein thrombosis (DVT), a common complication following knee or hip replacement surgery that can result in considerable morbidity and mortality, has been reported to be 18% [8], Stiffness (Affects approximately 6% to 7% of patients undergoing surgery, Contemporary literature supports defining "acquired idiopathic stiffness" as having a range of motion of <math><90^\circ</math> persisting for >12 weeks after primary TKA, in the absence of complicating factors including pre-existing stiffness, Stiffness causes significant functional disability and lower satisfaction, Females and obese patients are reported to have increased risk). [6], Prosthesis-related complications: loosening or fracture of prosthesis components, joint instability and dislocation, component misalignment and breakdown. [6,13], High-risk activities that may not be permitted, or require clearance with the orthopaedic surgeon, post-surgery: High impact aerobics, Mountain biking, Soccer, football, volleyball, baseball/softball, handball, basketball, Gymnastic, Water sports, Skiing, Skating. [7] Prosthetic joint infection (PJI) after TKA and THA remains a common and challenging problem for joint replacement surgeons and patients. [2,7,12] Once the diagnosis of PJI has been made, patient goals and characteristics as well as the infection timeline dictate treatment. [7,13,15] Infection after a TKR and THA can be disastrous and is one of the more common causes of failure. The reported incidence of infection in modern practice is between 0.5% and 3% using contemporary infection control measures. [15] historically, an incidence of 23% has been reported. A patient with an infected TKR and THA may be treated with long-term antibiotics, debridement with retention of the prosthesis, arthrodesis, or by one- or two-stage reimplantation. [16] Over the last 10 to 15 years there has been an increase in the prevalence of infections caused by resistant organisms such as methicillin-resistant *Staph. aureus* (MRSA) and methicillin-resistant *Staph. epidermidis* (MRSE).[16] Recent epidemiological data suggest that between 4% and 27% of all prosthetic infections are polymicrobial in origin. The causative organisms for the majority of PJI are bacterial, and most frequently *Staphylococcus* and *Streptococcus*. Fungal infections are rare, contributing to under 1% of all PJI cases, with *Candida* being the most frequent organism. [1][17] Clinical Management Within both institutions' patients

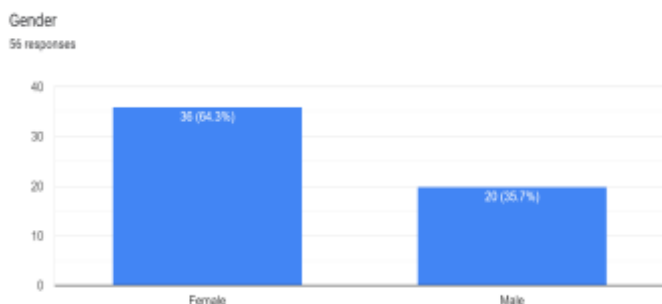
presenting with PJI were managed within a bone infection unit multidisciplinary team, consisting of surgeons, infectious disease physicians, clinical pharmacists, specialist nurses, and administrative staff. Preoperative sampling and prior microbiological history were used as guidelines to customize perioperative antibiotic therapy for each patient. The length of postoperative antibiotics was decided by the multidisciplinary team. [17] Over the last two decades the prevalence of infections caused by organisms such as MRSA and MRSE has increased, mainly due to the inappropriate use of antibiotics.[11] These two Gram-positive bacteria are the most pervasive pathogenic organisms that infect TKRs; other organisms such as Gram-negative bacilli are also found, but less frequently. [17] Surgical site infection (SSI) is a devastating nosocomial complication that occurs after THR and TKR, decreasing the success rate by increasing the morbidity and mortality of affected patients.[2] Based on the anatomical site of infection, SSIs are divided into three categories: superficial incisional, deep incisional, and organ/joint infection. According to published data, the incidence of SSI accounts for 1.69% after THR and 2.82% after primary TKR. [2,4] Some of these factors are patient-dependent, including patient age and comorbidities with a high prevalence among patients treated with arthroplasty (diabetes mellitus, coronary artery disease, and cancer and urinary tract infection). [7] Prophylactic antibiotics reduce the risk of developing PJI. Nowadays, Antibiotic prophylaxis is used to prevent bacterial overinfection. Pharmacologically speaking, the goal of antibiotic prophylaxis is to keep medication concentrations in bone, tissue, and serum at the lowest inhibitory concentration during surgery in order to prevent potential germs from attaching.[2] The three bactericidal antibiotics that are most frequently used in orthopedic surgery are vancomycin, cephalosporins, and penicillin. The most often used preventive antibiotics in primary arthroplasty are cephalosporins. But as bacterial resistance has grown, there is a greater need to utilize a new family of antibiotics as prophylaxis, namely vancomycin. The goal of antibiotic prophylaxis (AP) is to stop surgical site contamination from becoming infected. Yet, the right antibiotic, dosage, and timing are essential for effective antibiotic prophylaxis. (2,18) The majority of published recommendations recommend intravenous broad-spectrum antibiotics. According to the guidelines, *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Escherichia coli*, and *Proteus* are the most prevalent organisms that require additional care. First- and second-generation cephalosporins lend themselves well to prophylaxis, having excellent coverage of Gram-positives and Gram-negatives. [2,18] Third generation cephalosporins are not recommended in any guidelines regarding total joint arthroplasty, as they have reduced activity on Gram-positives. Cloxacillin is recommended less, despite its low side effect profile, due to its narrow spectrum of activity against the more common organisms associated with PJIs. [11,19] According to the AAOS, the routine use of vancomycin could promote the development of vancomycin-resistant enterococci (VRE) colonization and infections.[3] Vancomycin should also only be used to treat infections in people with a potentially fatal allergy to beta-lactam antibiotics or significant

infections caused by organisms resistant to the antibiotic. [18]  
 Patient education: pain science, pain management, the importance of home exercises, setting rehabilitation goals and expectations. [7,10,14]

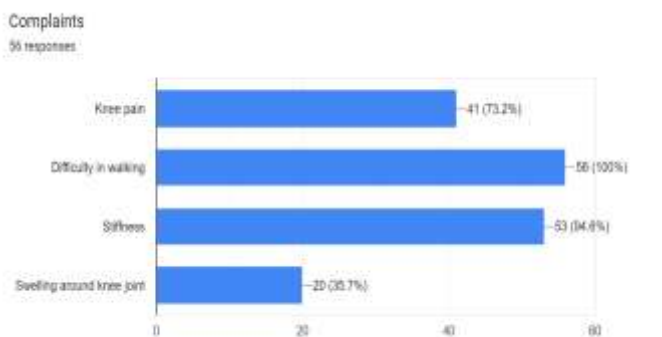
II. RESULTS



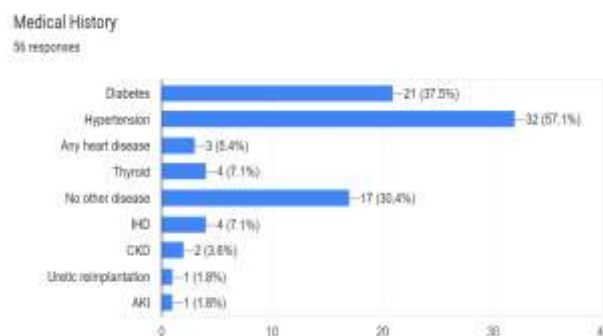
In the evaluation of TKR/THR based on age, we found that most people who suffered from osteoarthritis is above 45 years of age, in which after 55 years of age people are more prone to diagnosed with osteoarthritis.



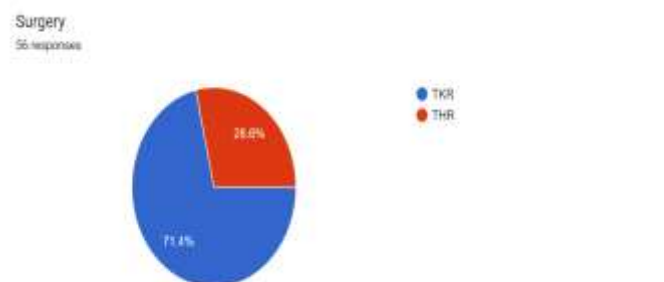
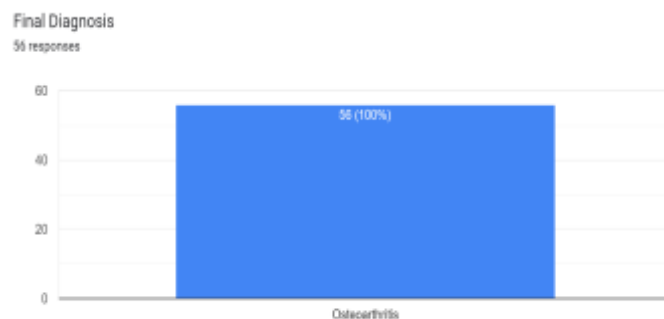
We evaluate total 56 number of patients in which female is 36 and male is 20, ration of patient based on male and female was 64.3% and 35.7% respectively, which represents that female are more likely to diagnosed with osteoarthritis.



About primary common complaint of patient includes mainly knee and hip pain, difficulty in walking, stiffness, swelling around knee in which difficulty of walking and stiffness were main symptoms of patient.



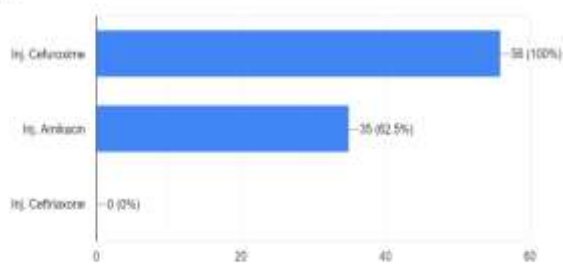
Patient who diagnosed with osteoarthritis who needs TKR and THR surgery in which major patients were already suffering from various major medical condition, where hypertension and diabetes were common and also 30% patients were those who did not have any major diseases. Other than hypertension and diabetes various disease also in the list includes heart disease, thyroid related disease, kidney related disease.



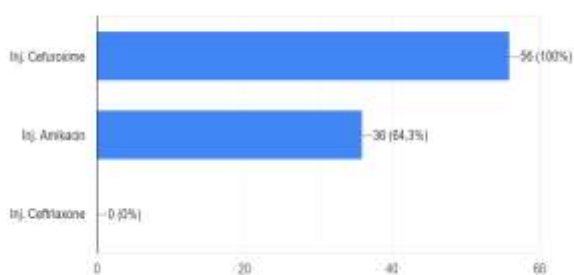
Patient who diagnosed with osteoarthritis required two types of surgeries: TKR and THR where total number of patients who required TKR and THR surgery were 40 and 16 respectively and ratio for the same was 71.4% and 28.6% respectively for TKR and THR. In case of TKR 26 female and 14 male and in case of THR 10 female and 6 males were admitted for surgery.



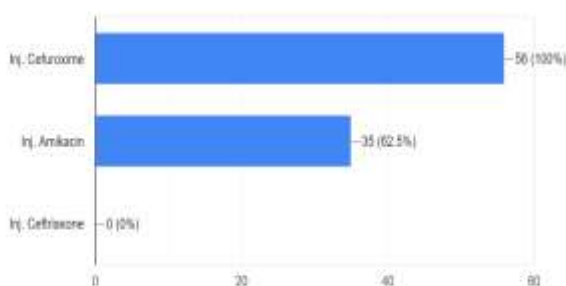
Pre OP Antibiotics  
55 responses



Antibiotics during OT  
55 responses



Post OP Antibiotics  
55 responses



There are mainly two antibiotics given during whole hospital administration for TKR and THR surgery either Inj. Cefuroxime (1.5gm) or Inj. Amikacin (500mg) or both. Antibiotics given before performing surgery either Inj. Cefuroxime (1.5gm) or Inj. Amikacin (500mg) or both. In which 21 patients were given Inj. Cefuroxime (1.5gm) only whereas 35 patients were given both antibiotics Inj. Cefuroxime (1.5gm) and Inj. Amikacin (500mg). In case of antibiotics administered during performing surgery were also Inj. Cefuroxime (1.5gm) or Inj. Amikacin (500mg), in which 20 patients were given Inj. Cefuroxime (1.5gm) only whereas 36 patients were given both antibiotics Inj. Cefuroxime (1.5gm) and Inj. Cefuroxime (500mg). Antibiotics given after surgery were same as antibiotic given before surgery.

### III. DISCUSSION

The data analysis reveals that osteoarthritis predominantly affects individuals above 45 years, with a higher incidence after

the age of 55. Females constituted 64.3% of patients, indicating a higher likelihood of osteoarthritis diagnosis in women. The primary complaints among patients included knee and hip pain, difficulty in walking, stiffness, and swelling, with difficulty in walking and stiffness being prominent symptoms. Patients diagnosed with osteoarthritis often had comorbidities, with hypertension and diabetes being common. Other diseases, including heart, thyroid, and kidney-related conditions, were also present. Of the osteoarthritis patients, 71.4% required total knee replacement (TKR), and 28.6% required total hip replacement (THR). Female patients comprised a higher percentage for both TKR (65%) and THR (62.5%). Antibiotics administered pre-surgery were mainly Inj. Cefuroxime (1.5gm) or Inj. Amikacin (500mg), with 37.5% of patients receiving both. Similarly, antibiotics during surgery consisted of the same options, with 64.3% of patients receiving both antibiotics. Post-surgery antibiotic regimen mirrored pre-surgery administration. This data provides valuable insights into the demographic distribution, comorbidities, surgical requirements, and antibiotic usage patterns in osteoarthritis patients undergoing TKR and THR surgeries, contributing to a comprehensive understanding for future research and clinical interventions.

### IV. CONCLUSION

In summary, our study reveals a higher incidence of osteoarthritis in females aged 45 and above, particularly peaking after 55 years. Common comorbidities include hypertension and diabetes. Total Knee Arthroplasty is predominant (71.4%), with Total Hip Arthroplasty at 28.6%, both with a notable female majority. Antibiotic use mainly involves Inj. Cefuroxime and Inj. Amikacin. These insights inform future strategies for optimizing care in osteoarthritis patients undergoing orthopedic surgeries.

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*Corresponding Author:*

*S P Srinivas Nayak, Assistant Professor, Dept. of Pharmacy Practice, Parul Institute of Pharmacy & Research, Parul University, Vadodara, Gujarat. Email: [sp.nayak19810@paruluniversity.ac.in](mailto:sp.nayak19810@paruluniversity.ac.in)*