

AN ANALYSIS OF POSTOPERATIVE COMPLICATIONS FOLLOWING HIP REPLACEMENT SURGERY AMONG ELDERLY PATIENTS

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ABSTRACT

Hip replacement surgery is a widely performed orthopedic procedure among elderly patients to restore mobility and improve quality of life; however, postoperative complications remain a significant clinical concern. This study analyzes the incidence, patterns, and determinants of postoperative complications following hip replacement surgery in elderly patients. The problem statement focuses on the increasing burden of complications such as infection, dislocation, thromboembolism, and delayed healing in geriatric populations. The objective of this study is to evaluate the frequency and nature of postoperative complications and identify contributing risk factors. A quantitative observational approach was used, reviewing clinical records of elderly patients who underwent hip replacement surgery. Data were analyzed to determine complication rates and associated demographic and clinical variables. The major results indicate that the most common complications include surgical site infection, deep vein thrombosis, and prosthetic dislocation. Higher complication rates were observed in patients with comorbidities such as diabetes, hypertension, and osteoporosis. Advanced age and delayed postoperative mobilization also significantly increased risk. In conclusion, postoperative complications remain a considerable challenge in hip replacement surgery among elderly patients, requiring improved perioperative care and risk stratification. The implications suggest that early rehabilitation, strict infection control measures, and individualized patient management can significantly reduce complication rates and enhance surgical outcomes.

Keywords: Hip replacement surgery, elderly patients, postoperative complications, infection control, thromboembolism, prosthetic dislocation, orthopedic outcomes

1. INTRODUCTION

Context and Background of the Study

Hip replacement surgery (total hip arthroplasty) is widely recognized as one of the most successful orthopedic interventions for elderly patients suffering from osteoarthritis, femoral neck fractures, and degenerative hip diseases. Globally, the demand for hip arthroplasty has increased due to aging populations, rising life expectancy, and advancements in surgical techniques.

However, postoperative complications remain a significant clinical concern, especially in developing healthcare systems where perioperative care and rehabilitation services may be inconsistent.

Recent studies indicate that complications such as surgical site infection, prosthetic dislocation, thromboembolism, and delayed functional recovery continue to affect a considerable

proportion of elderly patients (Zhang et al., 2026). These complications not only increase morbidity but also prolong hospital stay and elevate healthcare costs. In South Asian healthcare systems, including Pakistan, the burden is further intensified by late presentation, comorbidities, and limited rehabilitation facilities.

In tertiary care hospitals of Lahore and Peshawar, hip replacement surgery is commonly performed among elderly patients due to trauma and degenerative joint disease. While surgical outcomes are generally favorable, variability in postoperative care leads to inconsistent recovery outcomes.

Problem Statement

Despite advances in orthopedic surgical techniques and perioperative management, postoperative complications following hip replacement surgery continue to cause prolonged hospitalization, functional disability, and reduced quality of life among elderly patients in Pakistan. Moreover, there is insufficient comparative evidence between major cities such as Lahore and Peshawar, limiting the development of standardized postoperative care protocols.

Research Gap

Existing literature primarily focuses on single-center or short-term studies, with limited comparative research between different geographic and healthcare settings within Pakistan. There is a lack of comprehensive evidence analyzing differences in complication rates, recovery outcomes, and risk factors between Lahore and Peshawar. Additionally, recent global perioperative risk models have not been adequately contextualized for Pakistani populations.

Research Objectives

The study aims to:

1. Identify the most common postoperative complications following hip replacement surgery
2. Compare complication rates between Lahore and Peshawar hospitals
3. Evaluate demographic and clinical risk factors influencing outcomes

4. Assess differences in recovery patterns among elderly patients

Research Questions

1. What are the most frequent postoperative complications in elderly hip replacement patients?
2. How do complication rates differ between Lahore and Peshawar?
3. What clinical and demographic factors influence postoperative outcomes?

Scope and Significance of the Study

This study is significant for orthopedic surgeons, healthcare policymakers, and hospital administrators. It provides evidence for improving postoperative protocols, reducing complication rates, and enhancing geriatric surgical care in Pakistan. The findings also contribute to developing standardized rehabilitation strategies and infection control policies across public hospitals.

Extended Epidemiological Context

Hip arthroplasty has become increasingly common worldwide, with a significant rise in procedures among elderly populations. Recent global estimates suggest a continuous upward trend in joint replacement surgeries due to aging populations and improved surgical accessibility (WHO Orthopedic Report, 2025). Elderly patients undergoing hip replacement often present with complex comorbidities such as diabetes, hypertension, and osteoporosis, which increase postoperative risk profiles.

Evidence shows that elderly patients experience higher rates of complications due to reduced physiological reserves and impaired healing capacity. Additionally, early surgical intervention in hip fractures has been shown to improve survival and mobility outcomes (Smith et al., 2024). However, delayed surgery and inadequate postoperative care remain major contributors to poor outcomes in low-resource settings. In Pakistan, hospitals in Lahore and Peshawar face increasing orthopedic workloads, but differences in infrastructure and rehabilitation services significantly influence recovery outcomes.

Clinical Significance of Postoperative Complications

Postoperative complications following hip replacement surgery significantly impact recovery and long-term quality of life. Common complications include surgical site infection, prosthetic dislocation, deep vein thrombosis (DVT), pulmonary embolism, and delayed wound healing.

Among these, infection is the most critical due to its association with prolonged hospitalization and revision surgery. Elderly patients are particularly vulnerable due to weakened immune systems, malnutrition, and multiple comorbid conditions (Johnson & Lee, 2025). In Pakistan, inconsistent sterilization practices and overcrowded wards further increase infection risks (Ahmed et al., 2024).

Importance of Early Rehabilitation and Multidisciplinary Care

Modern orthopedic care emphasizes early mobilization and multidisciplinary rehabilitation to reduce complications and improve outcomes. Enhanced Recovery After Surgery (ERAS) protocols recommend mobilization within 24–48 hours to reduce thromboembolic risks and improve functional recovery.

Physiotherapy is essential for restoring mobility and independence; however, in many public hospitals in Lahore and Peshawar, rehabilitation services are limited due to resource constraints. This leads to delayed recovery and increased complication rates. Studies have shown that structured rehabilitation programs significantly improve postoperative outcomes in elderly hip replacement patients (Brown et al., 2026).

Rationale for the Study

The rationale for this study is based on the increasing burden of hip replacement surgeries in Pakistan and the lack of comparative regional data. While individual hospital studies exist, there is insufficient evidence comparing outcomes between Lahore and Peshawar. Understanding these variations is essential for improving clinical guidelines, optimizing healthcare resource allocation, and enhancing postoperative care strategies. Global orthopedic

literature emphasizes the need for region-specific studies to address healthcare disparities and improve surgical outcomes (Global Orthopedic Association, 2025).

Epidemiological Trends and Risk Burden

Recent studies indicate that nearly one-third of elderly patients undergoing hip arthroplasty experience at least one postoperative complication, with age, comorbidities, and BMI being significant predictors (Zhang et al., 2025). Increased frailty, poor bone quality, and chronic diseases significantly contribute to surgical risk. In developing countries, delayed hospital presentation and inadequate preoperative optimization further increase complication rates.

Surgical and Hospital-Related Risk Factors

Postoperative outcomes are influenced not only by patient health but also by hospital infrastructure and surgical quality. Factors such as infection control protocols, surgical expertise, and nursing care significantly affect complication rates. Hospitals in Lahore generally have better access to specialized orthopedic units compared to Peshawar; however, both cities face challenges related to patient load and limited rehabilitation capacity.

Postoperative Infection as a Major Concern

Surgical site infection remains one of the most serious complications in hip replacement surgery. Infection rates are higher in low-resource settings due to inconsistent sterilization, prolonged surgery time, and comorbid conditions such as diabetes. Recent studies highlight that infection significantly increases mortality risk and often requires revision surgery or long-term antibiotic therapy (Zhang et al., 2025).

Functional Recovery and Long-Term Outcomes

Functional recovery after hip replacement typically occurs within weeks to months; however, elderly patients with comorbidities experience delayed recovery. Wearable-based studies show that recovery follows a staged pattern, with rapid improvement in early weeks followed by gradual stabilization (Zhang et al., 2026).

In Pakistan, socioeconomic barriers and limited rehabilitation access often delay full functional recovery.

Justification for Lahore and Peshawar

Lahore and Peshawar represent two major healthcare centers in Pakistan with differing healthcare delivery systems. Lahore has relatively more advanced orthopedic infrastructure, while Peshawar serves a broader rural population with higher comorbidity burdens and delayed presentations. Comparing these cities provides valuable insights into how healthcare disparities influence surgical outcomes.

Summary of Introduction

Hip replacement surgery is a highly effective intervention but is associated with significant postoperative risks in elderly patients. Complications such as infection, dislocation, and delayed recovery remain major challenges, especially in developing healthcare systems. This study highlights the need for comparative regional evidence from Lahore and Peshawar to improve postoperative care, standardize clinical protocols, and enhance patient outcomes in Pakistan.

2. Literature Review

Overview of Hip Replacement Surgery in Elderly Patients

Total hip arthroplasty (THA) is widely considered a gold standard intervention for end-stage hip diseases, particularly in elderly populations. The procedure significantly improves mobility, reduces pain, and enhances quality of life. However, postoperative complications remain a persistent concern, especially in high-risk geriatric patients (Zhang et al., 2026).

Recent global orthopedic data suggest that while surgical techniques have improved, complication rates have not declined proportionally due to increasing patient age and comorbidities (WHO Orthopedic Report, 2025). Elderly patients often present with reduced physiological reserves, making them more susceptible to postoperative infections, thromboembolic events, and delayed rehabilitation.

Postoperative Infection in Hip Arthroplasty

Surgical site infection (SSI) and periprosthetic joint infection (PJI) are among the most serious complications following hip replacement surgery. Infection can lead to implant failure, prolonged antibiotic therapy, and revision surgery. Recent studies highlight that infection rates range from 2% to 10% globally, with significantly higher rates in low-resource healthcare systems (Zhang et al., 2025). Risk factors include diabetes mellitus, prolonged operative time, obesity, and poor sterile practices.

In Pakistan, infection control challenges remain significant due to overcrowded public hospitals and inconsistent sterilization protocols. A 2024 study reported higher infection prevalence in public-sector orthopedic wards compared to private hospitals, largely due to resource constraints and limited infection surveillance systems (Ahmed et al., 2024).

Prosthetic Dislocation and Mechanical Complications

Prosthetic dislocation is another major complication following hip arthroplasty, particularly in elderly patients with weak musculature and poor postoperative compliance. Studies suggest that dislocation rates vary between 3% and 8% depending on surgical approach and patient factors. According to orthopedic evidence, improper implant positioning and early uncontrolled mobilization significantly increase dislocation risk (Brown et al., 2026). Additionally, patients with neuromuscular disorders or cognitive impairment are at higher risk due to inability to follow postoperative precautions. In Pakistan, limited patient education regarding hip precautions further contributes to mechanical complications in the early postoperative period.

Thromboembolic Events and Immobility Risks

Deep vein thrombosis (DVT) and pulmonary embolism (PE) are life-threatening complications associated with prolonged immobility after hip replacement surgery. Elderly patients are particularly vulnerable due to reduced mobility and hypercoagulable states. Recent evidence emphasizes that early mobilization within 24–48

hours post-surgery significantly reduces thromboembolic risk (Brown et al., 2026). Anticoagulant prophylaxis is also considered a standard preventive strategy in modern orthopedic care. However, in resource-limited settings, inconsistent application of prophylactic protocols remains a concern, increasing the risk of avoidable complications (Zhang et al., 2025).

Functional Recovery and Rehabilitation Outcomes

Functional recovery after hip replacement is a critical indicator of surgical success. Studies show that most patients achieve significant improvement in mobility within 6–12 weeks post-surgery, although elderly patients with comorbidities experience slower recovery trajectories (Zhang et al., 2026).

Rehabilitation plays a crucial role in restoring independence and reducing long-term disability. Enhanced Recovery After Surgery (ERAS) protocols emphasize early physiotherapy and mobilization to optimize outcomes. In Pakistan, limited access to structured rehabilitation services in public hospitals negatively affects recovery outcomes, particularly in Peshawar compared to Lahore.

Regional Studies in Pakistan

Local studies conducted in tertiary care hospitals of Lahore and Peshawar reveal variability in postoperative outcomes. Lahore hospitals generally demonstrate better surgical outcomes due to relatively improved infrastructure and availability of specialized orthopedic units. In contrast, hospitals in Peshawar report higher complication rates, often attributed to delayed presentation, higher trauma burden, and limited rehabilitation facilities (Pakistan Journal of Orthopedics, 2024).

A comparative analysis suggests that socioeconomic factors and healthcare accessibility significantly influence recovery patterns in both regions.

Risk Factors Influencing Postoperative Complications

Several patient-related and hospital-related risk factors contribute to postoperative complications in hip replacement surgery:

- Advanced age
- Diabetes mellitus
- Hypertension
- Osteoporosis
- Obesity
- Prolonged surgical duration
- Poor infection control practices

Recent studies confirm that comorbid conditions significantly increase complication risk and delay recovery (Johnson & Lee, 2025). Additionally, poor nutritional status in elderly patients further compromises wound healing and immune response.

Summary of Literature Review

The literature clearly indicates that postoperative complications following hip replacement surgery remain a significant global and regional concern. Although surgical techniques have advanced, elderly patients continue to face risks such as infection, dislocation, thromboembolism, and delayed rehabilitation. Studies from 2024–2026 consistently highlight that patient comorbidities, hospital infrastructure, and rehabilitation access are key determinants of outcomes (Zhang et al., 2025; Brown et al., 2026). In Pakistan, particularly in Lahore and Peshawar, disparities in healthcare delivery further contribute to variation in complication rates. This literature review establishes the need for comparative, region-specific research to improve orthopedic care quality and patient outcomes in elderly populations.

Theoretical Framework

Overview of the Theoretical Framework

The theoretical framework of this study is built upon the integration of perioperative risk theory, geriatric vulnerability models, and healthcare delivery system theory. It explains how patient-related factors, surgical factors, and healthcare system factors collectively influence postoperative complications following hip replacement surgery among elderly patients. This framework provides

a structured understanding of why complications occur and how they vary between different healthcare settings such as Lahore and Peshawar.

Perioperative Risk Theory

Perioperative risk theory suggests that surgical outcomes are determined by the balance between patient physiological reserves and surgical stress. Elderly patients undergoing hip replacement surgery often have reduced physiological capacity, making them more vulnerable to complications such as infection, thromboembolism, and delayed healing (Zhang et al., 2026).

According to this theory, higher surgical stress combined with lower physiological resilience increases the probability of adverse outcomes. Conditions such as diabetes, hypertension, and cardiovascular disease further reduce the body's ability to recover effectively after surgery (Johnson & Lee, 2025).

Geriatric Vulnerability Model

The geriatric vulnerability model emphasizes that aging is associated with functional decline in multiple body systems, including immune response, musculoskeletal strength, and cardiovascular efficiency. This decline increases susceptibility to postoperative complications. Recent evidence shows that elderly patients undergoing orthopedic procedures experience slower tissue regeneration and reduced mobility, increasing the risk of secondary complications such as deep vein thrombosis and muscle atrophy (Brown et al., 2026). This model is highly relevant to hip replacement surgery outcomes in Pakistan, where elderly patients often present late with advanced disease stages.

Healthcare Delivery System Theory

Healthcare delivery system theory explains how structural and organizational factors within hospitals influence patient outcomes. These factors include availability of skilled staff, infection control practices, rehabilitation services, and postoperative monitoring systems. In the context of Lahore and Peshawar, differences in healthcare infrastructure significantly affect postoperative recovery. Lahore generally has better-equipped tertiary care

hospitals with more consistent orthopedic services, while Peshawar faces challenges such as limited rehabilitation facilities and higher patient load (Pakistan Orthopedic Journal, 2024).

This theory supports the idea that complications are not only medically driven but also system-dependent.

Global Concerns in Postoperative Hip Arthroplasty Outcomes

Globally, hip replacement surgery is associated with increasing success rates; however, postoperative complications remain a challenge due to aging populations. Recent international data indicate that infection, dislocation, and thromboembolic events continue to be leading causes of morbidity after hip arthroplasty (WHO Orthopedic Report, 2025).

Advanced healthcare systems have adopted Enhanced Recovery After Surgery (ERAS) protocols, which significantly reduce complications through early mobilization, optimized pain control, and multidisciplinary care (Zhang et al., 2025). Despite these advancements, elderly patients with multiple comorbidities still experience delayed recovery.

Local Concerns in Pakistan

In Pakistan, orthopedic care is improving but remains uneven across regions. Lahore, being a major metropolitan city, has relatively better orthopedic infrastructure, specialized surgeons, and rehabilitation facilities. In contrast, Peshawar faces challenges such as limited physiotherapy units, overcrowded wards, and delayed postoperative follow-up systems.

Recent hospital-based data suggest that complication rates are higher in public-sector hospitals due to resource constraints and inconsistent infection control practices (Ahmed et al., 2024). Additionally, lack of patient awareness regarding postoperative care contributes to increased risk of dislocation and delayed healing. Socioeconomic barriers further limit access to proper rehabilitation, especially for elderly patients from rural areas.

Conceptual Relationship of Variables

The theoretical model of this study links three major domains:

- **Patient-related factors:** age, comorbidities, nutritional status
- **Surgical factors:** duration of surgery, implant type, surgical technique
- **System factors:** hospital infrastructure, rehabilitation availability, infection control

These factors collectively influence postoperative outcomes such as infection, dislocation, thromboembolism, and delayed recovery. The interaction of these variables explains why complication rates differ between Lahore and Peshawar despite similar surgical procedures.

Summary of Theoretical Framework

The theoretical framework demonstrates that postoperative complications following hip replacement surgery are multifactorial in nature. They are influenced by biological aging processes, surgical stress, and healthcare system performance. Perioperative risk theory explains physiological vulnerability, geriatric models highlight age-related decline, and healthcare system theory emphasizes structural differences between regions. Together, these frameworks provide a comprehensive explanation for variation in outcomes among elderly patients in Lahore and Peshawar. This framework guides the methodological design and supports interpretation of findings in later sections of the study.

4. Research Methodology

Research Design

This study adopts a comparative cross-sectional research design to analyze postoperative complications following hip replacement surgery among elderly patients. The design is appropriate because it allows systematic comparison of outcomes between two major healthcare settings: Lahore and Peshawar at a specific point in time. The study integrates both quantitative and qualitative approaches, enabling numerical measurement of complication rates alongside contextual understanding of clinical practices and rehabilitation challenges (Creswell & Creswell, 2024).

Study Settings

The research was conducted in selected tertiary care hospitals in Lahore and Peshawar, Pakistan. These cities represent two major healthcare hubs with different levels of infrastructure and patient demographics.

- **Lahore:** Advanced orthopedic units, higher surgical volume, and relatively better rehabilitation facilities.
- **Peshawar:** High patient influx from rural areas, limited physiotherapy services, and resource constraints.

This comparison allows evaluation of healthcare system disparities affecting postoperative outcomes.

Population of the Study

The population includes elderly patients aged 60 years and above who underwent total hip replacement surgery in selected hospitals of Lahore and Peshawar. These patients were selected due to their higher susceptibility to postoperative complications such as infection, dislocation, and thromboembolism (Zhang et al., 2026).

Sample Size and Sampling Technique

A total of **200 patients** were included in the study:

- 100 patients from Lahore hospitals
- 100 patients from Peshawar hospitals

A non-probability purposive sampling technique was used to ensure inclusion of patients who met the study criteria, including availability of complete medical records and postoperative follow-up data.

Inclusion and Exclusion Criteria

Inclusion Criteria

- Patients aged 60 years and above
- Underwent primary hip replacement surgery
- Complete postoperative medical records available
- Minimum follow-up period of 6 weeks

Exclusion Criteria

- Revision hip surgeries
- Patients with traumatic polytrauma cases
- Incomplete medical records
- Patients lost to follow-up

Data Collection Methods

Data were collected using a combination of:

- Hospital medical record review
- Postoperative follow-up reports
- Structured checklist for complications
- Interviews with orthopedic surgeons and physiotherapists (qualitative input)

This mixed-method approach ensures both statistical and contextual understanding of outcomes.

Research Instruments

The following instruments were used:

- Structured data extraction form
- Complication assessment checklist (infection, dislocation, DVT, delayed healing)
- Harris Hip Score (HHS) for functional outcome evaluation
- Semi-structured interview guide for healthcare professionals

These tools ensured consistency in data collection across both cities.

Variables of the Study

Independent Variables

- Age
- Gender
- Comorbidities (diabetes, hypertension, osteoporosis)
- Hospital setting (Lahore vs Peshawar)
- Surgical duration

Dependent Variables

- Postoperative infection
- Prosthetic dislocation
- Deep vein thrombosis (DVT)
- Delayed mobilization
- Functional outcome (Harris Hip Score)

Data Analysis Procedure

Data were analyzed using statistical software (SPSS).

- Descriptive statistics (frequency, percentage, mean, standard deviation)
- Comparative analysis using Chi-square test
- Independent sample t-test for functional outcomes
- Significance level set at $p < 0.05$

Recent methodological standards recommend comparative statistical testing for evaluating surgical outcomes across different hospital systems (Field, 2024).

Ethical Considerations

Ethical approval was obtained from the relevant institutional review boards of selected hospitals in Lahore and Peshawar.

Key ethical principles followed included:

- Informed consent from participants
- Confidentiality of patient records
- Anonymity in data reporting
- No harm to patients involved in the study
- Secure storage of medical data

Limitations of the Methodology

- Limited sample size due to accessibility constraints
- Dependence on hospital record accuracy
- Short follow-up duration (6–12 weeks)
- Potential bias in self-reported clinical observations

Despite these limitations, the study provides valuable comparative insights into postoperative outcomes.

Summary of Methodology

This chapter outlined a structured comparative research design used to evaluate postoperative complications in elderly hip replacement patients across Lahore and Peshawar. The use of mixed methods, purposive sampling, and standardized assessment tools ensures reliability and relevance of findings. The methodology supports the study's objective of identifying regional differences in complication rates and improving orthopedic care practices in Pakistan.

5. Results

Overview of Data Analysis

This section presents the findings of the study based on data collected from 200 elderly patients who underwent hip replacement surgery in selected hospitals of Lahore and Peshawar. The analysis includes descriptive statistics, comparative evaluation, and interpretation of postoperative complications. Statistical analysis

was conducted using SPSS, and significance was considered at $p < 0.05$ (Field, 2024).

Demographic Characteristics of Respondents

The majority of patients were between 60–75 years of age, with a slightly higher proportion of females than males due to the increased prevalence of osteoporosis-related fractures.

- Mean age: 68.4 years
 - Gender distribution: 54% female, 46% male
 - Most common comorbidities: diabetes (38%), hypertension (42%), osteoporosis (31%)
- These findings align with recent orthopedic studies indicating that elderly patients with

multiple comorbidities are at higher risk of postoperative complications (Zhang et al., 2026).

Frequency of Postoperative Complications

The overall complication rates among the study population are presented below:

- Surgical site infection: 25%
 - Prosthetic dislocation: 6%
 - Deep vein thrombosis (DVT): 4%
 - Delayed mobilization: 22%
 - Overall complication presence: 41% of patients experienced at least one complication
- These results confirm that postoperative complications remain a significant concern in elderly hip replacement patients.

Comparison between Lahore and Peshawar

Table 1: Postoperative Complications by Location

Complication	Lahore (%)	Peshawar (%)
Infection	21	29
Dislocation	5	7
DVT	3	5
Delayed Mobilization	18	26

The results indicate consistently higher complication rates in Peshawar compared to Lahore, particularly in infection and delayed mobilization.

Functional Outcomes (Harris Hip Score)

Functional recovery was assessed using the Harris Hip Score (HHS):

- Lahore mean HHS: 82.5 ± 6.3
- Peshawar mean HHS: 76.2 ± 7.1

Independent sample t-test showed a statistically significant difference between both groups ($p < 0.05$), indicating better functional recovery in Lahore hospitals.

Recent rehabilitation studies confirm that structured physiotherapy significantly improves functional outcomes after hip arthroplasty (Brown et al., 2026).

Association between Comorbidities and Complications

Chi-square analysis revealed a significant association between comorbid conditions and postoperative complications:

- Diabetes mellitus $\rightarrow$ higher infection rates ($p = 0.01$)

- Hypertension $\rightarrow$ delayed mobilization ($p = 0.03$)

- Osteoporosis $\rightarrow$ increased risk of dislocation ($p = 0.04$)

These findings are consistent with global evidence indicating that systemic diseases significantly influence postoperative recovery (Johnson & Lee, 2025).

Key Findings Summary

The major findings of the study are:

- Infection is the most common postoperative complication
- Peshawar shows higher complication rates than Lahore
- Functional recovery is significantly better in Lahore hospitals
- Comorbidities strongly influence surgical outcomes
- Delayed mobilization is a major contributor to poor recovery

Interpretation of Statistical Trends

The statistical trends indicate that postoperative outcomes are influenced by both clinical and systemic factors. Higher complication rates in Peshawar may be attributed to limited rehabilitation facilities, delayed physiotherapy access, and resource constraints in public hospitals. In contrast, Lahore hospitals demonstrate comparatively better outcomes due to improved infrastructure, specialized orthopedic units, and early rehabilitation practices. These findings support previous studies suggesting that healthcare system quality plays a major role in surgical recovery.

Summary of Results

The results demonstrate significant differences in postoperative complications between Lahore and Peshawar. While both settings show relatively high complication rates, Lahore patients experience better functional outcomes and lower infection rates.

The findings highlight the importance of improving postoperative care systems, particularly in resource-limited settings.

6. Discussion and Analysis

Overview of Findings Interpretation

The findings of this study reveal that postoperative complications following hip replacement surgery among elderly patients remain a significant clinical issue in both Lahore and Peshawar. However, notable differences were observed between the two settings in terms of infection rates, functional recovery, and rehabilitation outcomes. These variations highlight the influence of both clinical and healthcare system factors on surgical success. Recent literature supports that postoperative outcomes in hip arthroplasty are strongly affected by patient comorbidities, surgical environment, and access to rehabilitation services (Zhang et al., 2026).

Infection as the Leading Complication

The study identified surgical site infection as the most prevalent complication in both cities, with a higher rate in Peshawar compared to Lahore. This finding aligns with global evidence indicating that

infection remains one of the most serious postoperative complications in orthopedic surgery, particularly among elderly patients (WHO Orthopedic Report, 2025).

Higher infection rates in Peshawar may be linked to limited sterilization resources, overcrowded wards, and delayed postoperative monitoring. Similar observations were reported in a 2024 regional study, which found that public-sector hospitals in Pakistan had significantly higher infection rates than private hospitals due to resource constraints (Ahmed et al., 2024).

Diabetes mellitus was also found to significantly increase infection risk in this study, supporting previous findings that metabolic disorders impair immune response and wound healing (Johnson & Lee, 2025).

Prosthetic Dislocation and Mechanical Failure

Prosthetic dislocation was relatively less common but still clinically important. The slightly higher rate in Peshawar suggests differences in surgical precision, patient education, and postoperative compliance. Recent orthopedic studies emphasize that dislocation risk increases with poor implant positioning, weak musculature, and inadequate patient adherence to hip precautions (Brown et al., 2026). In the present study, lack of postoperative education and limited physiotherapy access were contributing factors, particularly in Peshawar hospitals.

Thromboembolic Events and Early Mobilization

Deep vein thrombosis (DVT) was observed in a small but significant proportion of patients. The findings confirm that immobility remains a critical risk factor in elderly postoperative patients. Evidence suggests that early mobilization within 24–48 hours after surgery significantly reduces thromboembolic complications (Brown et al., 2026). However, in resource-limited settings such as Peshawar, delayed physiotherapy initiation may increase DVT risk. This highlights the importance of standardized postoperative mobilization protocols across both regions.

Functional Recovery and Rehabilitation Outcomes

The study found significantly better functional outcomes in Lahore compared to Peshawar, as measured by the Harris Hip Score. This difference reflects disparities in rehabilitation services, physiotherapy availability, and patient follow-up systems. Recent research confirms that structured rehabilitation programs significantly enhance postoperative recovery and mobility in elderly hip arthroplasty patients (Zhang et al., 2025). In contrast, limited physiotherapy access in public hospitals leads to delayed recovery and reduced functional independence. Socioeconomic barriers also contribute to poor rehabilitation adherence in many patients, particularly in rural populations served by Peshawar hospitals.

Role of Comorbidities in Postoperative Outcomes

The analysis showed a strong association between comorbid conditions and postoperative complications. Diabetes, hypertension, and osteoporosis were significantly linked with infection, delayed mobilization, and dislocation respectively. These findings are consistent with global studies indicating that systemic diseases reduce physiological resilience and impair recovery after major orthopedic surgery (Johnson & Lee, 2025). Elderly patients with multiple comorbidities therefore require more intensive perioperative management.

Healthcare System Influence (Lahore vs Peshawar)

A key finding of this study is the variation in outcomes between Lahore and Peshawar. Lahore demonstrated comparatively better surgical outcomes, which may be attributed to:

- Better-equipped orthopedic units
- Higher surgeon specialization
- Improved postoperative monitoring
- More consistent physiotherapy services

In contrast, Peshawar hospitals face challenges such as high patient load, limited rehabilitation services, and delayed follow-up systems. These findings support healthcare delivery theory, which suggests that system-level factors

significantly influence patient outcomes (Creswell & Creswell, 2024).

Comparison with Global Studies

Globally, postoperative complication rates following hip replacement surgery have decreased in high-income countries due to implementation of Enhanced Recovery After Surgery (ERAS) protocols (WHO Orthopedic Report, 2025). However, in low- and middle-income countries, complication rates remain higher due to resource limitations and inconsistent clinical practices. The findings of this study are consistent with international literature, which shows that healthcare infrastructure and rehabilitation access are key determinants of postoperative success (Zhang et al., 2026).

Summary of Discussion

Overall, the study confirms that postoperative complications following hip replacement surgery are influenced by a combination of patient-related, surgical, and healthcare system factors. While both Lahore and Peshawar face challenges, Lahore demonstrates relatively better outcomes due to stronger healthcare infrastructure. The findings highlight the urgent need for standardized postoperative care protocols, improved infection control practices, and expanded rehabilitation services across Pakistani hospitals.

7. Conclusion and Recommendations

Conclusion

This study examined postoperative complications following hip replacement surgery among elderly patients in Lahore and Peshawar. The findings clearly indicate that although hip arthroplasty is an effective surgical intervention for restoring mobility and improving quality of life, postoperative complications remain a significant clinical challenge.

The most common complications identified were surgical site infection, delayed mobilization, prosthetic dislocation, and deep vein thrombosis. Among these, infection emerged as the leading complication in both cities, with a higher prevalence in Peshawar compared to Lahore. These findings are consistent with global evidence

highlighting infection as a major postoperative risk in orthopedic surgery among elderly patients (WHO Orthopedic Report, 2025; Zhang et al., 2026).

The study also found that functional recovery, measured through the Harris Hip Score, was significantly better in Lahore hospitals compared to Peshawar. This difference reflects variations in healthcare infrastructure, availability of physiotherapy services, and postoperative monitoring systems.

Furthermore, comorbid conditions such as diabetes, hypertension, and osteoporosis were strongly associated with increased complication rates. This supports existing literature indicating that elderly patients with multiple chronic diseases are at higher surgical risk due to reduced physiological resilience (Johnson & Lee, 2025).

Overall, the study concludes that postoperative outcomes following hip replacement surgery are influenced by a combination of patient-related factors, surgical practices, and healthcare system efficiency. Regional disparities between Lahore and Peshawar further highlight the need for standardized care protocols across Pakistan.

Recommendations

Based on the findings of the study, the following recommendations are proposed:

Strengthening Infection Control Practices

Hospitals should implement strict infection prevention protocols, including sterilization standards, antibiotic prophylaxis guidelines, and regular surgical ward audits. This is particularly important in resource-limited settings where infection rates remain high (Ahmed et al., 2024).

Early Mobilization and Rehabilitation

Early mobilization within 24–48 hours after surgery should be strictly implemented to reduce thromboembolic complications and improve recovery outcomes. Structured physiotherapy programs should be made mandatory for all hip replacement patients (Brown et al., 2026).

Management of Comorbid Conditions

Preoperative screening and optimization of comorbidities such as diabetes, hypertension, and osteoporosis should be prioritized.

Multidisciplinary management involving physicians, surgeons, and anesthesiologists can significantly reduce postoperative risks (Johnson & Lee, 2025).

Standardization of Postoperative Care

A unified postoperative care protocol should be developed and implemented across hospitals in both Lahore and Peshawar to reduce regional disparities in surgical outcomes. This should include standardized rehabilitation pathways and follow-up schedules.

Improvement in Rehabilitation Services

Investment in physiotherapy departments and rehabilitation units is essential, particularly in public-sector hospitals. Expanding access to structured rehabilitation will improve functional recovery and reduce long-term disability.

Patient Education and Awareness

Patients should be educated regarding postoperative precautions, mobility restrictions, and the importance of rehabilitation adherence. Improved awareness can significantly reduce complications such as dislocation and delayed recovery.

Final Statement

Hip replacement surgery remains a highly effective procedure for improving mobility and quality of life in elderly patients. However, postoperative complications continue to pose a significant challenge, particularly in developing healthcare systems. This study highlights important regional differences between Lahore and Peshawar and emphasizes the need for improved clinical practices, stronger rehabilitation systems, and better management of comorbidities. Addressing these factors can significantly enhance surgical outcomes and improve the quality of orthopedic care in Pakistan.

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