

EFFECTIVENESS OF PHYSIOTHERAPY IN POSTOPERATIVE RECOVERY FOLLOWING JOINT REPLACEMENT SURGERY

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ABSTRACT

Joint replacement surgery is commonly performed to manage advanced degenerative joint diseases such as osteoarthritis and rheumatoid arthritis. Postoperative physiotherapy plays an essential role in improving recovery outcomes by reducing pain, restoring joint mobility, and enhancing functional independence. However, limited retrospective evidence is available regarding the effectiveness of physiotherapy rehabilitation following joint replacement surgery in routine clinical settings. A retrospective observational study was conducted using medical records of 80 patients who underwent Total Knee Replacement (TKR) or Total Hip Replacement (THR) surgeries. Data were collected from orthopedic and physiotherapy departments of a tertiary care hospital. Outcome measures included Visual Analog Scale (VAS) for pain assessment, Range of Motion (ROM), Functional Independence Measure (FIM), and postoperative complications. Pre-treatment and post-treatment outcomes were compared using paired t-test analysis. The findings demonstrated significant improvement in postoperative recovery following physiotherapy rehabilitation. Mean pain scores decreased significantly from 7.38 ± 1.15 to 2.31 ± 1.16 ($p < 0.001$). Mean ROM improved from 60.24 ± 11.74 degrees to 108.54 ± 12.12 degrees ($p < 0.001$), while FIM scores increased significantly from 56.65 ± 8.58 to 87.85 ± 7.82 ($p < 0.001$). Most participants experienced uncomplicated recovery, with only minor postoperative complications reported. The study concluded that physiotherapy rehabilitation significantly improved postoperative recovery outcomes following joint replacement surgery. Structured rehabilitation programs effectively reduced pain, enhanced joint mobility, improved functional independence, and contributed toward safe postoperative recovery among joint replacement patients.

KEYWORDS: Physiotherapy, Joint Replacement Surgery, Postoperative Rehabilitation, Range of Motion, Functional Independence

1. INTRODUCTION

Musculoskeletal disorders and degenerative joint diseases are a dominant source of chronic disability and diminished quality of life globally, especially in elderly people. One of the most common reasons for hip and knee joint pain, stiffness and loss of mobility is due to a condition called osteoarthritis. Joint replacement surgeries are in high demand worldwide due to the growing aging population, sedentary lifestyle, obesity, and chronic degenerative diseases. Thus, rehabilitation after total joint replacement has become an essential part of orthopedic care for improved mobility and restoration of physical function (L. Snell *et al.*, 2018). Joint replacement surgery is a procedure to replace the surfaces of the damaged joints with artificial tissue substitutes to restore their function and alleviate pain. Total Knee Replacement (TKR) and Total Hip Replacement (THR) are two of the most commonly performed orthopedic procedures all over the globe. These surgeries are most commonly recommended for people with advanced osteoarthritis, rheumatoid arthritis, traumatic injury or extreme joint degeneration that makes it more difficult to move around and live a normal life. Postoperative recovery and patient management have been improved with enhanced recovery protocol (ERP) post major joint arthroplasty (Galbraith *et al.*, 2018).

Even though joint replacement surgery is successful, it can still be difficult for many people to recover. Common postoperative complications that impact functional recovery are pain, decreased muscle strength, decreased mobility, decreased range of motion, and delayed ambulation. Good rehabilitative plans are thus vital to get the best possible outcomes patients can achieve following surgery. There are indications that multidisciplinary rehabilitation programs and physiotherapy interventions have an important role in the fast recovery, shorter hospital stay and improved patient results after joint replacement surgery (Bandholm *et al.*, 2018). Physiotherapy rehabilitation has been regarded as an integral part

of post-surgical orthopedic care. Rehabilitation plans aim to promote early mobility, regain joint mobility, regain strength of the surrounding muscles and enhance physical function. Early postoperative physio has been proven to help enhance short term recovery and minimise functional limitation post hip and knee replacement surgery (Haas *et al.*, 2018). In the same way, fast-track protocols applied during the rehabilitation process have shown benefits in the recovery time, satisfaction, and return to functional activity after total hip replacement (THR) surgery (Efford & Samuel, 2023). Structured Physiotherapy after Joint Replacement surgery has been shown to be effective in several studies. Strengthening exercises, gait training, flexibility exercises, endurance training and balance exercises are all part of the rehab program and have shown significant promise in the reduction of pain and functional independence. Evidence-based rehabilitation post hip arthroplasty has been linked to better post-surgical outcomes and long-term results in orthopedic patients (Colibazzi *et al.*, 2020). Post-total shoulder arthroplasty physiotherapy has also demonstrated great efficacy in enhancing postoperative mobility and rehabilitation (Edwards *et al.*, 2020). As a result of their beneficial effects on the postoperative recovery and patient care, Enhanced Recovery After Surgery (ERAS) programs have been gaining increasing attention in the field of orthopedic rehabilitation. ERAS protocols involve a multidisciplinary strategy for rehabilitation, early mobilisation, pain management and physiotherapy to ensure best patient outcomes post-surgery. ERAS has been shown to have a significant effect in recovery outcomes and a reduction in postoperative complications after hip and knee arthroplasty (Frassanito *et al.*, 2020). In a similar vein, systematic reviews have found that systematic recovery protocols improve recovery following major joint replacement surgeries, and that these protocols are effective at hastening functional recovery in that patient population (Deng *et al.*, 2018). There have also been a number of studies on the effectiveness of postoperative physiotherapy in relation to cost-effectiveness and clinical outcomes. Post-total hip replacement physiotherapy rehabilitation has been found to improve mobility and decrease disability, and is a cost-effective postoperative management strategy (Fatoye, Wright, *et al.*, 2020). Similarly, the Physiotherapy interventions after total knee replacement (TKA) has shown significant clinical efficacy in enhancing recovery outcomes and improving the quality of life for patients after TKA (Fatoye, Yeowell, *et al.*, 2021). Measuring functional recovery after joint replacement surgery typically involves measuring decrease in pain, improvement in range of motion (ROM), recovery of mobility and functional independence. Continuous passive motion (CPM) therapy has been shown to be beneficial in the recovery and rehabilitation of patients who have undergone knee arthroplasty (Jia *et al.*, 2024), and when CPM is used in conjunction with physiotherapy, it has been seen to have a positive impact on postoperative recovery. Preoperative resistance training has also been linked to better functional performance after total knee replacement (TKR) and hip replacement (THR) surgery, as well as better rehabilitation outcomes (Jørgensen *et al.*, 2022).

Postoperative rehabilitation is also a crucial aspect in preventing complications related to prolonged immobility and delayed recovery. Physiotherapy interventions have also been reported to decrease postoperative stiffness, muscle weakness and mobility restrictions in orthopedic patients. The literature review revealed that physiotherapy plays a crucial role in enhancing flexibility and restoring joint motion following surgical procedures to prevent postoperative knee stiffness (Kumar *et al.*, 2020). Likewise, post-surgical physical therapy has proven positive results on postoperative recovery after open TMD surgery using structured rehabilitation methods (De Meurechy *et al.*, 2019). It is also crucial to monitor physical activity and participation in rehabilitation following surgery to assess long-term recovery outcomes following joint replacement surgery. Observational studies have shown that physical activity levels are much better after hip and knee arthroplasty when the patients take an active role in their rehabilitation (Hawke *et al.*, 2019). In addition, utilization of post-operative physical therapy services has been linked to improved recovery outcomes and better progression of rehabilitation following total hip and knee replacement surgeries (Groot *et al.*, 2022).

While a number of studies have shown the benefits of physiotherapy rehabilitation after joint replacement surgery, there is still variability in outcomes after surgery, which may related to the type of rehabilitation and the adherence of patients to it as well as to differences in age, comorbidities and functional status. Systematic reviews and meta-analyses have all found that rehabilitation programs play a critical role in enhancing postoperative outcomes following total knee arthroplasty (Alrawashdeh *et al.*, 2021). But there is still only a small amount of retrospective evidence on the effectiveness of physiotherapy rehabilitation in enhancing postoperative recovery outcomes in routine clinical practice. Slow post-operative recovery can negatively impact mobility, independence and quality of life and can also raise the risk for post-operative complications and disability. Hence, it is important to assess the effectiveness of physiotherapy rehabilitation after joint replacement surgery for better evidence-based orthopedic rehabilitation practice and better patient care. Considering these, the present retrospective study has been designed to evaluate the efficacy of physiotherapy in post joint replacement surgeries.

2. METHODOLOGY

2.1 Study Design

This was a retrospective observational study to look into effectiveness of physiotherapy in postoperative recovery after joint replacement surgery. A retrospective design was chosen because it gave an opportunity to evaluate the clinical and rehabilitation results already documented in patient medical records. The study mainly focused on analysing the improvement in pain, range of motion, functional independence and postoperative complications in patients who received physiotherapy rehabilitation treatment following total knee and total hip replacement surgery.

2.2 Study Setting

The study was conducted from patient records in the orthopedic and physiotherapy departments of a tertiary care hospital and rehabilitation center. The data comprised of patients who had undergone joint replacement surgery and then physio

intervention as a post-operative therapy. Patient rehabilitation outcomes were recorded in the hospital records, and physiotherapy assessment files for clinical follow up and treatment evaluation purposes, throughout the study period.

2.3 Study Population and Sample Size

Patients who had undergone Total Knee Replacement (TKR) surgery or Total Hip Replacement (THR) surgery and postoperative physiotherapy rehabilitation program were included in the study population. In total, 80 patient records were analysed. The subjects selected were males and females from various age groups. All complete data records with demographic, clinical, rehabilitation and outcome assessment information were deemed suitable for use in the analysis of the retrospective study.

2.4 Sampling Technique

Patient records were selected from the hospital database using convenience sampling technique. Patient records that met the inclusion criteria and had complete physiotherapy rehabilitation data were included in the study. Records that contained incomplete information, no postoperative assessment or inadequate rehabilitation documentation were not used. The chosen sampling methodology was found to be suitable for retrospective clinical investigations, as it allowed an efficient use of the available patient records in order to assess outcome and rehabilitation.

2.5 Inclusion and Exclusion Criteria

The study was conducted on patients aged > 45 years who underwent total knee or total hip replacement surgery and undergone postoperative physiotherapy rehabilitation. Records were only included if the patient had undergone pre-treatment and post-treatment evaluations. Patients who had revision surgeries, neurological disease that would interfere with mobility, traumatic fractures, malignancies and those without complete medical records were excluded. These criteria were set up to achieve uniformity of study subjects and the reliability of postoperative rehabilitation outcome assessment.

2.6 Data Collection Procedure

Retrospective data was gathered from hospital medical records, physiotherapists assessment sheets and rehabilitation documentation in a structured format. Demographic factors including age, gender and BMI as well as clinical factors like type of surgery, duration of hospital stay and number of physiotherapy sessions attended were documented. Pre-treatment and post-treatment physiotherapy assessment records were retrieved and used for statistical analysis of outcome variables such as pain scores, range of motion measurements, functional independence scores and postoperative complications.

2.7 Physiotherapy Rehabilitation Protocol

Postoperative physiotherapy rehabilitation program involved early mobilization exercises, gait training, muscle strengthening exercises, balance exercises, flexibility exercises, and functional mobility activities. Depending on the patient's condition, stage of recovery, and functional deficits following surgery, rehabilitation interventions were tailored. In hospital and rehabilitation follow-up periods patients received supervised physiotherapy. The main goal of the rehabilitation protocol was to minimize postoperative pain, increase joint mobility, decrease the need for functional support and prevent postoperative complications after joint replacement surgery.

2.8 Outcome Measures

Several clinical outcome measures were used to assess the effectiveness of physiotherapy rehabilitation. The degree of pain was determined by the Visual Analog Scale (VAS) and the range of motion (ROM) was evaluated. The Functional Independence Measure (FIM) scoring system was used to assess functional recovery and independence. The other clinical findings on walking independence and postoperative complications were also noted. The pre-treatment and post-treatment outcome measurement was compared to see the effectiveness of physiotherapy rehabilitation interventions.

2.9 Statistical Analysis

The data collected were coded and analyzed using MS. Excel. Demographic and clinical variables were presented using descriptive statistics such as mean, SD, frequency and percentage and correlation. Pre and post treatment outcome measures were compared using paired t-test analysis. The p-values were used to determine statistical significance and a p-value of < 0.05 was deemed statistically significant for all the inferential statistical analyses conducted in the study.

3. RESULTS

3.1 Demographic and Clinical Profile of Participants

Demographic analysis showed that the participants mean age was 61.36 ± 9.83 years and mean BMI was 28.86 ± 4.09 kg/m². The male patients in the study accounted for 62.5%, while females accounted for 37.5%. Most of the patients had Total Knee Replacement (63.75%) and the remaining had Total Hip Replacement (36.25%). Patients had a mean hospital stay of 7.73 ± 2.32 days and a mean of 11.72 ± 4.72 physiotherapy sessions throughout postoperative rehabilitation (Table 1).

Table 1. Demographic and Clinical Profile

Variable	Frequency (%) / Mean \pm SD
Age (years)	61.36 ± 9.83
BMI (kg/m ²)	28.86 ± 4.09
Male	50 (62.5%)
Female	30 (37.5%)

Total Knee Replacement	51 (63.75%)
Total Hip Replacement	29 (36.25%)
Hospital Stay (days)	7.73 ± 2.32
Physiotherapy Sessions	11.72 ± 4.72

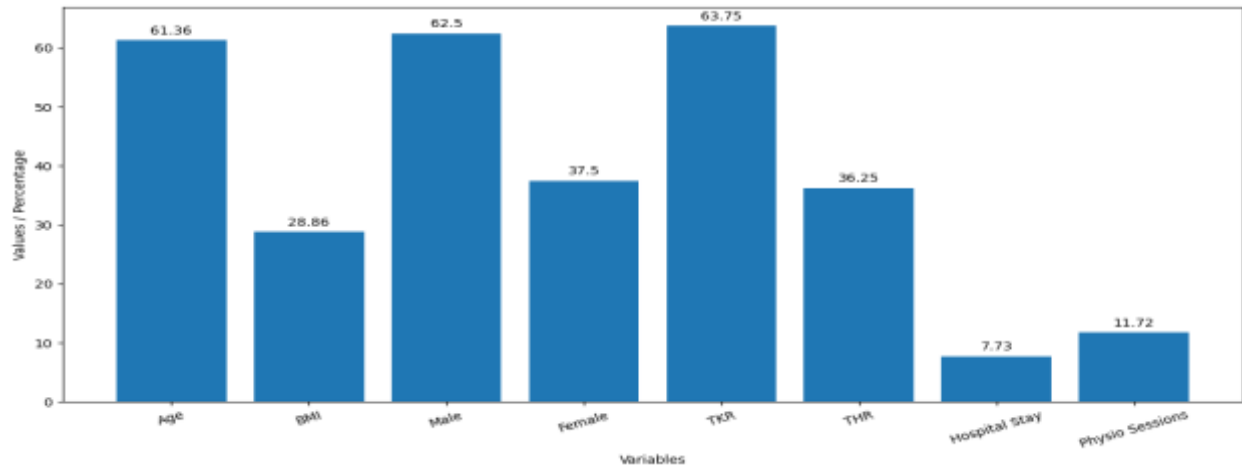


Figure 1. Demographic and Clinical Profile

The demographic and clinical characteristics of the study population used for the retrospective analysis is shown in Figure 1. This figure shows the distribution of gender, type of joint replacement surgery, average age, body mass index, time spent in hospital and number of physiotherapy sessions during postoperative rehabilitation of patients who underwent joint replacement surgery.

3.2 Effect of Physiotherapy on Postoperative Pain

There was a significant reduction in pain scores after physiotherapy when using the Visual Analog Scale (VAS). The mean score for pain before rehabilitation was 7.38 ± 1.15 and was significantly reduced following rehabilitation to 2.31 ± 1.16 . The postoperative pain scores were decreased significantly ($t = 28.69, p < 0.001$) as shown by paired t-test analysis. The results also show that physiotherapy was crucial to decrease pain and improve patients' postoperative comfort (Table 2).

Table 2. Comparison of Pre- and Post-Treatment Pain Scores

Variable	Mean ± SD	t-value	p-value
Pre-treatment VAS Score	7.38 ± 1.15	28.69	<0.001*
Post-treatment VAS Score	2.31 ± 1.16		

3.3 Effect of Physiotherapy on Range of Motion (ROM)

There was a significant improvement in joint mobility following physiotherapy rehabilitation. The mean pre-treatment range of motion (ROM) was 60.24 ± 11.74 degrees and the mean post-treatment ROM was significantly greater at 108.54 ± 12.12 degrees. The paired t-test analysis showed that there was a highly significant improvement in the ROM values after physiotherapy intervention ($t = -22.30, P < 0.001$). The results indicate that the postoperative rehabilitation had a good effect on the Flexibility of the patients included in the study and the functional movement of the joint was increased. (Table 3)

Table 3. Comparison of Pre- and Post-Treatment Range of Motion

Variable	Mean ± SD	t-value	p-value
Pre-treatment ROM	60.24 ± 11.74	-22.30	<0.001*
Post-treatment ROM	108.54 ± 12.12		

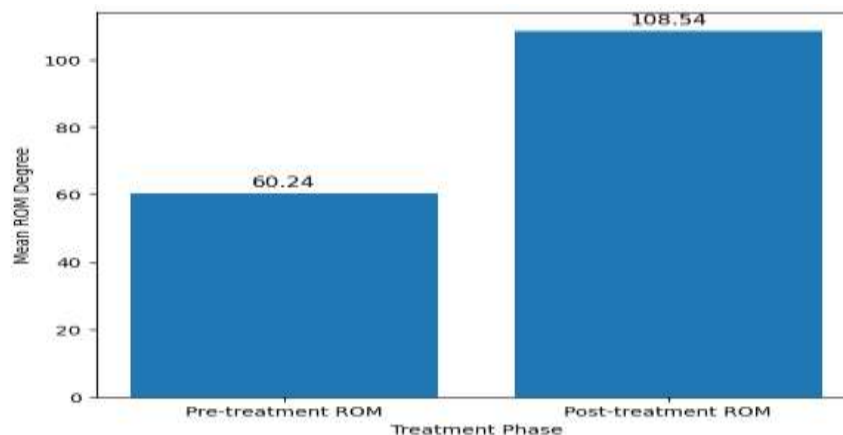


Figure 2. Comparison of Pre- and Post-Treatment Range of Motion

Before and after physiotherapy rehabilitation, the joint ROM of patients who had undergone joint replacement was compared as shown in Figure 2. The figure illustrates a significant improvement in postoperative mobility after the rehabilitation intervention, highlighting the positive impact of physiotherapy in promoting joint flexibility, restoring functional movement and improving overall postoperative recovery outcomes.

3.4 Effect of Physiotherapy on Functional Independence

There was a significant improvement in functional independence measure (FIM) scores after physiotherapy rehab post-surgery. The pre-treatment FIM score mean was 56.65 ± 8.58 while the post-treatment FIM score mean was 87.85 ± 7.82 . Statistically significant improvement in functional independence following physiotherapy intervention was found using paired t-test ($t = -22.21$, $p < 0.001$). Results showed physiotherapy played a significant role in a patient's postoperative capacity to perform day to day activities alone following joint replacement surgery (Table 4).

Table 4. Comparison of Pre- and Post-Treatment Functional Independence Scores

Variable	Mean \pm SD	t-value	p-value
Pre-treatment FIM Score	56.65 ± 8.58	-22.21	<0.001*
Post-treatment FIM Score	87.85 ± 7.82		

3.5 Postoperative Complications Following Rehabilitation

The postoperative complications were evaluated and it was found that most patients had an uncomplicated recovery after physiotherapy rehabilitation. Joint stiffness was noted in 12.5% of the patients and minor infection was noted in 2.5% of patients only. 85.0% of the participants stated that they suffered from no postoperative complications during the rehabilitation period. These results show that physiotherapy rehabilitation was related to safe postoperative recovery and low rate of complications among joint replacement patients (Table 5).

Table 5. Distribution of Postoperative Complications

Complication	Frequency (%)
No Complications	68 (85.0%)
Joint Stiffness	10 (12.5%)
Minor Infection	2 (2.5%)

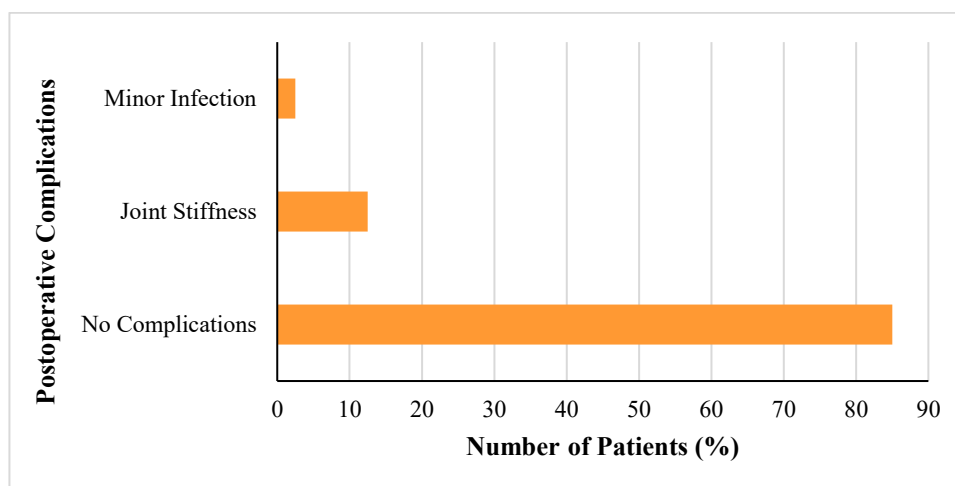


Figure 3. Distribution of Postoperative Complications Following Physiotherapy Rehabilitation

The distribution of postoperative complications reported by the joint replacement patients after the physiotherapy rehabilitation is shown in Figure 3. Most of the participants had no difficulties with their postoperative recovery, with a very small amount of stiffness in the joints or minor infection. The results show that physiotherapy rehabilitation was related to safe recovery outcomes and low postoperative complications.

3.6 Correlation Between Rehabilitation Variables and Recovery Outcomes

To explore the relationships between physiotherapy rehabilitation parameters and postoperative recovery outcomes in joint replacement patients, correlation analysis was conducted. Results showed a weak positive correlation with the number of physiotherapy sessions and an improvement in ROM, indicating that with more physiotherapy sessions, better mobility may be achieved post-surgery. There was a weak negative correlation between pain reduction and ROM improvement and a slight negative correlation between age and functional independence improvement after rehabilitation (Table 6).

Table 6. Correlation Between Rehabilitation Variables and Recovery Outcomes

Variables	Correlation Coefficient (r)
Physiotherapy Sessions vs ROM Improvement	0.117
Pain Reduction vs ROM Improvement	-0.213
Age vs FIM Improvement	-0.195

4. DISCUSSION

The aim of the present retrospective study was to assess the efficiency of physiotherapy in postoperative recovery after joint replacement surgery. Following Total Knee Replacement (TKR) and Total Hip Replacement (THR), patients showed significant improvement in pain relief, range of motion, and functional independence with physiotherapy rehabilitation. These results showed that structured rehabilitation programs had a positive impact on postoperative recovery and restoration of mobility. Sattler *et al.*, (2020) reported similar findings, highlighting the importance of modern rehabilitation strategies after TKA for recovery after surgery and functional performance. One of the key results of the current study was the substantial decrease in postoperative pain after physiotherapy intervention. One of the main aims of post-operative rehabilitation is pain management as uncontrolled pain can hinder the mobilization and increase the length of recovery. The decrease in Visual Analog Scale (VAS) scores seen in the present study showed the efficacy of physiotherapy in enhancing patient comfort and progression of their rehabilitation. Wylde *et al.* (2018) found similar results when they found that postoperative rehabilitation interventions significantly reduced chronic pain severity after total knee replacement surgery.

Another important finding in the present study was that there was a highly significant improvement in postoperative range of motion (ROM) following physiotherapy rehabilitation. Restoration of ROM is important for increasing joint flexibility, mobility and functional activity after arthroplasty. The observed results are consistent with the rehabilitation exercises for improving post-surgical joint mobility and stiffness. Songsong *et al.* (2023) found that an enhanced recovery program and quantitative rehabilitation training resulted in improved early postoperative recovery and mobility following total knee replacement, supporting similar findings. Study participants' Functional Independence Measure (FIM) scores showed a significant increase after rehabilitation. The improvement in functional independence indicates that physiotherapy interventions were effective in improving patients' ability to perform activities of daily living independently. The positive results in terms of postoperative functional recovery observed in the present study may be attributed to the early mobilization, strengthening exercises, gait training, and flexibility exercises. Similar results were obtained by Van Egmond *et al.* (2018), who stated that physiotherapy and telerehabilitation strategies proved to be effective in enhancing postoperative recovery outcomes and physical functioning of surgical patients.

Postoperative complication profile in this study revealed that majority of the subjects had uncomplicated postoperative period after undergoing physiotherapy rehabilitation. The rate of joint stiffness or minor infection was small in number of patients, suggesting that rehabilitation interventions may play a role in the safe recovery and decreasing postoperative complications. Pritchard *et al.* (2020) also found that enhanced recovery and rehabilitation after hip and knee arthroplasty (HA or KA) were clinically effective and economically valuable to improve patient outcomes and reduce health-care burden. The current results also confirm the need for strong and evidence-based rehabilitation post joint replacement surgery. Postoperative functional outcomes and mobility have been improved with high-intensity physiotherapy interventions among arthroplasty patients. The same results were found by Vasileiadis *et al.* (2022) who presented that physiotherapy training before and after TKA had a significant positive impact on functional recovery. Additionally, patient education and improved recovery strategies that focus on rehabilitation have been identified as crucial components in optimizing postoperative recovery (Wainwright & Burgess, 2018). Results showed a weak positive correlation with the number of physiotherapy sessions and an improvement in ROM, indicating that with more physiotherapy sessions, better mobility may be achieved post-surgery. There was a weak negative correlation between pain reduction and ROM improvement and a slight negative correlation between age and functional independence improvement after rehabilitation. The findings from the present study indicate that structured physiotherapy rehabilitation should be included in the standard postoperative orthopedic care. Pain management, strengthening exercises, gait training, flexibility exercises and functional mobility can be important components of rehabilitation programs that can help speed recovery and enhance quality of life for those undergoing joint replacement surgery. The results indicate that physiotherapy rehabilitation programmes are still a vital part of the enhanced recovery pathway following orthopaedic surgery.

There were limitations to the study. As the study was a retrospective one, cause-and-effect conclusions between physiotherapy intervention and recovery outcomes could not be made. The study employed a relatively small study population, with only one clinical setting, which may limit the generalizability of the findings. Long term rehabilitation outcome and long term follow up of the patients to the therapy protocols were also not assessed. Future studies should, therefore, involve larger multicenter populations, prospective study designs, and long follow-up evaluations to further investigate the effectiveness of physiotherapy rehabilitation after the joint replacement surgery.

5. CONCLUSION

The current retrospective study assesses the effectiveness of physiotherapy in postoperative recovery after joint replacement surgery (Joint Replacement Surgery (JRS) in people with Total Knee Replacement (TKR) and Total Hip Replacement (THR). Results showed that physiotherapy rehabilitation was effective in improving the postoperative outcomes such as pain, range of motion (ROM) and functional independence. The statistical analysis showed highly significant results between pre-treatment and post-treatment evaluations, suggesting that structured physiotherapy interventions had a crucial role in improving the postoperative recovery and restoring physical function in patients who underwent a joint replacement. The researchers also showed that the recovery was uncomplicated for the majority of participants in the rehabilitation phase, with only a few developing postoperative complications (joint stiffness or minor infection). These results indicate that in addition to functional improvement, physiotherapy rehabilitation also facilitated better postoperative recovery. The findings of the current study corroborate the use of evidence-based physiotherapy rehabilitation in the conventional post-operative orthopedic treatment. Enhanced recovery pathways in joint replacement surgery should include structured rehabilitation programs as key elements. Although the study may have some drawbacks, including retrospective design, the authors acknowledge the limitations of relatively small sample size and the lack of long-term follow-up evaluation, the article still offers valuable clinical evidence on the benefits of physiotherapy

following surgery. Larger population prospective studies across multiple centers with long-term assessment are suggested to enhance evidence on rehabilitation in the postoperative care of orthopedic patients in the future.

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