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The effects of prehabilitation on the functional status of patients undergoing total joint arthroplasty: A Literature Review

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ABSTRAK

***Latar Belakang**: Total joint arthroplasty (TJA) telah terbukti sebagai pengobatan pilihan untuk penyakit stadium akhir pada osteoarthritis (OA) pinggul maupun lutut. Operasi TJA biasanya bersifat elektif. Terdapat kesenjangan waktu yang lama antara diagnosis dan operasi itu sendiri, sehingga hal itu menimbulkan potensi penurunan fungsi selama periode pra operasi, disertai dengan efek keparahan penyakit yang lebih besar pada hasil pasca operasi. Oleh karena itu, manajemen pra operasi penting dalam persiapan TJA dalam memberikan kesempatan untuk meningkatkan fungsi pada individu yang menunggu TJA dan meningkatkan pemulihan fungsional pasca operasi. Program latihan pra operasi, yang disebut prehabilitasi, telah dipelajari untuk meningkatkan hasil sebelum dan sesudah operasi. Pelaksanaan prehabilitasi sebelum TJA dalam berbagai literatur terbaru memiliki banyak manfaat untuk meningkatkan status fungsional.*

***Tujuan**: Tinjauan pustaka ini bertujuan untuk menilai efek prehabilitasi terhadap status fungsional pada pasien dengan TJA.*

***Metode**: Artikel ini mengunakan kajian literatur yang diperoleh melalui pencarian pada database online EBSCO, Science Direct, Proquest, dan Scopus dengan kriteria inklusi memiliki full text, dipublikasi tahun 2016-2021, dan berbahasa Inggris yang kemudian dicocokan dengan kata kunci spesifik untuk mendapatkan artikel yang sesuai.*

***Hasil**: Sebanyak 7 artikel terpilih telah direview yang sesuai dengan tujuan penelusuran dan hasilnya disajikan dalam bentuk tabel. Hasil artikel menunjukkan bahwa partisipan dalam penelitian ini terdiri dari pasien yang menjalani TKA atau THA.*

***Kesimpulan:**Berdasarkan telaah review pada jurnal pilihan, didapatkan bahwa prehabilitasi memberikan beberapa manfaat diantaranya meningkatkan kekuatan otot, peningkatan ROM, mengurangi rasa nyeri, mengurangi lama tinggal di rumah sakit serta pemulihan fisik dan fungsional yang lebih cepat pasca operasi TJA.*

KATA KUNCI*: arthroplasty; prehabilitasi; preoperative exercise; status fungsional*

ABSTRACT

***Background**: Total Joint Arthroplasty (TJA) has been proven as the common procedure for end-stage disease in both hip and knee OA. TJA surgery is usually elective. There is a long waiting time between the diagnosis and the surgery, creating a potential for functional decline during the preoperative period that makes a greater effect of disease severity on postoperative result. Therefore, preoperative management is important in TJA preparation*

in allowing an opportunity window to improve function in patients waiting for TJA surgery and improve postoperative functional recovery. Preoperative exercise programs, known as prehabilitation, have been studied to improve results, before and after surgery. The implementation of prehabilitation before TJA in the recent literature has been shown has many benefits to improve functional status

***Objectives**: This literature review sought to assess the effects of prehabilitation on the functional status of patients undergoing TJA.*

***Methods**: This review made use of articles obtained through online search on the database of EBSCO, Science Direct, Proquest, and Scopus, with inclusion criteria having full text, published in 2016-2021, and written in English which then matched with certain specific keywords to get the appropriate article.*

***Results**: A total of 7 selected articles have been reviewed in accordance with the search objectives and the results are presented in tabular form. The results of the article indicate that the participants in this study consisted of patients who underwent TKA or THA.*

***Conclusions**: Based on a review conducted on selected articles, it was revealed that prehabilitation provides several benefits including increasing muscle strength, increasing ROM, reducing pain, reducing hospital stay duration, and allowing faster physical and functional recovery after TJA surgery.*

KEYWORD: *arthroplasty; prehabilitation; preoperative exercise; functional status*

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INTRODUCTION

Total Joint Arthroplasty (TJA) is the most common elective surgical procedure. Total Knee Replacement (TKR) and Total Hip Replacement (THR) surgeries can result in a huge economic burden on global healthcare, as they are expected to increase by 673% and 174%, respectively, between 2005 and 2030 (1) .

Improved general health before surgery can be associated with better postoperative results and fewer complications for patients undergoing different types of surgical interventions. A preventive approach to improve the functional capacity of patients before surgery, generally known as “prehabilitation”, includes a range of physiotherapy and/or cognitive behavioral treatments aimed at improving specific capacities, physical status, pain perception, surgical experience, and consequences experienced by patients (2)although effective, results in suboptimal outcome and degrees of disability in a relevant proportion of patients. Postoperative rehabilitation has failed to demonstrate efficacy in the mid and long term. So-called “prehabilitation” (physiotherapy and/or cognitive-behavioural therapy

The concept of prehabilitation exercise is to prepare patients by improving their functional status before receiving surgery. Patients undergoing elective joint replacement surgery generally exhibit severe functional impairment and muscle weakness due to pain and lack of physical activity (1). Impaired muscle strength, speed, agility and dynamic balance, appear to be decent predictors of delayed postoperative functional recovery from THR (3)scheduled for primary total hip replacement due to late stage osteoarthritis. The intervention group will receive patient education and exercise for 6-12 weeks. The control group will receive care as usual.

The primary outcome is gait speed. Secondary outcomes are lower body strength, mobility, aerobic capacity, activity of daily living, length of stay at the hospital, referral to an inpatient rehabilitation clinic, pain, quality of life and cost-effectiveness. Estimated sample size is 150 participants randomised into the two arms. The data will be analysed following the intention-to-treat principle with methods for repeated measurements. Ethics and dissemination: The project proposal has been approved by The Regional Committee for Medical Research Ethics in South Norway (ref no. 2018/503.

The number of articles reviewing rehabilitation of patients awaiting elective joint replacement surgery continues to grow. Several studies have suggested that well-designed prehabilitation exercise programs can improve range of motion, physical function, and quality of life in patients awaiting joint replacement surgery. This action leads to improved postoperative results compared to individuals following the standard care. In contrast, other researchers have shown that prehabilitation exercises are not effective in improving postoperative results (1).

MATERIALS AND METHODS

A systematic approach was used to compile this literature study. The research question that was formulated was, " "What is the effect of prehabilitation on functional status in total joint arthroplasty patients?". This research implemented a literature review method, obtaining articles through online search on the database of EBSCO, Science Direct, Proquest, and Scopus using the keywords "prehabilitation, arthroplasty, functional status".

The articles found were read carefully to see if they met the inclusion criteria to be used in this literature review. The inclusion criteria selected articles published in 2016-2021, written in English, and full text. The search ended up with seven articles from indexed international journals.

RESULTS AND DISCUSSION

RESULTS

The database search results obtained 7 articles. There were 2 articles found that met the publication criteria in 2017 and 2020, respectively, three articles published in 2016, and 2 articles published in 2021. The results of the article indicate that the participants in this study consisted of patients who underwent TKA or THA. There were two articles using TKA participants, four articles using TJA (TKA and THA) participants and one article using THA participants.

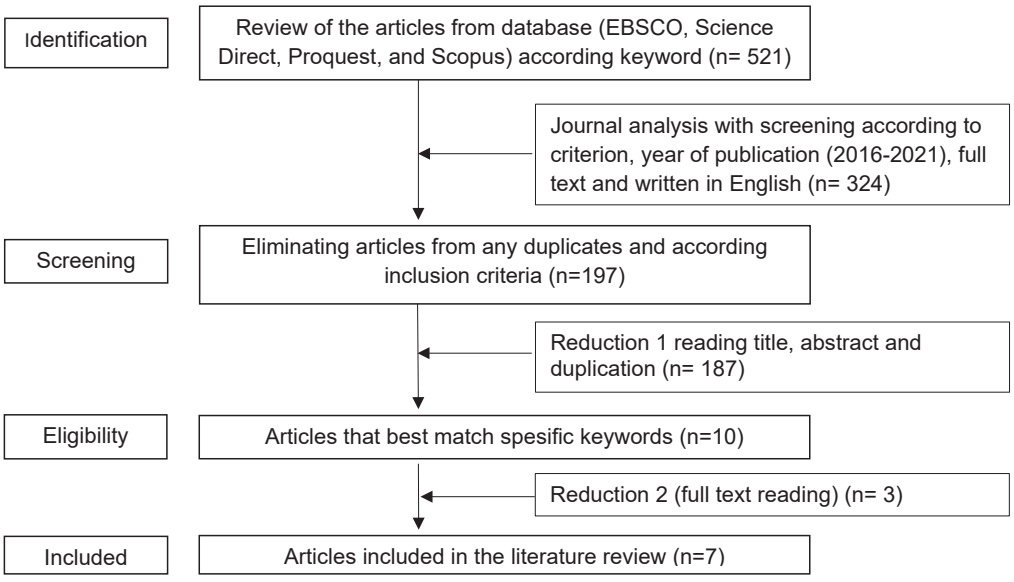

Figure 1: Article Selection Process

The following table presents the articles that have been analyzed in relevant with the research theme:

Table 1: Results of review of various article of effect prehabilitation in patients undergoing total joint arthroplasty

Year	Title	Sample	Method	Result	Conclusion
2021	Effects of Preoperative Telerehabilitation on Muscle Strength, Range of Motion, and Functional Outcomes in Candidates for Total Knee Arthroplasty: A Single-Blind Randomized Controlled Trial (4)	Patients scheduled to undergo primary TKA for treating advanced knee OA were recruited from an orthopedic surgical rehabilitation hospital. The Inclusion criteria were: • scheduled for bilateral TKA • aged between 65 and 75 years • having efficient control of comorbidities • capable of walking more than 10 m without assistance • having average vision and hearing • filling consent to voluntary participation in a preoperative rehabilitation program with the approval of the surgeon • without cognitive impairment and with good communication skills • familiar with smartphone applications	Method: This research was a three-arm, parallel-group, single-blind randomized controlled trial. Collection: Preoperative telerehabilitation interventions were performed 3 weeks before TKA procedure. Therefore, examinations were carried out at three different points. Baseline data and post-intervention data were collected at 4 weeks and 1 day before TKA procedure, respectively. Follow-ups were completed 6 weeks after TKA. These three measurement points were used to evaluate the effect of preoperative intervention on the patients' physical function, pain, muscle strength, daily activities, and quality of life after TKA. The intervention group participated in a 3-week intensive exercise program (30 minutes / session, 2 times/day, 5 days / week) before TKA.	Quadriceps strength was measured using a dynamometer; WOMAC evaluated pain, stiffness, and function of patients with knee OA who had undergone TKA; Self-passive knee flexion ROM was measured using a digital goniometer; The TUG test was used to assess dynamic balance ability and to predict falls in elderly population	Preoperative telerehabilitation program has a positive effect on functional outcomes after TKA. The intervention improves patient-reported functional outcomes, muscle strength, and ROM of those with end-stage OA undergoing TKA. The patients reported better scores of pain at 6 weeks after TKA.

Year	Title	Sample	Method	Result	Conclusion
			The control group received standard care before TKA.		
2016	High-intensity preoperative training improves physical and functional recovery in the early post-operative periods after total knee arthroplasty: A randomized controlled trial (5)	All patients aged over 60 years and diagnosed with advanced idiopathic knee OA (according to the radiological criteria of the American College of Rheumatology Guidelines) and scheduled for unilateral TKA at a local hospital during 2014 were considered candidates and asked to participate.	Method: Randomized controlled trial Data Collection: The intervention group completed a preoperative training program for 3 days per week, for 8 weeks. The training session began with a 15-minute warm-up. A warm-up set was also performed before each resistance exercise using light resistance for 10 repetitions. The main program consisted of 5 sets of 10 repetitions for each exercise, with 60 second rest between sets. Each training session concluded with a 5-minute mild static cool-down on the hip abductors, flexors, and extensors of the knee and ankle plantar flexors.	The University of Western Ontario and McMaster Osteoarthritis Index (WOMAC), Physical Function Scale of Short Form-36 questionnaire (SF-36), 10 cm visual analog scale (VAS), isometric knee flexion, isometric knee extension, isometric hip abduction, active knee range of motion and functional tasks (Timed Up and Go test and Stair ascent-descent test) were assessed at 8 weeks before surgery (T1), after 8 weeks of training (T2), 1 month after TKA (T3), and 3 months after TKA (T4). The intervention group completed a program of 8 week training 3 days per week before surgery.	Preoperative training for end-stage OA patients supports an improvement in early postoperative outcomes. High-intensity strength training during the preoperative period reduces pain and improves lower leg muscle strength, ROM and functional task performance before surgery, resulting in reduced length of hospital stay and allowing faster physical and functional recovery after TKA.

Year	Title	Sample	Method	Result	Conclusion
2017	Preoperative Physical Therapy Education Reduces Time to Meet Functional Milestones After Total Joint Arthroplasty (6)	Inclusion Criteria: Patients scheduled for unilateral TJA (THA or TKA), aged between 18 and 85 years, able to independently ambulate half a block or more with or without assistive devices, able to independently perform nonreciprocal stairs with or without assistive devices, and planned to be discharged after surgery. The patients were then randomized into two groups. One group (control; n = 63) received no further treatment after group education classes. The other group (experimental; n = 63) received preopPTEd.	Method: randomized controlled trial between February and October 2015 Data Collection: PreopPTEd consisted of one-time, one-on-one sessions with a physical therapist to learn and practice postoperative precautions, exercises, bed mobility, and ambulation with and negotiation of stairs. After this session, all patients in the preopPTEd group were given access to a special lateral joint microsite that provided detailed information on exercises, transfers, ambulation, and activities of daily living via video, images, and text.	Postoperative pain, stiffness, and function were assessed using the WOMAC score administered before and after surgery (approximately 4-6 weeks).	Increased readiness to leave PT, no effect on LOS or WOMAC scores at 6 weeks.
2021	The effect of a preoperative physical therapy education program on short-term outcomes of patients undergoing elective total hip arthroplasty: A controlled prospective clinical trial (7) parallel-group controlled clinical trial was conducted from September 2016 to July 2018. Fifty patients who were scheduled for a first elective	This research involved patients scheduled for the first elective THA procedure at Barzilai Medical Center, Ashkelon, Israel. Fifty patients were recruited, with 25 in each group (intervention and control).	Method: A prospective parallel-group controlled clinical trial was conducted between 9/2016 and 7/2018. Data Collection: 2 to 4 weeks preoperatively, patients were asked to arrive at the hospital and meet with operating room staff (anesthesiologist, orthopedic surgeon and nurse). During the preoperative visit, two groups of patients undergoing THA were generated. One group met with operating room staff and received information	Functional status was evaluated using The Oxford Hip Score (OHS) before surgery and 6 weeks after surgery. Length of Hospitalization (LOS) was also recorded. Anxiety was measured using Spielberger's State-Trait Anxiety Inventory questionnaire before surgery and on the second postoperative day. Walking and balancing	Structured physical therapy and interactive educational sessions significantly reduce postoperative short-term anxiety and pain when walking, improved mobility and function, encourage discharge, and increase post-THA patient satisfaction levels.

Year	Title	Sample	Method	Result	Conclusion
	education program; THA procedure were recruited and were equally allocated into one of two groups: intervention and control groups. While all patients received the routine preparation for the procedure, the intervention group underwent an additional structured physical therapy education session. Functional status was evaluated using The Oxford Hip Score (OHS		related to a preoperative physical therapy The second group met with operating room staff without receiving any information regarding the physiotherapy education program. Educational sessions led by a physical therapist last 20 to 30 minutes including oral presentations and PowerPoints and answering patient questions. In addition, the patients received information booklet related to the hip surgery to be performed.	abilities were assessed using the Tinetti Performance-Oriented Mobility Assessment (POMA) on the second postoperative day. Pain at rest and during weight bearing were measured by Numerical Rating Scale (NRS) on the second postoperative day. The level of satisfaction was evaluated by the NRS 6 weeks after surgery.	
2016	The effect of prehabilitation on the range of motion and functional outcomes in patients following the total knee or hip arthroplasty: A pilot randomized trial (8)	Patients undergoing elective total hip or knee arthroplasty were recruited from Orthopedic Surgical Review Clinics (SRC) in the healthcare network with a Risk Assessment and Prediction Tool (RAPT) with a score of 6. Sixty-four individuals who underwent elective lower limb arthroplasty were included.	Method: This research implemented a prospective pilot randomized controlled design with assessor blinding. Data Collection: Prehabilitation included one-hour sessions twice weekly for at least three and a maximum of four weeks prior to surgery. Control participants did not complete the pre-surgical program. Prehabilitation participants were assessed by a physiotherapist prior to attending a one-hour group training and education session. Patients attended twice weekly, one-hour sessions,	The main outcome measures were the EQ-5D-3L and the patient-specific functional scale (PSFS). The EQ-5D-3L was an internationally recognized measure of health-related quality of life. PSFS was used to measure activity limits and measure functional outcomes over time. Active range of motion (knee only) was assessed using a universal goniometer.	Additional prehabilitation to usual care significantly improves postoperative knee flexion range of motion recovery, however, not into function or quality of life benefits.

Year	Title	Sample	Method	Result	Conclusion
			at CRC for a period of not less than three weeks and a maximum of four weeks prior to their surgery.	Health utility and quality of life as measured by the EQ-5D-3L and patient-specific functional scales were measured before allocation and eight weeks postoperatively.	
2016	Does preoperative rehabilitation for patients planning to undergo joint replacement surgery improve outcomes? A systematic review and meta-analysis of randomized controlled trials (9) Embase and Cochrane CENTRAL up to November 2015 for randomised controlled trials comparing prehabilitation versus no prehabilitation before joint replacement surgery. Postoperative pain and function scores were converted to Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC	This research involved those with randomized controlled trials comparing preoperative rehabilitation programs (i.e., prescribed and supervised exercise or physiotherapy with or without co-interventions such as education, nutritional counseling, acupuncture, transcutaneous electrical nerve stimulation, etc.) versus no formal preoperative rehabilitation program.	Method: A systematic review and meta-analysis of randomized controlled trials Data Collection: Researchers systematically looked for three databases up to 10 November 2015 including PubMed, Embase and Cochrane CENTRAL for a randomized controlled trial comparing pre-habilitation versus no-prehabilitation before joint replacement surgery.	Clinical outcomes of interest included postoperative pain scores (Visual Analogue Scale (VAS), or pain subcomponents from the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) or pain-related subdomains from other instruments), patient function (WOMAC function scores, physical function subdomains). SF-36 or other function-related instrument), time to resume activities of daily living (ADL), quality of life, patient satisfaction, infection, transfusion, stroke and overall postoperative mortality or complications.	Prehabilitation may slightly improve early postoperative pain and function among patients undergoing joint replacement; However, the effects remain too small and short-term to be considered clinically important, and do not affect the main outcomes of interest (ie, length of stay, quality of life, or cost).
2020	The Influence of Preoperative Physical Activity on Postoperative Outcomes of Knee	Research considered for inclusion in this review were randomized controlled trials (RCTs), prospective cohort	Method: This systematic review was conducted according to the Preferred Reporting	The main outcomes of the analysis, taking into account the reported clinical	Prehabilitation for patients undergoing total knee arthroplasty results in a

Year	Title	Sample	Method	Result	Conclusion
	and Hip Arthroplasty Surgery in the Elderly: A Systematic Review (6)	studies (PCS), case-control studies (CCS), and case series (CS).	Items Guidelines for Systematic Reviews and Meta-analyses (PRISMA) and followed the Cochrane methodology for systematic reviews. Knee Community Score (KSS) and range of motion (ROM) of the index joint. A systematic review was conducted with online databases including PubMed-Medline, Cochrane Central and Google Scholar	scores, included knee injury and the McMaster University Western Ontario McMaster University Osteoarthritis Outcome Score (KOOS), Next, the results of physical performance tests were considered, including a 6-minute (6-MWT) walking test, time up and go (TUG) test, and walking distance and speed.	shorter length of stay, but it does not improve postoperative recovery. Similarly, regarding total hip arthroplasty, although currently available data suggest a significantly better outcome in patients undergoing prehabilitation programs, there is a lack of solid evidence to support it. Prehabilitation is a non-invasive and low-cost activity.

Effectsof Prehabilitation on Functional Status Improved ROM, WOMAC/OHS/POMA Score

The first article carried out tele-prehabilitation consisting of mobility, flexibility, strengthening exercises (using rubber bands), and balance training for 3 weeks before TKA. It found improvements in all outcomes such as knee ROM, WOMAC points, and TUG (Timed Up and Go) time. Knee flexion ROM was measured passively using a digital goniometer. It increased from 107 to 114 in the pre-post intervention and 138 at 6 weeks after TKA in the PT group. According to the reported WOMAC questionnaire, there was a significant difference in pain scores between groups. These results reveal that preoperative telerehabilitation programs have a positive effect on outcomes after TKA, such as improving patient reported functional outcomes, muscle strength, and ROM for those with end-stage osteoarthritis who were undergoing TKA.

The second article revealed that the results of isometric knee flexion and hip abduction were greater in the intervention group, while the isometric knee extension was greater at T2 and T4. ROM extension and flexion were greater in the intervention group at T2, T3 and T4. Likewise, the intervention group showed greater WOMAC stiffness scores at all of these times. All functional assessments (Physical Functionality Scale of SF-36, TUG, Ladder test and WOMAC functional) showed greater scores in favor of the intervention group at T2, T3 and T4. The third article found that there were no clinically relevant differences in the 6-week WOMAC scores between the two groups. The fourth article obtained some results that the mean postoperative OHS was significantly higher in the intervention group compared to the control group ($P < 0.001$). In addition, both groups improved their functional ability 6 weeks postoperatively; however, the intervention group

showed greater improvement than the control group (P = 0.001). The intervention group showed a higher postoperative POMA score compared to the control group (P = 0.005).

In the fifth article, it was revealed that the knee flexion of prehabilitation participants increased by 12.6 degrees (p = 0.001). The addition of prehabilitation to standard care significantly increased the range of recovery of postoperative knee flexion motion, however, this did not include function or quality of life. The sixth article obtained some results that prehabilitation slightly reduced pain scores at 4 weeks postoperatively, but the difference did not last more than 4 weeks. Prehabilitation slightly improved WOMAC function scores at 6-8 and 12 weeks. The effect was similar for knee and hip surgery. The seventh article showed that, for TKA, most research obtained a comparable trend of improvement in postoperative range of motion (ROM) and functional scores, and quality of life.

Shorten Length of Stay

The second article revealed that regarding LOS, the intervention group showed a reduction in length of stay compared with the control group (4.5 ± 0.9 vs. 6.4 ± 1.1; p < 0.001). In conclusion, preoperative training for end-stage OA patients supports an improvement in early postoperative outcomes**.** The third article found that there was no difference in hospital LOS between the pre op PT Education group and the control group (p = 0.082). The fourth article no significant difference was found in LOS between the control and intervention groups (P = 0.551). In the fifth article, it was revealed that the knee flexion of prehabilitation participants increased by 12.6 degrees (p = 0.001). The addition of prehabilitation to standard care significantly increased the range of recovery of postoperative knee flexion motion, however, this did not include function or quality of life. The sixth article results that prehabilitation no differences were found for the length of stay. The seventh article showed that prehabilitation for patients undergoing TKA led to a shorter length of stay but did not improve postoperative recovery.

Reduce Pain

The second article revealed that lower pain scores on the VAS dimensions were found in the intervention group on all assessments.The fourth article showed although no significant difference was observed in resting pain between groups (P = 0.105), the intervention group reported lower pain intensity on walking compared to the control group (P = 0.041). Patients in the intervention group showed lower levels of anxiety two days after surgery compared to the control group (P < 0.001). While both groups reported high levels of satisfaction 6 weeks postoperatively, patients in the intervention group were more satisfied than those in the control group (P = 0.003). The sixth article obtained some results that prehabilitation slightly reduced pain scores at 4 weeks postoperatively, but the difference did not last more than 4 weeks.

DISCUSSION

A preventive approach which objective to increase functional capacity before surgery, is generally called “prehabilitation”. Currently, this term can be defined as a preventive physical and/or cognitive reconditioning strategy whose goal is to improve postoperative outcomes in terms of hospital stay, functional capacity and peri-operative complications. This course of action or program can be administered during the surgical waiting list period, when patients appear to be more receptive to changes in their health behaviors, including those aimed at improving their physical condition. In general, the physical aspect of this treatment consists of various modalities of specific physiotherapy and/or strengthening exercises for muscles and joints, or for the body in general. Many research supports the theory that preoperative improvement in physical condition has a beneficial impact on functional

recovery and the incidence of perioperative complications. Prehabilitation (physiotherapy and/or cognitive-behavioral therapy) focuses on improving a patient's functional capacity before surgery by improving their physical condition and perception of pain, the surgical experience, or its consequences. Several studies has also shown that prehabilitation improves postoperative outcomes, shortens hospital stay, and reduces costs compared to classical postoperative rehabilitation. However, the actual effect appears to be influenced by factors such as obesity, comorbidities and, especially, misperceptions (2) although effective, results in suboptimal outcome and degrees of disability in a relevant proportion of patients. Postoperative rehabilitation has failed to demonstrate efficacy in the mid and long term. So-called "prehabilitation" (physiotherapy and/or cognitive-behavioural therapy.

Prehabilitation is a special type of exercise program, designed to strengthen the body and to prevent injury in preparation for medical procedures. For example: TKA and THA are the most selective surgeries, but can wait weeks or months. Therefore, the patients need more postoperative care to return to their previous healthy state. To prevent declined functional capacity associated with an increased sedentary lifestyle, some experts have advocated the implementation of a preoperative exercise program (10).

In a research conducted by (11), it was revealed that many nursing interventions could improve the recovery of patients undergoing hip and knee orthopedic surgery. One of which was physiological interventions which can be in the form of resistance training, prehabilitation exercise, heelift suspension boot intervention, oral nutritional intervention, jubilee dressing intervention, cold therapy intervention, and CPM.

An important aspect to a successful outcome after surgery is starting an exercise program before surgery. This gives it an edge in terms of strength and flexibility and improves circulation. The following exercises have been developed specifically for joint replacement patients and should be performed two to three times daily.

Prehabilitation is a multimodal, multidisciplinary approach to for administering patient care while awaiting surgery and non-surgical procedures to reduce susceptibility and increase resilience to peri-interventional and post-interventional risks, accelerate and improve outcomes and quality of life, and reduce health care costs (12)

Prehabilitation has a small to moderate effect. In patients undergoing TKA, significant improvements were observed in function, quadriceps strength, and length of treatment. In patients undergoing THA, significant improvements were observed in pain, function, and length of stay. Therefore, a more standardized approach to reporting clinical trial interventions and patient adherence is needed to fully evaluate the effect of prehabilitation on postoperative outcomes (13).

Two specific studies showed that preoperative (prehabilitation) physical exercise programs have a positive effect on improving the postoperative outcome of TKA. Physical exercise during the preoperative period can improve the performance of functional tasks before surgery, increase muscle strength, increase ROM, reduce pain, reduce length of hospital stay, and allow faster physical and functional recovery after TKA surgery (7)(5). This showed that the preoperative physical exercise program (prehabilitation) can be used as an intervention given to patients who will undergo TJA surgery. During this research, pre-habilitation was given an average of 3-4 weeks before the patient underwent surgery. The rehabilitation was provided in the form of exercise/ physical therapy and patient education. This is in line with the research of Pinskiy et al. (2021) who showed that structured physical therapy and interactive patient education significantly

reduced postoperative short-term anxiety, pain when walking, improved mobility and function, encouraged discharge, and increased post-THA patient satisfaction.

For the improvement of postoperative ROM after TKA, adding a prehabilitation program has a significant effect on the range of recovery of knee flexion motion (8). Results from systematic reviews and other meta-analyses concluded that pre-habilitation programs provided minor to moderate improvement but that improvement was seen based on surgically repaired joints. For example, in patients undergoing total hip arthroplasty, patients experienced significant improvement in their pain, had decreased length of stay and improved hip function when prehabilitation was completed (14).

However, there are several other studies obtaining different results to the ones that have been described so far. Their results revealed that there is no effect of prehabilitation on the functional status and quality of life of patients and it is assumed that the effect is too small on length of stay and postoperative recovery. A research by Almeida et al. (2020) demonstrated that prehabilitation decreased length of hospital stay but did not improve postoperative functional recovery in older adults undergoing joint replacement. Individual research on systematic reviews varied widely in prehabilitation protocols, timing of assessment, and outcome measures. A possible reason for the difference in outcomes observed in these various studies is heterogeneity in the selection of outcome measures; differences in intensity and duration of prehabilitation; and patient population differences. It is possible that there would be a larger effect size of prehabilitation in patients who had more disability or functional impairment at baseline.

CONCLUSION AND RECOMMENDATION

Prehabilitation provides several benefits including increasing muscle strength, increasing ROM, reducing pain, reducing hospital stay duration, and allowing faster physical and functional recovery after TJA surgery. The results of this literature review show that prehabilitation programs provide improvement that quite varies. As there are various effects of prehabilitation shown by various literatures, it is advised that further research will incorporate more sources to better prove the effectiveness of prehabilitation programs for patients undergoing joint replacement surgery. In addition, nurses can participate in this prehabilitation program to motivate patients who will undergo TJA to take an active role.

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