International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)

ISSN:2347-6567

IJAMSCR |Volume 10 | Issue 1 | Jan- Mar - 2022
www.ijamscr.com

Research article *Medical research*

Significance of prehabilitation in obese TKR patients

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ABSTRACT

Background

Obesity is related with an increased risk of osteoarthritis, and the occurrence of obese patients needing a total knee replacement (TKR) has increased in the latest years. A high body mass index (BMI) may impact post-TKR rehabilitation outcomes. Currently, rehabilitation programmes after TKR concentrate on increasing the range of movement and strengthening exercises, while prehabilitation for improving balance, mobility is relatively neglected. Prehabilitation may be effective in bringing the fitness level of elderly patients to a higher level before they go for surgery.Thus the aim of our study is to find out significance of prehabilitation in obese TKR patients.

Method

Activity Specific balance confidence scale was taken and ROM was assessed. The aims and objectives of research were explained and willing participants were included in the study after their written consent.

Results

ABC scale: In group A (who have taken prehabilitation), 64% participants had high level of physical functioning, 36% showed moderate level of physical functioning and 0% had low level of physical functioning. In group B (who haven't taken prehabilitation), 76% participants had moderate level of physical functioning, 20% showed low level of physical functioning and 4% had high level of physical functioning. When assessed for knee rom,in group A, 4 people had 111-120^{0}of Knee ROM, 14 people had121-130^0 and 7 people had 131-140^0 of Knee ROM. In group B, 2 people had 90-100^0 of Knee ROM, 14 people had 101-110^0, 8 people had 111-120^0 and 1 had 121-130^{0}of Knee ROM.

Conclusion

The study concluded that there is significance of prehabilitation in obese TKR patients.

Keywords: Significance, Prehabilitation, Total Knee Replacement, Obese, Physiotherapy.

INTRODUCTION

Obesity is associated with a vast variety of co-morbidities, some of which may lead to disability or evendeath [(1)].Obesity is related with an increased risk of osteoarthritis, and the occurrence of obese patients needing a total knee replacement (TKR) has increased in the latest years. A high body mass index (BMI) may impact post-TKR rehabilitation outcomes[(2)]. So in general, the risk of having co-morbidities rises as body mass index (BMI) increases. The most commonly used classification of obesity is expressed interms of BMI, in which individuals whose BMI is < 18.5 kg/m2, areconsidered as underweight. Those whose BMI ranges from 18.5 to 24.9 kg/m2 are classified as having normal or acceptable weight and those whose BMI ranges from 25 to 29.9 kg/m^2 are commonly referred to as overweight. Obesity is said to be present when BMI is ≥ 30 kg/m^2. There are three grades of obesity which are as follows:

- Grade 1 (BMI ranging from 30 to 34.9 kg/m2)
- Grade 2 (BMI from 35.0 to 39.9 kg/m2)
- Grade 3 (BMI ≥ 40 kg/m2.)[(1)].

Osteoarthritis is one the most common cause of knee pain in the aged. This disease is marked by degenerative changes in the articular cartilage and succeeding new bone formation at the articular margins. The primary defect in hyaline cartilage is an alteration in the ratio of total glycosaminoglycans to that of the collagen fiber content present in the matrix. The disease often is primary but various predisposing conditions are recognized. As the disease progresses, the patient finds increasing difficulty in performing the activities of daily life. The predominant indication for surgical treatment which is tkr is persistent pain and serious disturbance of the activities of daily life against conservative treatment, thus leading to imbalance[(3)].

Total knee arthroplasty is considered the treatment of choice for patients with intractable pain and substantial functional improvement after conservative treatment. After the immediate post operative in-patient period, physiotherapy produce long term benefits in terms of physical function in patients after TKA. Improvement in strength, balance, and other neuromuscular aspects facilitate functional activities and prevent functional adverse outcomes such as falls. [(4)]

Currently, rehabilitation programmes after TKR concentrate on increasing the range of movement and strengthening exercises, while prehabilitation for improving balance, mobility is relatively neglected. A better understanding of the impact of tkr on balance and potentially on associated functional improvement could facilitate more effective rehabilitation after TKR and awareness of prehabilitation for the same.[(5)]Additional physical modalities may be used to reduce pain and swelling. However exercise is typically the focus of intervention in the post-acute phase.[(6)]

Rehabilitation that is instituted in the postoperative period aims to help patients regain physical fitness and robustness to preoperative levels. However, recent studies have shown that prehabilitation may be more effective in bringing the fitness level of elderly patients to a higher level before they go for surgery[(7)]. Physiotherapy in the pre-operative period is emerging as an important component of postoperative recovery. Physical therapy in the preoperative period can improve physical deconditioning and potentially affect subsequent postsurgical outcomes. Fast-track surgical programs have highlighted the importance of early ambulation in the postoperative period. Timely and early physiotherapy in the perioperative period improves surgical recovery and reduces postoperative complications like thromboembolism, pulmonary complications, orthostatic intolerance, ileus, and muscle atrophy/weakness. Thus, perioperative physiotherapy has emerged as an important intervention in preventing these complications leading to good and better outcomes[(8)].Patients awaiting TKR face long delays whilst enduring severe pain and functional limitations. Optimizing pre-operative TKR education and prehabilitation could help improve patient outcomes pre- and post-operatively; however, current pre-operative TKR rehabilitation varies widely. Definitive evidence on the optimal content and delivery of pre-operative TKR physiotherapy in obese patients is lacking. Hence this study is aimed to develop significance of prehabilitation in obese tkr patients. [(9)] .

Measuring knee range of motion is important in examination and as a post-operative outcome. It is therefore important that measurements are accurate. Knee angles can be measured by traditional goniometers, smart phone apps are readily available and there are also purpose made digital devices.[(10)]The greatest improvement for knee ROM takes place during the first 12 weeks post arthroplasty and hence rehabilitation plays an important role[(11)].

Knee pain and disability can persist following knee replacement surgery which may place patients at

increased risk of falls. The number of falls experienced following knee replacement surgery remained relatively high, which may be attributed to the persistence of impaired lower limb proprioception. Although knee replacement surgery improves function and alleviates pain, people who undergo this procedure may need to engage in rehabilitation following the surgery to reduce the risk of falling.[12]

It is already widely known that patients with knee OA have a disability in their proprioception compared to similar age controls. Also, the number of mechanical sensory receptors around the ligaments of knee joints with OA has been reported to be reduced when inspected histologically.The knee is the most commonly injured weight bearing joint, and OA of the knee is known to be a risk factor for fall injuries. Therefore, it would be valuable for OA patients to receive education related to preventing falls and rehabilitative training after evaluating their balance control abilities.Clinical balance evaluation tests such as the timed up and go test (TUG), 10 meter walking test (10 m WT), functional reach test (FRT), Activity specific balance confidence scale (ABC) and the Berg balance scale (BBS)are all reported to have high intraclass correlation and reliability between test-retests.[13]

Activities-specific balance confidence (ABC) scale is a structured questionnaire that measures an individual's confidence during ambulatory activities without falling or experiencing a sense of unsteadiness. It was developed in 1995 by Powell and Myers, and consists of 16 questions gauging the individual's confidence while doing activities[14].Subjects with greater balance confidence post tkr had better functional performance and reported fewer difficulties with activities of daily living. [15]

METHODOLOGY

Ethical clearance was taken from institutional ethical committee of Tilak Maharashtra Vidyapeeth, Department of Physiotherapy.The aims and objectives of the research were explained to the participants and those are willing to participate were included in the study after the written consent was obtained. Sample size was selected on the basis of inclusion and exclusion criteria. 50 participants were selected. Demographic details of subjects like Age, Gender and BMI was taken. Theinclusion criteria was participants who were between 50-80 years both male and female, those who have taken physiotherapy either pre or post TKR, those who are willing to participate and those who fall under class2 and class3 of obesity. The exclusion criteria included the participants who have not taken physiotherapy in both post tkr,those who fall under class 1 obesity,those who haveneurological conditions like Dementia, Alzheimer's, Parkinson's Disease etcand those who are not willing to participate.The duration of the study was 6 months. The participants were divided in two groups of 25 each - Group A and Group B. Group A participants was aligned to those who had taken physiotherapy before tkr and Group B participants were those who haven't taken physiotherapy before tkr. A randomised control study was conducted and errors were resolved with approval of the guide.

Balance of the participant was measured by using Activity Specific Balance Confidence Scale. This scale includes 16 activity and participants have to answer for each of the following activities, indicating their level of confidence in doing the activity without losing balance from choosing one of the percentage points on the scale from 0% to 100%.Activities-specific balance confidence (ABC) scale is a structured questionnaire that measures an individual's confidence during ambulatory activities without falling or experiencing a sense of unsteadiness. It was developed in 1995 by Powell and Myers, and consists of 16 questions gauging the individual's confidence while doing activities.This questionnaire was given to the participants and any query regarding understanding the questions was cleared at the same time.

Activities-specific balance confidence (ABC) scale

If you normally use a walking aid to do the activity or hold onto someone, rate your confidence as if you were using these supports.

0% 10 20 30 40 50 60 70 80 90 100%

"How confident are you that you can maintain your balance and remain steady when you....

1. Walk around the house? _____%
2. Walk up or down stairs? _____%
3. Bend over and pick up a slipper from the front of a closet floor? _____%
4. Reach for a small can off a shelf at eye level? _____%

5. Stand on your tip toes and reach for something above your head? _____%
6. Stand on a chair and reach for something? _____%
7. Sweep the floor? _____%
8. Walk outside the house to a car parked in the driveway? _____%
9. Get into or out of a car? _____%
10. Walk across a parking lot to the mall? _____%
11. Walk up or down a ramp? _____%
12. Walk in a crowded mall where people rapidly walk past you? _____%
13. Are bumped into by people as you walk through the mall? _____%
14. Step onto or off of an escalator while holding onto a railing? _____%
15. Step onto or off an escalator while holding onto parcels such that you cannot hold onto the railing? _____%
16. Walk outside on icy sidewalks? _____%

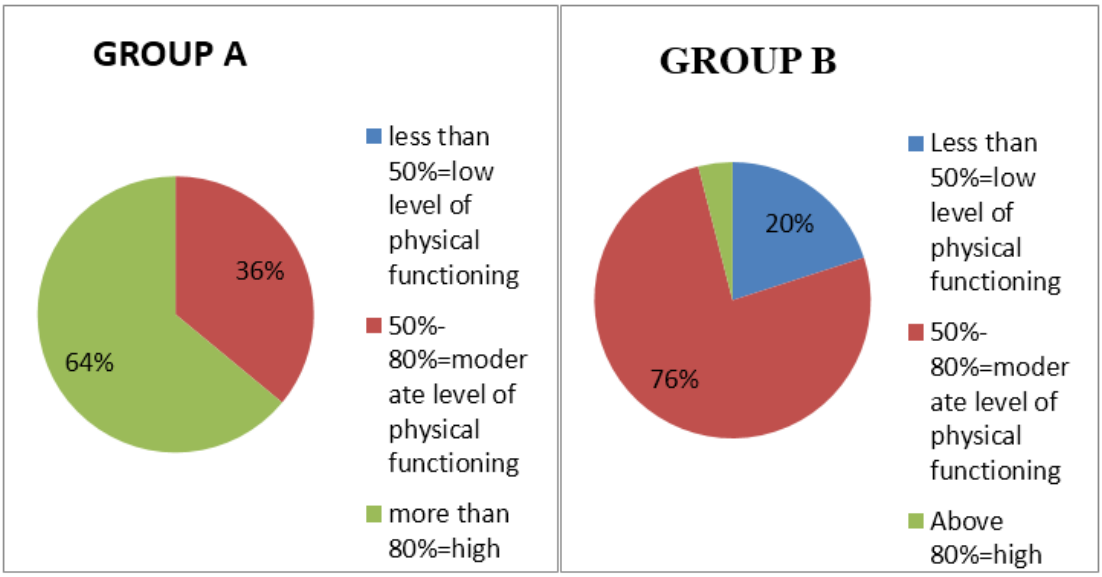
Interpretation

Less than 50% = low level of physical functioning
50%-80% = moderate level of physical functioning
More than 80% = high level of physical functioning[16].

Range of Motion

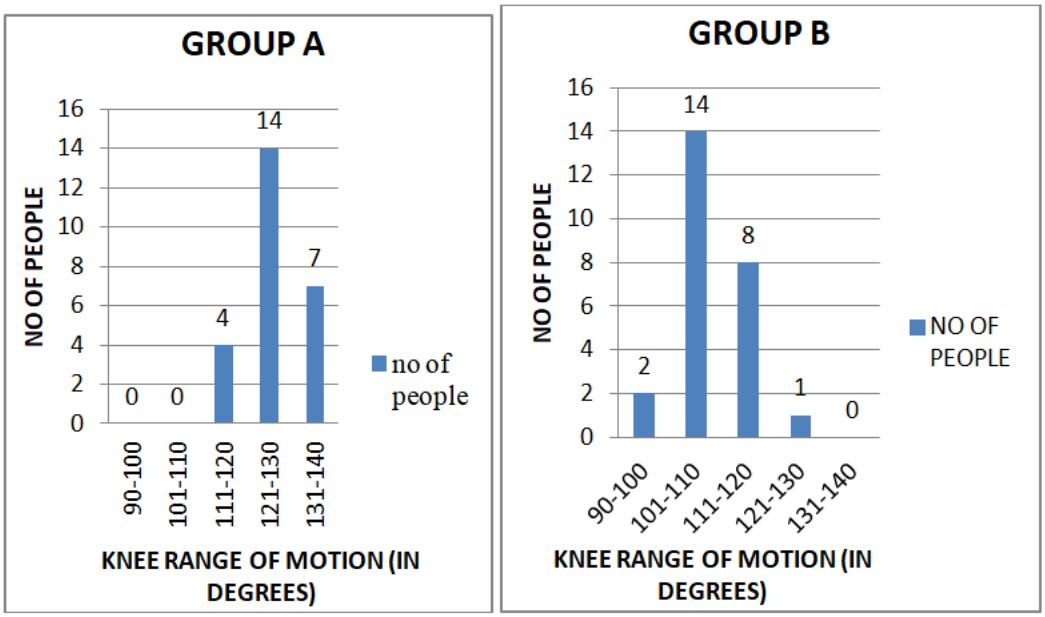
Range of knee of the participant was measured by using goniometer in supine position. Participant was placed in prone position with test-side ankle off plinth and leg in extension. Then the therapist placed the axis of the goniometer on lateral epicondyle of the femur, the stationary arm along the femur to the greater trochanter and the movement arm along the fibula to lateral malleolus. The participant was then ask to flex his knee as much as possible and therapist measured the range by the goniometer respectively.

RESULTS



Graph no. 1 shows in Group A, almost 64% participants had high level of physical functioning, while 36% participants showed moderate level of physical functioning and 0% participants had low level of physical functioning. In Group B, 76% participants had moderate level of physical functioning, 20% of them showed low level of physical functioning and 4% had high level of physical functioning.

Graph 1: ABC SCORE



Graph no. 2 shows in Group A, 4 people had 111-120 degrees of Knee ROM, 14 people had 121-130 degrees and 7 people had 131-140 degrees of rom.In group B, 2 people had 90-100 degrees of Knee ROM, 14 had 101-110 degrees, 8 people had 111-120 degrees and 1 had 121-130 degrees of Knee ROM.

Graph 2: KNEE ROM

DISCUSSION

The aim of research was to study the significance of prehabilitation in obese tkr patients. Anna M Anderson, Cristine Comer et.al underwent a study on Consensus on pre-operative total knee replacement education and prehabilitation recommendations: a UK-based modified Delphi study which included a three-round, online modified Delphi study which was conducted with a 60-member expert panel. All panellists had experience of TKR services as patients (n = 30) or professionals (n = 30).This modified Delphi study developed a comprehensive set of recommendations that represent a useful resource for guiding decision-making on the content and delivery of pre-operative TKR education and prehabilitation. The final set of recommendations comprised 34 education topics, 18 education delivery approaches, 10 exercise types, 13 exercise delivery approaches and two other treatments.[9]On the other hand, this study was a cross-sectional study conducted offline with total 50 participants divided into 2 groups as mentioned above. Graph 1. (ABC Score) and Graph 2.(ROM) showed significantly much better ABC scores and almost full knee ranges in group A than in group B, thus proving the significance of prehabilitation in obese tkr patients.

Erik Lenguerrand, Neil Artzet. alunderwent a study on: Effect of Group-Based Outpatient Physical Therapy on Function after Total Knee Replacement: A Multicenter Randomized Controlled Trial, which evaluated the long-term clinical effectiveness of a novel group-based outpatient physical therapy (PT) following total knee replacement (TKR). Supplementing usual care with this group-based outpatient PT intervention led to improvements in function at 12 months after TKR. However, patient satisfaction was higher in the intervention group, and there was some evidence of clinically relevant improvements in function at 3 months.[17] However, this study focuses on prehabilitation in obese tkr patients as it lacks much awareness about the same. The results of which proved the significance of prehabilitation in tkr patients.

Kate E Webster, Julian A. Feller et.al underwent a study on Balance Confidence and Function after Knee replacement surgery which aimed to study the relationship between balance confidence and function in older adults after knee-replacement surgery. Thirty-six adults (20 men and 16 women age 58–84 years) completed measures of balance confidence, general self-efficacy, and function. The results showed that the participants with greater balance confidence had better

functional performance and reported fewer difficulties with activities of daily living.[15] While in this study, in graph.1 group A participants who had taken physiotherapy before tkr showed 64% of high level of physical functioning and 36% of moderate level of physical functioning according to the ABC questionnaire as compared to the group B participants who didn't take physiotherapy before tkr reported 76% showing moderate level of functioning and while 20% showed low level of physical functioning.

CONCLUSION

Our study concluded that there is significance of prehabilitation in obese tkr patients.

FUTURE SCOPE

- Large sample size can be taken.
- Further interventions can be done.
- Advanced equipments can be used.
- Larger geographical area can be taken.

ABBREVIATIONS

TKR- Total knee replacement, ROM- Range of motion, OA- Osteoarthritis, BMI- Body mass index, ABC- Activity-specific balance confidence.

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How to cite this article: NirmiteeHonap, DivyaJethwani , Dr.VaibhaviMahendrakar · Significance of prehabilitation in obese TKR patients. Int J of Allied Med Sci and Clin Res 2022; 10(1): 64-70.

Source of Support: Nil. **Conflict of Interest:** None declared.