REDVET - Revista electrónica de Veterinaria - ISSN 1695-7504
Vol 25, No. 1s (2024)
http://www.veterinaria.org
Article Received: 08 June, 2024 Revised: 14 July, 2024 Accepted: 29 August, 2024

"Empowering Mobility: The Impact of Muscle Strength Training On Activities of Daily Living Post-TKR"

Ms.D. Selvarani[1]*, Dr.M. Gandhimathi[2], Dr.Suja Suresh[3]

[1]Ph.D. Scholar, Rani Meyyammai College of Nursing, Chidambaram, Annamalai University, Tamilnadu.
[2]Vice Principal, Govt.College of Nursing, Cuddalore, The Tamil Nadu Dr.M.G.R. Medical University, Chennai,
[3]Principal, SRM Trichy College of Nursing,The Tamil Nadu Dr.M.G.R.Medical University, Chennai.

Abstract:
Total Knee Replacement (TKR) is a common surgical procedure for patients with severe knee osteoarthritis, aiming to alleviate pain and restore joint function. However, postoperative recovery often involves persistent muscle weakness and difficulties in performing Activities of Daily Living (ADL), which can impede full rehabilitation. This study investigates the impact of strength training exercises on the ability to perform ADL in patients following TKR. A Quantitative research approach and pre-experimental design was selected to assess the effectiveness Muscle Strength Training to improve ADL performance in TKR patients. The results revealed that structured strength training significantly enhanced and marked improvements in their ability to perform ADL, with a faster return to preoperative activity levels.

Key words: Activities of Daily Living (ADL), Assess, Muscle Strength Training Exercises, Total Knee Replacement (TKR).

INTRODUCTION:

Osteoarthritis (OA) is an irreversible joint condition causing pain, joint stiffness, movement limitations, and disability. It is connected with developmental process and likely to affect the joints which have been more than once strained all through the years. Joints most commonly affected by it are, namely, cervical and lumbo sacral spine, hip, knee, and first metatarsal phalangeal joint. The problems of the patients are joint pain and swelling, limited range of motion, decreased functional mobility. OA is the most common type of arthritis. Total Knee Replacement (TKR) is the most widely practised elective surgical procedure for advanced osteoarthritic patients globally. Total Knee Replacement (TKR) is a common surgical intervention aimed at alleviating pain and restoring function in patients with advanced knee osteoarthritis. This surgery makes pain-free life style and helps in bringing out motion in patients with serious knee joint pain. It is estimated that over 1, 20,000(2022) TKRs are performed in India annually. TKR surgeries are now being increasingly performed in the younger age groups also.

However, post-surgical recovery often presents challenges such as muscle weakness, limited mobility, and difficulties in performing activities of daily living (ADL). This study examines the impact of muscle strength training exercises on muscle function and the ability to perform ADL in TKR patients. The findings indicate that targeted muscle strength training and hamstring strength, improves functional mobility. Patients who engage in structured strength training post-TKR experience better outcomes in terms of muscle function, mobility, and overall quality of life. This underscores the importance of incorporating strength training into rehabilitation programs to empower patients in regaining independence and improving post-surgical recovery.

Need for the Study:

Over the past four hundred years, total knee replacement surgery has become the most successful one for patients with serious knee joint pain. Patients who undergo TKR show marked improvements in function and reduction in pain. However, recovery of functional ability is a variable and not all patient experience significant improvements in pain and function. Achieving optimal outcomes requires an approach that focuses on rehabilitation post-surgery, particularly muscle strengthening exercises. Muscle weakness and atrophy around the knee joint are common following TKR due to pain, immobility, and disuse. Enhancing muscle strength is crucial for improving muscle function, which directly influences patients' ability to perform ADL. The quadriceps muscle, in particular, has been identified as a key contributor to joint stability and mobility in post-operative recovery. Patients those who do not follow the rehabilitation process, they end up with the complications.

A study was conducted by Moghadden A.K et al (2023) to assess Effectiveness of muscle strengthening exercises on the clinical outcomes of patients with knee osteoarthritis at Vali-E-asr Hospital, Zanjan, Iran: A randomized four-arm controlled trial revealed that muscle strengthening exercises significantly ($P<0.005$) enhances quadriceps and hamstring strength, improves functional mobility, and accelerates the recovery of ADL. This underscores the importance of incorporating strength training into rehabilitation program to empower patients. In the present study the investigator

wanted to evaluate the effectiveness of muscle strengthening exercises on Activities of Daily Living (ADL) among TKR patients.

PROBLEM STATEMENT:
To assess the effectiveness of Muscle Strength training on Activities of Daily Living (ADL) among patients who had undergone Total Knee Replacement (TKR) surgery in Selected Hospital, Tamilnadu.

OBJECTIVES
1. To evaluate the effectiveness of muscle strengthening exercises on activities of daily living among patients with total knee replacement.
2. To associate the level of Activities of Daily Living (ADL) with their selected demographic variables.

OPERATIONAL DEFINITION
Assess: It refers to measure (Muscle Strengthening Exercises) the Muscle function among patients who underwent Total knee replacement surgery.
Effectiveness: It refers the impact of Muscle strengthening exercise to improving the Activities of Daily Living among patients who underwent Total knee replacement surgery.
Muscle strengthening Exercises: It is a set of muscle strengthening exercise which helps to increase the strength of muscles, stabilize the knee joint, and improve range of motion in the knee.
Activities of Daily Living: (ADL) is a term used to collectively describe fundamental skills required to independently care for oneself, such as eating, bathing, and mobility which is assessed by Barthel index scale (Mahoney and Barthel in 1965, Collin et al., 1988).
Total knee replacement surgery: It is a surgical procedure to resurface a knee damaged by arthritis or trauma. Metal and plastic parts are used to cap the ends of the bones that form the knee joint, along with the kneecap.

HYPOTHESIS
H1 - There is a significant improvement in the activities of daily living after muscle strengthening exercises at $p < 0.05$ level of significance.
H2 - There is a significant association between the muscle function and selected demographic variables.
RESEARCH METHODOLOGY
Research Approach: Quantitative Research Approach
Research Design: Pre- experimental research design
Settings of the Study: Priyam Ortho Hospital at Perambalur
Target population: The Patient Who underwent Total Knee Replacement surgery.
Accessible population: The Patient Who underwent Total Knee Replacement surgery in selected hospital, Perambalur.
Sample: The Patient Who underwent Total Knee Replacement surgery in Priyam Ortho Hospital, Perambalur and who fulfilled the inclusion criteria.
Sampling technique: Non-Probability Convenience Sampling technique was used for this study.
Sample size: 45 Samples

CRITERIA FOR SAMPLE SELECTION
Inclusion Criteria
a) Patients of both Genders.
b) Patients who are available at the time of data collection.
c) Patients who can understand speak and read Tamil and English.
d) Patients with co-morbid conditions under medical treatment.
e) Patients who underwent unilateral or bilateral Total knee replacement

Exclusion Criteria
a) Critically ill patients.
b) Patients who are having neurological disorders.
c) Patients with physical disabilities.
d) Patients with psychological disorder.

VARIABLES
Dependent variable:
Activities of Daily Living,
Independent variable:
Muscle Strengthening Exercises

REDVET - Revista electrónica de Veterinaria - ISSN 1695-7504
Vol 25, No. 1s (2024)
http://www.veterinaria.org
Article Received: 08 June, 2024 Revised: 14 July, 2024 Accepted: 29 August, 2024

DEVELOPMENT AND DESCRIPTION OF THE TOOL

Section – A: consists of demographic variables which include (age, sex, socio economic status, Religion, Educational status, Type of family). • Clinical variables includes (Weight, BMI, Life style of the patient, whether patient receiving any other complimentary therapy for joint pain, previous history of lower leg surgery, history of non – communicable diseases).

Section B: ADL (Barthel Index) (Mahoney and Barthel in 1965, Collin et al., 1988.

Total Points 100 ♣< 20 indicates total dependency ♣ 20 – 39 indicates very dependency ♣ 40 – 59 indicates partial dependency ♣ 60 – 79 indicates slight dependency ♣ 80 – 100 indicates Independent

Description of Data collection procedure:

The Ethical Committee Clearance was obtained from Priyam Ortho Hospital. The samples were selected by the Non-Probability Convenience Sampling Technique. The Informed Consent was obtained from the samples. Pre –test was done to assess the Activities of Daily Living (ADL) by using Barthel Index Scale. After that Muscle strengthening exercises was taught to the patient. Patients were instructed to do both Basic and Knee Range of Motion Exercises 3Sets and 5 Times a day. After that Practice of exercises were observed by using check list by the investigator from the day of surgery to 5th post-operative day. The Post test was conducted by Using the Same Scale.

Table1: **Demographic Variables of the Participants** **(N=45)**

S.No	Demographic variables	Frequency	Percentage
1.	Gender:		
	Male	23	51.1
	Female	22	48.9
2.	Age (in years):		
	20-30 Years	9	20
	31-40 Years	13	28.9
	41-50Years	12	26.7
	>50 Years	11	24.4
3.	Educational status:		
	Illiterate	3	6.7
	Primary education	6	13.3
	Secondary education	12	26.7
	Colligate education	24	53.3
4.	Marital status:		
	Married	33	73.3
	Unmarried	8	17.7
	Widower	3	6.7
	Divorced	1	3.3
5.	Occupational status:		
	Students	1	2.2
	Self employed	15	33.3
	Unemployed	12	26.7
	Working in private sector	4	8.9
	Working in government sector	13	28.9
6.	Type of family:		
	Nuclear family	25	55.6
	Joint family	20	44.4
7.	Monthly Income:		
	<10000	20	
	10000-20000	16	44.4 35.5
	>20001	9	20.0

Table 1 showed that the (29%) samples age between 31-40 years and (28%) samples 41-50 years and the more than half samples were male 51.9%. 53.3% of the samples have collegiate level of education and 73.3% samples were married. 55.6% samples belong to nuclear family, and 44.4% of the samples were having monthly income less than 10,000.

REDVET - Revista electrónica de Veterinaria - ISSN 1695-7504
Vol 25, No. 1s (2024)
http://www.veterinaria.org
Article Received: 08 June, 2024 Revised: 14 July, 2024 Accepted: 29 August, 2024

Table 2: **Clinical Variables** **(N=45)**

S.No	Clinical variables	Frequency	Percentage
1.	BMI:		
	Underweight	8	17.8
	Normal weight	15	33.3
	Over weight	12	26.7
	Obesity	10	22.2
2.	Years of Having Knee pain		
	< 3 Years	12	26.7
	4– 6 Years	13	28.9
	7 – 9 Years	10	22.2
	>9 Years	10	22.2
3.	Previous exposure to information on TKR		
	Yes	19	42.2
	No	26	57.8
4.	Dietary Pattern		
	Vegetarian	22	48.9
	Non-Vegetarian	23	51.1

Table 2 Shows that 15 samples were having normal weight (33.3%), and 13 samples were having knee pain for a period of 4to 6 years (28.9%), More than half of the samples had no exposure to previous information to TKR 26(57.8%), and 23(51.1%) samples were taking non-vegetarian food.

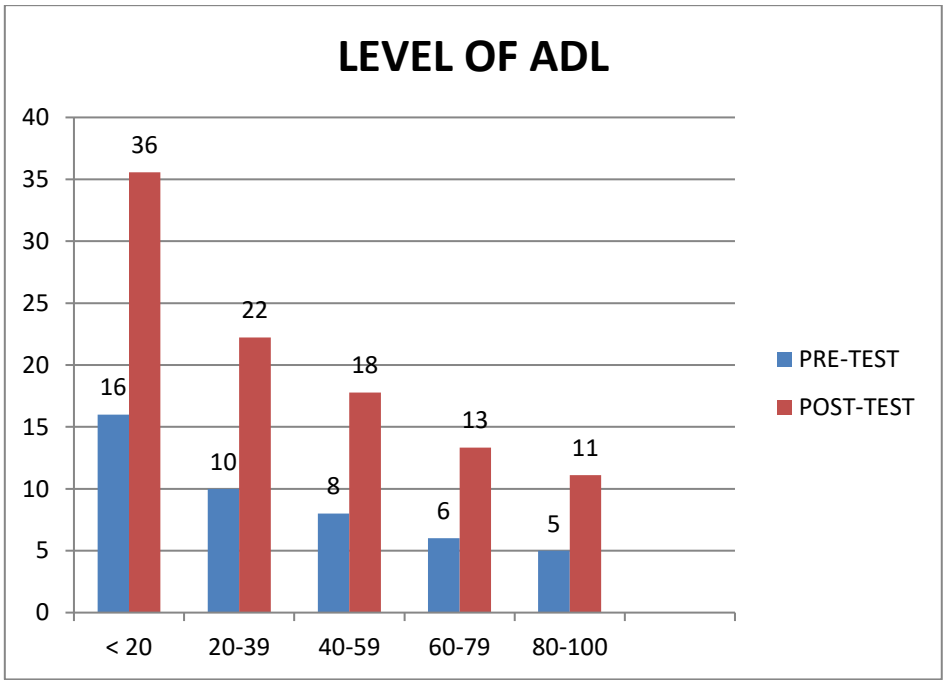

Figure 1: Frequency and Percentage distribution of Activities of Daily Living before and after Muscle strengthening exercises.

Among 45 samples in pre-test 16(36%) were totally dependent, 10 (22%) were very dependent, 8 (18%) were partially dependent, 6 (13%) were independent. In Post-test 2 (9%%) were total dependent, 6 (13%) were very dependent, 8 (18%) were partially dependent, 10 (22%) were independent. In post-test after muscle strengthening Activities of Daily Living (ADL) was improved significantly($p<0.05$).

REDVET - Revista electrónica de Veterinaria - ISSN 1695-7504
Vol 25, No. 1s (2024)
http://www.veterinaria.org
Article Received: 08 June, 2024 Revised: 14 July, 2024 Accepted: 29 August, 2024

Table 3: Effectiveness of muscle strengthening exercises on Activities of Daily Living (ADL) among TKR patients

S.No.	Variables	Pre-test		Post-test		t Value	P value
		Mean	SD	Mean	SD		
1.	Activities of Daily Living	40.31	27.00	68.09	24.94	5.069*	0.05

Table 3 showed that the effectiveness of muscle strengthening exercises on Activities of Daily Living among TKR patients. The mean score of Activities of Daily Living improved from 40.31± 27 in pre-test to 68.09± 24.94 after administration of muscle strengthening exercises which shows that the intervention was highly effective ($p<0.05$).

DISCUSSION:

Activities of Daily Living before and after Muscle strengthening exercises among patients who had Total Knee Replacement (TKR).

Research by Papalia et al (2020) conducted a study The Role of Physical Activity and Rehabilitation Following Hip and Knee Arthroplasty in the Elderly at Saudi Arabia to assess the Effectiveness of muscle strengthening exercises on the clinical outcomes of patients with knee osteoarthritis, provided evidence in favour of this goal. According to this study, the best intervention for OA patients to enhance their daily living activities and lessen pain and stiffness in the morning is to perform muscle strengthening exercises. ($p<$**0.001)**.

Ryo Tanaka (2020) conducted a study to assess the Effect of an intensive functional rehabilitation program on the recovery of activities of daily living after total knee arthroplasty: randomized four-arm controlled trial" provided evidence in favour of this goal. According to this study, the best intervention for OA patients to enhance their daily living activities and lessen pain and stiffness in the morning is to perform muscle strengthening exercises. As a result of matching, 42 patients were extracted. The averages (standard deviation) of the FIM motor score were 79.0 (10.8) for the experimental group and 80.5 (9.4) for the control group. The BI scores were 88.1 (13.3) for the experimental group and 91.0 (10.1) for the control group. ($P<0.005$)

The effectiveness of muscle strengthening exercises on activities of daily living among TKR patient:

A research by Kumarahewa C.V et al. ((2020) to assess the effectiveness of quadriceps muscle strengthening on knee joint stability and activities of daily living in patients with knee joint osteoarthritis at Rahama, Srilanka., found that the There was a statistically significant, reduction in knee pain ($p=0.001$), improvement of quadriceps muscles girth ($p=0.012$) and an improvement of daily living activities ($p=0.001$) after engaging in the physiotherapy exercise program.

CONCLUSION:

Muscle strengthening is a critical component of post-operative rehabilitation for Total Knee Replacement patients. The findings from numerous studies under Score its effectiveness in enhancing muscle function and assisting patients in regaining independence in ADLs. As it is a Cost –Effective and feasible intervention, this can be taught by nurses to patients with Total Knee Replacement(TKR). Future research should aim at defining optimal exercise protocols and exploring the long-term benefits of strength training post-TKR. It can be incorporated in to the routine patient care where nurses play an important role.

REFERENCES:

1. World Health Organisation. Chronic rheumatic conditions.WHO [Internet].Availablefrom: http://www.who.int/chp/topics/rheumatic/en/ Cited on 2019 Feb.

2. Lakkireddy, Maheshwar, et al. "Analysis of Total Knee Replacements in a South Indian Institute." *International Journal of Research in Orthopaedics*, vol. 4, no. 2, Feb. 2018, pp. 187–92. *www.ijoro.org*, https://doi.org/10.18203/issn.2455-4510.IntJResOrthop20180046

3.https://speciality.medicaldialogues.in/advances-in-total-knee-replacement-tkr-surgery

4. Paul, M., et al. "A Systematic Review of the Impact of Postoperative Aerobic Exercise Training in Patients Undergoing Surgery for Intra-Abdominal Cancers." *Techniques in Coloproctology*, vol. 27, no. 12, 2023, pp. 1169–81. *PubMed Central*, https://doi.org/10.1007/s10151-023-02844-9

5. Cushnaghan J, Bennett J, Reading I, Croft P, Byng P, Cox K, Dieppe P, Coggon D, Cooper C. Long-term outcome following total knee arthroplasty: a controlled longitudinal study. Ann Rheum Dis. 2009 May; 68(5):642-7.

6. Fortin PR, Penrod JR, Clarke AE, St-Pierre Y, Joseph L, Bélisle P, Liang MH, Ferland D, Phillips CB, Mahomed N, Tanzer M, Sledge C, Fossel AH, Katz JN. Timing of total joint replacement affects clinical

outcomes among patients with osteoarthritis of the hip or knee. Arthritis Rheum. 2002 Dec; 46(12):3327-30.
7. Woodland N, Takla A, Estee MM, Franks A, Bhurani M, Liew S, Cicuttini FM, Wang Y. Patient-Reported Outcomes following Total Knee Replacement in Patients Aged 65 Years and Over- A Systematic Review. J Clin Med. 2023 Feb 17;12(4):1613. doi: 10.3390/jcm12041613. PMID: 36836148; PMCID: PMC9966398.
8. Ditton E, Johnson S, Hodyl N, Flynn T, Pollack M, Ribbons K, Walker FR, Nilsson M. Improving Patient Outcomes Following Total Knee Arthroplasty: Identifying Rehabilitation Pathways Based on Modifiable Psychological Risk and Resilience Factors. Front Psychol. 2020 May 29;11:1061. doi: 10.3389/fpsyg.2020.01061. PMID: 32670136; PMCID: PMC7326061.
9. Chughtai M, Elmallah RD, Mistry JB, Bhave A, Cherian JJ, McGinn TL, Harwin SF, Mont MA. Nonpharmacologic Pain Management and Muscle Strengthening following Total Knee Arthroplasty. J Knee Surg. 2016 Apr;29(3):194-200. doi: 10.1055/s-0035-1569147. Epub 2015 Dec 18. PMID: 26683980
10. Ryo Tanaka, Takuya Hayashizaki, Ryoji Taniguchi, Jun Kobayashi, Takuya Umehara,Effect of an intensive functional rehabilitation program on the recovery of activities of daily living after total knee arthroplasty: A multicenter, randomized, controlled trial,Journal of OrthopaedicScience,Volume 25, Issue 2,2020,Pages 285-290,ISSN 0949-2658,https://doi.org/10.1016/j.jos.2019.04.009
11.Sadeghi, Alireza, et al. “Effectiveness of Muscle Strengthening Exercises on the Clinical Outcomes of Patients with Knee Osteoarthritis: A Randomized Four-Arm Controlled Trial.” *Caspian Journal of Internal Medicine*, vol. 14, no. 3, 2023, pp. 433–42. *PubMed Central*, https://doi.org/10.22088/cjim.14.3.433.
12. Papalia R, Campi S, Vorini F, Zampogna B, Vasta S, Papalia G, Fossati C, Torre G, Denaro V. The Role of Physical Activity and Rehabilitation Following Hip and Knee Arthroplasty in the Elderly. J Clin Med. 2020 May 9;9(5):1401. doi: 10.3390/jcm9051401. PMID: 32397459; PMCID: PMC7291199.
13.Kumarahewa C.V et al. "Effectiveness of quadriceps muscle strengthening on knee joint stability and activities of daily living in patients with knee joint osteoarthritis”Sri Lanka Anatomy Journal (SLAJ), voi,4(I), 2020, pp.31-37DOI: http://doi.org/10.4038/slaj.v4i1.112