

Effect of Application of Sports Activities Teaching Protocol on Total Knee Replacement Patients Outcomes

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Abstract

Background: Total knee replacement is a surgical procedure in which the knee joint is replaced by prosthetic implant to replace the weight-bearing surfaces of the knee joint to relieve pain and disability. **Aim of the study:** To evaluate the effect of application of sports activities teaching protocol on total knee replacement patients outcomes. **Method:** Aquasi-experimental study design was utilized in this study. This study was conducted in the department of orthopedic surgery at Assiut University hospital. A total number (60) adult patient undergoing total knee replacement divided into study and control group. **Tools:** Demographic, medical data and knee outcome survey sports activities scale. **Results:** Revealed that there was a highly statistical significant difference between the patient in the study and control groups regarding the symptoms and function limitation affect , level of sport activity post protocol in (post procedure ,after three weeks,2,4and 6months with $p \leq .001^{**}$. **Conclusion:** Patient's outcome was improved after application of sports activities protocol for patient with total knee replacement. **Recommendation:** Replication of the present study on a larger probability for generalization of the results.

Keyword: *Patients outcomes, Sports activities & Total knee replacement*

Introduction

Knee replacement: is a surgical procedure in which the knee joint is replaced by prosthetic implant to replace the weight-bearing surfaces of the knee joint to relieve pain and disability. It is most commonly performed for osteoarthritis, and also for other knee diseases such as rheumatoid arthritis and trauma. Knee replacement surgery can be performed as a partial or a total knee replacement (**Rasanen et al., 2007**). Approximately (160) cases of Total knee replacement are admitted in the Orthopedic department at Assiut university hospital (**Assiut University Hospital records 2020**).

Knee replacement: is performed for destruction of joint cartilage either from osteoarthritis, rheumatoid arthritis/inflammatory arthritis, posttraumatic degenerative joint disease, or osteonecrosis/joint collapse with cartilage destruction. Damage to the synovial joint of one or more of the three compartments (lateral, medial, patellofemoral) may be the result of a variety of pathologic conditions such damage causes pain and impairs the normal functioning of the knee joint, which is a complex hinge, primarily allowing flexion and extension but also allowing rotation and gliding. (**Cram et al., 2010**).

Teaching the patient exercises in order to improve patient daily activity and be ready to practice a correct version of the appropriate exercises, in this way recovery can begin very rapidly. It is also

important that the functional status of the patient before surgery be as good as possible, this help in recovery after surgery. Furthermore the patient can also start exercise program before surgery. The patient has to train his postural control, needs to perform exercises and develop the strength of the lower extremities (**Huber, et al., 2013**).

Exercises are prescribed post operatively to strengthen muscles providing joint stability and support, prevent muscle atrophy and joint contractures and prevent venous stasis and possible thromboembolism (**Zhang, et al., 2012**). The nurse provides education and supportive care to diverse populations of disabled individuals in collaboration with the family and the rehabilitation team members. The nursing role post TKR include assisting the patient undergoing to total knee replacement to achieve their maximal level of daily activity and teaching those with functional limitations how to effectively use residual abilities after a disability (**Weiss et al., 2014**).

One of the best ways to improve the patient's outcomes is the instruction about expected activities that can increased patient compliance and help in prevent complications. This includes the opportunity for the patient to practice exercises according to prescribed additionally; the patient should be informed about early ambulation. The patient should also be taught that early leg exercises and ambulation decrease many risks post total knee replacement (**Ghrea, et al., 2006**).

Significance of the study:

Due to the fact that total knee replacement is a major musculoskeletal-related condition affecting millions worldwide that can restrict patient's participation in activities of daily living and work, as well as it can recur and persist for years **Esculier, et al., (2018)**. So patients with total knee replacement need some specific measures to prevent early progression of complication as patient education about sport exercise protocol that contribute to promoting knee function. And help such group of patients improve daily activities.

Aim of the study:

The aim of this study was to:

To evaluate the effect of application of sports activities teaching protocol on total knee replacement patients outcomes.

Research Hypothesis:

To fulfill the aim of the study the research hypothesis was formulated as:-

Patient with total knee replacement in the study group will have better outcomes post application of sports activities teaching protocol than control group.

Operational definitions:**Patient's outcomes:**

Relief of pain and restoration of function, and improved quality of life are the 3 outcomes ranked highest by patients, confirming their inclusion in total knee replacement clinical trials. And dependent on the context of patients' lives, and represented an adaptation to their changed health state (**Susan, et al., 2020**).

Patient and Methods:**Research design:**

Quasi-experimental study design was utilized in this study. This design is used to explain relationships, clarify certain events happened or both. Quasi-experiments, however, lack either the randomization or control group features that characterize true experiments, or both features that strengthen the ability to make casual interference.

Setting:

This study was conducted in the department of orthopedic surgery and outpatient orthopedic clinic in Assiut University Hospital.

Patients:

A total number (60) adult patient undergoing total knee replacements are included the following criteria; age between 20-65 years, both male and female and agree to participate in this study. The study sample divided into two groups (study and control) (30 patients for each) were choose randomize.

Randomization technique:

After the patient admitted to the orthopedic department the first week were assigned for a study group and patient admitted to department at the second week were assigned for a control group and so for every weeks. The study group received exercise training program, while the control group receive routine hospital.

Sample size: wear calculated by using the epi-info program with confidence level at 95% and the flow rate of patients 160 cases in 6 months so the sample was calculated to be sixty patients taking by randomized methods according to the admission date to the rehabilitation department

Tool:

Two tools in the study were utilized for data collection includes the following:

Tool I: Structured interview questionnaire: it was developed by the researcher based on the literature review to assessment patient's personal data and past medical history it included.

Part (1) Demographic data: as age, gender, occupation, level of education, occupation and a receiving any instructions about total knee replacementect.

Part (2): Medical data: it included (associated chronic illness such as diabetic mellitus, hypertension, renal disease and liver disease).

Tool (2) Knee Outcomes Survey Sports Activities Scale (SAS).

The SAS is developed by (**Irrgang ,et al.,1998**). It is composed of 11 item scale that queries patients about how their symptoms effect their ability to perform sports and recreational activities (7 items) as well as how their knee condition effects their ability to perform specific sports related skills such as straight ,running, jumping and landing, quick stopping and starting, cutting and pivoting(4 items). Scoring scale is that each item is scored 0-5. The highest possible score is 55 and the sum of scores is divided by 55 and multiplied by 100 to give an overall SAS percent rating. Higher percentage ratings reflect higher levels of sports and recreational function.

Validity and reliability:

Face validity of study tools were checked by 5 expert professors in field of nursing and medicine, they reviewed the instruments for clarity, relevance, comprehensiveness, understanding, applicability and easiness for administrative minor modifications that required correction were carried out accordingly .Tools reliability refers to the degree of consistency with which the instrument measures the thing supposed to be measuring. Reliability of tools was confirmed by Alpha Cranach test (0.95).

A pilot study:

The purpose of this pilot study was to ensure the clarity of designated study tools. and to examine the utility of the designed tools and identify any difficulties or problems needed to be handled before applying it a pilot study carried out in November (2018) and last for one month in 10% of the study sample (6 patients) those patients who were involved in the pilot study were included to the actual study sample because no modification of data collection tools was done.

Methods:

1. An official permission was obtained from the head of orthopedic surgery department at Assiut University Hospital.
2. The consent from the patients who was participated in the study was being done.
3. Content validity was being checked by (5) expertise from medical and nursing staff.
4. A pilot study was being conducted on 10% of patients to evaluate the applicability and clarity of the developed tools it included in the sample.
5. The reliability of tools tested by test and retest according to pilot study.
6. Researcher was interviewed the patients to collect the necessary data for this study to evaluate patients outcomes after application sports activities about total knee replacement post-operative ,after 3 weeks by interview for study and control patients and follow up after 2,4 and 6 months in the outpatient clinic.

Ethical considerations:

- Research proposal was approved from ethical committee in the faculty of nursing.
- There was no risk for study subject during application of the research.
- The study was following common ethical-principles in clinical research.
- Informed consent was obtained from the patients who are willing to participate in the study after explaining the nature and purpose of the study.
- Confidentiality and anonymity were assured.
- Patient had the right to refuse to participate and or withdraw from the study without any rational any time.
- Patient privacy was considered during collection of data.

The nursing education protocol:

The booklet was prepared by the researcher based on review of related literature in a simplified Arabic language and was supported by photo illustrations it contained items regarding the following; brief anatomy of the knee joint and its function, causes of TKR , method of diagnosis, details excises

physiotherapy treatment to improving physical function .

The practical session involved notifying the patient about the most common types of exercises include the following; ankle plantar flexion/dorsiflexion, isometric knee extension in outer range, knee extension/flexion using a pillow behind the knee, knee and hip flexion/extension, isometric buttock contraction, hip abduction/adduction and straight leg raise (Oatis et al.,2014) (Artz , et al., 2015) (Boonchoo, et al., 2019) .

Nursing protocol has been implemented for all patients; the researcher explained the booklet in the following sequence:

- The nursing education protocol were administered to the patient in three sessions, the duration of each session was about half hour.
- The researcher in the first session explained to the patient simple information about anatomy the knee joint and function, diagnosis and management.
- Second session was specified for exercise which was demonstrated by the researcher to the patient post procedure about ankle plantar flexion/dorsiflexion, isometric knee extension in outer range, knee and extension/flexion, knee and hip flexion/extension.
- Third session was specified for evaluate the exercise which was demonstrated by the researcher to the patient.
- Each patient obtained a copy of the nursing education program.
- The researcher met with each patient individually, the study and its aims were explained to the patient.
- Patients were assessed after receiving the instruction booklet and at three weak ,2,4 and 6 months after receiving the instruction booklet through the follow up period, patients were conducted by the researchers through telephone and in the orthopedic clinic to make sure they are following the instructions and to answer any questions that might arise.

Statistical design:

Data was collected & analyzed by computer programmed SPSS. Using necessary statistical manipulation as; number, percentage, mean& standard deviation to determine significant for variables-value was considered to be significant if less than 0.05, high significant if less than 0.01, or insignificant if more than 0.05.

Results:**Table (1): Frequency distribution for demographic and medical data among patient participant (n=60)**

Variables	Study (n.30)		Control(n.30)		Significance
	N	%	N	%	
Age					
20-<35year	0	0.0	1	3.4	.206 ns
35-<50years	0	0.0	2	6.6	
50-<65	30	100	27	90	
Sex					
Male	1	3.4	6	20	.051 *
Female	29	96.6	24	80	
Education level					
Non educated	8	26.6	10	33.4	
Educated	22	73.4	20	66.6	
Occupation					
Work	8	26.6	12	40	.004 *
Not work	22	73.4	18	60	
Do you receive knee exercises program.					
Yes	9	16.1	18	30.0	.294 ns
No	21	37.5	12	20.0	
Medical data					
Diabetes	11	18.3	6	10.0	.126 ns
Hypertension	21	35.0	17	28.3	.211 ns
Renal disease	2	3.3	2	3.3	.694 ns
Liver disease	5	8.3	6	10.0	.500 ns

Table (2): Comparison between study and control groups regarding the symptoms and function limitation affect mean \pm SD level of sport activity post program (n=60)

Follow up	Total score =0-35 grade		P.Value
Symptoms of sport activity	Study	Control	
Post procedure	22.03 \pm 8.95	8.93 \pm 10.87	.001**
After three weeks	23.73 \pm 7.34	21.33 \pm 6.22	.177 ns
After 2 month	31.13 \pm 3.91	29.13 \pm 3.88	.052 ns
After 4 months	34.67 \pm 1.27	33.40 \pm 1.54	.001**
After 6 months	35.000 \pm 0.00	34.56 \pm .97	.018*
Total symptoms	29.33 \pm 7.71	25.47 \pm 11.16	.001**
Functional limitations with sports activities total score = 0-20 grads			
Post procedure	9.66 \pm 3.64	10.20 \pm 2.26	.499 ns
After three weeks	13.20 \pm 1.95	12.03 \pm 1.65	.015*
After 2 month	16.00 \pm 1.72	14.50 \pm .93	.001**
After 4 months	18.06 \pm 1.72	16.03 \pm 0.88	.001**
After 6 months	18.23 \pm 1.56	17.16 \pm 1.34	.006**
Total function limitation	15.03 \pm 3.94	13.98 \pm 2.96	.010*
Total activity	44.36 \pm 11.16	39.46 \pm 13.68	.001**

Independent t-test non significance = $p > 0.05$ ** highly significance $*p \leq 0.01$ Significance = $*p < 0.05$

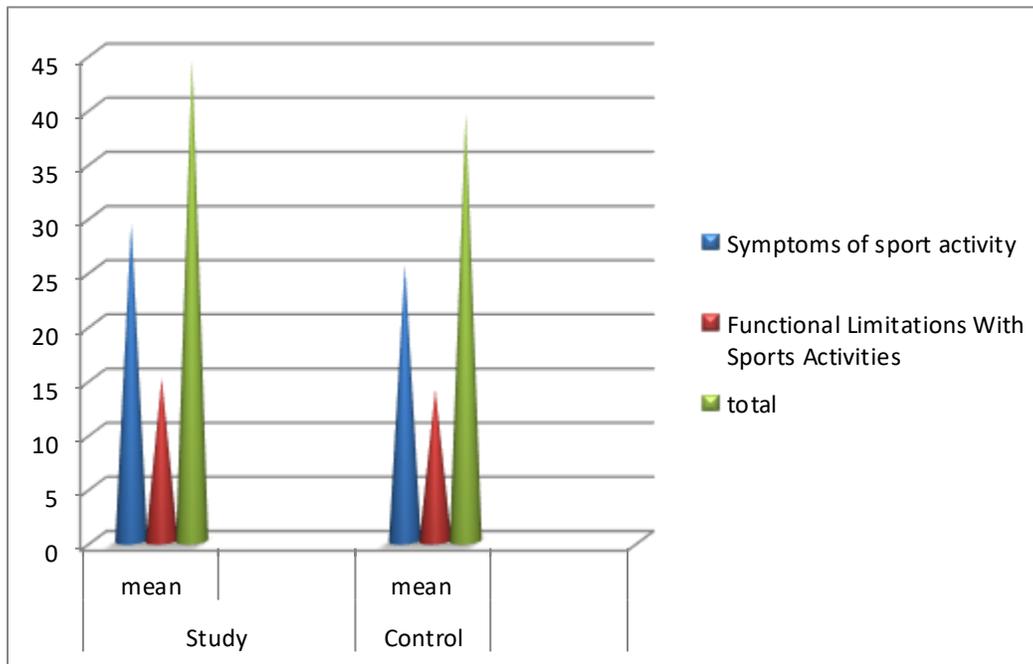


Figure (1): Comparison between study and control groups regarding the total of sporting activity post program (n=60)

Table (1): Revealed that there was the highest percentage of both study sample groups (96.6%, 80.0% respectively) were female, their age ranged from (50 to < 65) years old. Also the highest percentage of patient in both groups (73.4. %, 66.6 % respectively) were educated and not work and above half of them (35%, 28% respectively) were hypertension.

Table (2): Revealed that there was a highly statistical significant difference between the patient in the study and control groups regarding the symptoms and function limitation affect , level of sport activity post protocol in (post procedure ,after three weeks,2,4,6months with $p \leq .001^{**}$.

Figure (1): Revealed that there was a highly statistical significant difference between the patient in the study and control groups regarding the total of sporting activity post protocol application with $p \leq .001^{**}$.

Discussion:

Exercise programs for patient undergoing TKR consist of more dynamic exercises and require the skills in performance of activities daily living, such as stair ascending and descending, walking, and chair stands. (Oatis, et al., 2014) Although these trials have shown better outcomes for pain, physical function, and quality of life .The aim of the present study were to evaluate patient's outcome after

application of sports activities protocol for patient with total knee replacement.

The discussion covered the main result findings as follow:

Several studies have reported a worsened quality of life and activity daily living in patients with knee joint replacement. So patient education has been shown, in other pathologies, to improve the health status of patients especially with respect to pain, functional capacity and other quality of life variables (Barrett, et al., 2019.)

Initiate physical therapy and exercises as prescribed for the specific joint replaced; physical therapy quickly maximizes the patient's function which is associated with a greater probability of earlier discharge, which is in turn associated with a lower total cost of care, such as quadriceps setting, leg raising, and passive and active range-of-motion exercises. These exercises help prevent muscle atrophy and thromboembolism and strengthen the muscles of the affected extremity so that it can support the prosthetic joint. Use sequential compression devices or antiembolism stockings as prescribed. These help prevent thromboembolism and pulmonary embolus for the patient who must remain immobile following surgery (Graven & Hirnle, 2007).

As regards age of the study samples; the present study demonstrates that the majority of both groups

their ' ages ranged from 50 to less than 65 years old. The study result agree with (Goh, et al., 2017) who reported that good and excellent results of TKR in patients younger than 60 years. Also in most reports in the literature the younger patients having a TKR include a large proportion group with rheumatoid arthritis (Tew, et al., 2020)

From the researchers' point of view that knee osteoarthritis often causes pain and stiffness in the affected joint, often leading to a sharp decrease in knee strength and a slowing of gait speed that is beyond what is normally expected due to advancing age over 60 years old.

The present study demonstrate that the majority of the study samples in both groups were females this agree with (Peyron, et al., 2006) who verify that the prevalence of TKR is greater for women than for men.

Regarding to patients medical history of chronic diseases, the present study found that around one two third of the study and more than half control groups suffered from hypertension . This agrees with (Akamo, et al., 2017) they added that chronic diseases as hypertension was widely recognized have been proposed to contribute to the development of osteoarthritis. It has been theorized that hypertension might affect osteoarthritis via narrowing of blood vessels and ischemia, which would initiate cartilage degradation that lead to the need to TKR procedure. Although a study of (Veronese, et al., 2018) who demonstrated higher prevalence of osteoarthritis in individuals with hypertension patient undergoing to TKR.

The present study revealed that there was a statistically significance difference between the study and control groups regarding the total symptoms of sport activity scores while the total Symptoms of sport activity mean scores among study groups was that higher than control group. This disagree with (Gronstedt, et al., 2013). They demonstrate that at six month postoperative, all patients were perceiving change in the pain, symptoms, and quality of life.

The present study revealed that there was statistically significance difference between the study and control groups regarding the functional limitations with sports activities .This agree with (Piva , et al.,2010) they showed that the study group, which received educational exercise training , within eight weeks had a significant improvement in physical performance and mobility including: distance of functional forward reach; time for single leg stance timed sit-to-stand, stair climbing , up-and-go and exhibited greater improvement of physical activity as compared with the control group.

Moreover; the present study results agree with finding of the study by (Huber, et al., 2013). They demonstrate that teaching the patient the exercises in order to improve patient daily activity and be ready to practice a correct version of the appropriate exercises, in this way recovery can begin very rapidly and improvement better after TKR.

Also this on the same line with (Walsh, & Herbold, 2006) who reported that the effectiveness of exercises sports activates after hospital discharge which consisted of range of motion, stretching, strengthening, and endurance exercises and have shown beneficial effect on pain and limb function improvement .

From the researchers' point of view; patient education must be tailored to the patients based on knowledge and health needs, many patient education sessions may be required to facilitate adequate knowledge gains.

Nursing managers and nursing staff can help to improve the level of daily activities of such patients by planning and executing regular exercises programs and consequently provide more chance to improve self-care of such patients.

The results of our study are similar to those of other studies, mainly carried out in TKR patients, who found improvements in functional capacity and a reduction in medical visits, and improvements in other health parameters after the application of patient exercises protocol (Tahery, et al., 2011).

Conclusion:

Patient's outcomes was better after application of sports activities teaching protocol for patient with total knee replacement.

Recommendation:

Replication of the present study on a larger probability for generalization of the results.

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