Effect of Nursing Rehabilitation Program on Knee Functional Outcomes for Patients undergoing Arthroscopic Meniscus Surgery.

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Abstract

Background: Knee derangements are often due to either knee injury or arthritis. Knee injuries are so common that knee arthroscopy is amongst the most common procedures performed in orthopedic surgery. Successful arthroscopic meniscus surgery requires physical rehabilitation to help patients return to an active lifestyle. **The Aim of the study** is to evaluate the effect of nursing, rehabilitation program on knee functional outcomes for patients undergoing arthroscopic meniscus surgery. **Research design:** A quasi experimental research design with a pretest-posttest control group was utilized. **Setting**: the study was carried out in the Orthopedic Departments at El- Hadara Traumatology and Orthopedic University Hospital and the affiliated Outpatients Clinics, Alexandria. **Subjects:** Convenience sample of eighty adult patients were selected according to eligibility criteria. They were divided into two equal groups 40 in each study and control group. **Tools of data collection:** three tools were used to collect the necessary data, namely: Tool I: patient's assessment structure interview sheet, Tool II: knee pain scale and Tool III: Mobility Index of the Knee was divided into four parts. Part I: Muscle strength assessment scale, part II: Knee range of motion assessment sheet, part III: Knee Outcome Survey Activities of Daily Living Scale (ADLS) and part IV: Complications assessment sheet. **Results:** The result revealed that post program implementation, study group had a reduction in pain and improvement in knee muscle strength, knee function and **(KOS-ADLS)** more than the control group. **Conclusions*:*** Rehabilitation program after arthroscopic meniscus surgery had a significant positive effect on patient's knee functional outcomes. **Recommendations**: The developed booklet with its straightforward instructions and illustrations should be utilized in hospitals as a teaching aid for patient undergoing arthroscopic meniscal surgery.

Keywords: Knee Functional, Patients undergoing, Arthroscopic, Meniscus Surgery

Introduction

Musculoskeletal injuries are one of the major public health problems worldwide, causing a significant level of disability and suffering for individuals, as well as high burden to the health system and society. An Injury to one part of the musculoskeletal system usually results in injury or dysfunction of adjacent structures and structures enclosed or supported by them. The knee joint is the largest and most complicated joint of the human body, based on its movements it is trochoginglymus. **(Neumann, 2016 & Beaufils et al., 2017)**.

The knee menisci are two crescent shaped fibrocartilagenous structures that cover the peripheral portion of both the medial and lateral tibial plateau serving to deepen these areas for the reception of the femoral condyles to the flat tibial plateau. The menisci have been shown to significantly to optimal knee function by providing an essential biomechanical and structural role in joint load bearing, distribution, stability, congruence, as well as articular cartilage hemostasis and proprioception.It is well established that meniscal preservation in the younger active individual presenting with symptomatic meniscal disease is important **(Bell, & Ward, 2015 & Chen et al., 2017)**.

The meniscus is mostly torn by a rotational force incurred while the knee joint is partially flexed .The medial meniscus is much less mobile than the lateral meniscus and therefore more liable to injury. Numerous

classification of tear of the menisci has been proposed based on location or type of tear, etiology, and other factors, whereas it is recognized that tears are more common when degeneration change, cystic formation, or congenital anomalies are present **(LaPrade et al., 2015& Jarraya et al., 2017)**

Meniscal tears are a devastating knee injury with serious consequences. Not only treatment costs and time lost from work, but also there is a greatly increased risk of early osteoarthritis. The long-term effects of a meniscus injury can severely impact the patient's quality of life **(King et al .,2015)**. The occurrence of Meniscal injuries has increased in recent years, and today, it is estimated that approximately 61 per 100,000 of meniscal injuries occur in the USA each year (**Stanley et al., 2016)**. According to Alexandria El Hadara University hospital record in the last years 2020-2021 approximately 100 cases were admitted to an orthopedic department.

A forceful twist or sudden stop can cause the end of the femur to grind into the top of the tibia, pinching and potentially tearing the cartilage of the meniscus. This knee injury can also occur with deep squatting or kneeling, especially when lifting a heavy weight. Meniscus injuries often occur during athletic activities, especially in contact sports like football and hockey. **(Blake et al .,2018&Sherman et al., 2020)**. The risk of developing a torn meniscus increase with age because the cartilage begins to gradually wear out, losing its blood supply and its resilience. Increasing body weight also puts more stress on the meniscus **(Brody , 2015)**. Routine daily activities like walking and climbing stairs increase the potential for wear, degeneration, and tearing. It is estimated that six out of 10 patients older than 65 years have a degenerative meniscus tear **(Blake& Johnson, 2018)**.

Up to 60% of patients with meniscal tears can cause a range of symptoms who report feeling or hearing a "pop" in their knee at the time of injury, sudden instability in the knee, makes it feel wobbly, buckles, or gives out. When a complete Meniscal tear occurs, pain may begin immediately on the outside, back of the knee and the limits knee movement because of swelling and/or pain. After an acute injury activity is stopped, but the patient may be able to walk. They are more commonly seen in men as compared to women, with up to 80% of all meniscal tears being reported in men **(Beutler & Fields, 2018)**. On clinical knee examination, special meniscal tests a place flexes the knee and rotates the tibia while feeling along the joint and can detect a meniscal tear. Clinical examination in the form of positive McMurray test and Anderson medial-lateral grind test to see if the meniscal is intact. Also by many other investigational aids such as arthrogram, ultrasound, CT, MRI, or via arthroscopy **(Smith et al., 2015 &Maffulli et al., 2021)**

Current options for treatment of meniscus injury may be conservative or surgical. Conservative management often includes physical therapy and using a knee brace. In recent years and today, arthroscopic meniscus surgery is one of the most common procedures in orthopedic surgery (**Giuffrida etal ,. 2020**). Meniscus repair is preferred to meniscectomy, when possible, as meniscus-deficient knees are at a significant increase risk of osteoarthritis (OA) . When meniscus deficiency exists, Meniscus replacement may be an option in a subset of patients **(Rao et al., 2015)**.

The goal of arthroscopic meniscus surgery is to restore knee stability, enhance range of motion, and enable individuals to return to their prior activity level and less post-operative morbidity. After arthroscopic surgery about 60% of people have returned to the full level of activity they had before their injury **(Beaufils etal ,. 2017)**. But between 80% and 90% of people who have arthroscopic meniscus surgery have favorable results, with reduced pain, good knee function and stability & a return to normal levels of activity **(Feeley & Lau,2018)** .So, the need for rehabilitation becomes more crucial, and post arthroscopic meniscus surgery patients need highly specialized multidisciplinary team cooperation to act effectively and efficiently

Rehabilitation following arthroscopic meniscus surgery is an essential part of a full recovery. Nurses are in a strategic position for implementing rehabilitation programs that could increase patient compliance and prepare them adequately for self-care at home after hospital discharge **(Lewis, et al., 2016)** .Pre-

and post-operative rehabilitation is a major factor in the success of arthroscopic meniscus surgery. The efforts by nurses and other health care professionals to maintain function and prevent further dysfunction during the initial phase of care will greatly enhance the result of long term care. However, nursing is a pivotal factor in recovery and progress of the patient, without knowledgeable nursing intervention, the rehabilitation can fail **(Lau et al., 2018)**.

Nursing is considered a cornerstone in the recovery and progress of a patient's condition through teaching and giving an instruction to the patients on how to perform range of motion exercises, weight bearing limit, ambulation with the use of crutches and exercise restrictions. Nurse initial aims are to reduce pain and swelling in the knee, regain normal joint movement and strengthen the muscles around the knee, assess for signs and symptoms of complications or problems and post-operative follow up schedules **(David et al., 2015)**.

The rehabilitation nurse works in inpatient and outpatient settings that can be found in a range of acute to sub-acute rehabilitation facilities. This role description has been developed by staff nurses to clarify and specify the responsibilities of the staff nurse in a rehabilitation setting and to promote professionalism based on the established scope and standards of rehabilitation nursing practice **(Chirichella et al., 2019& Klemetti et al., 2020)**.

Significance of the study

The orthopedic department at El-Hadara Orthopedic and Traumatology University Hospital documented an admission number of patients for arthroscopic meniscus surgery of 100 in 2020 and 2021 (El-Hadara University Admission Office Census, 2021). Based on the clinical observation in the orthopedic department and outpatient clinic at El-Hadara University Hospital. It was observed that the number of patients under arthroscopic meniscus surgery has increased over the last years and these patients require continuous assessment, monitoring, and collaborative care to save their lives and reduce the frequency of complications that affect patient outcomes. Also, it is expected that this study's findings might help improve knee functional outcomes in terms of pain level, muscle strength, joint mobility and functional ability After arthroscopic meniscus surgery, nursing rehabilitation programis needed to better.

Aim of the study

The aim was to evaluate the effect of nursing, rehabilitation program on knee functional outcomes for patients undergoing arthroscopic meniscus surgery.

Research hypotheses:

H1: Patients who involved in nursing rehabilitation program (study group) will exhibit less level of pain after implementing nursing rehabilitation than the control group.

H2: Patients who involved in nursing rehabilitation program (study group) will exhibit Muscle strength, ROM of an affected knee better than those who do not the control group.

H3: Activities of daily living of the study group will be improved after implementing nursing, rehabilitation program than the control group.

H4: Patients who involved in nursing rehabilitation program (study group) will exhibit absence postoperative complication than the control group.

Operational definition

In this study, knee functional outcomes for patient's arthroscopic meniscal surgery refer to:- reduced level of pain of the affected knee, range of motion within normal limit ,maintenance of muscle strength and joint mobility, improved level of independence in performing activities of daily living and absence of complications, complaints or problems.

Materials and Method

Research Design

A quasi-experimental research design with a pretest-posttest the control group was utilized. The dependent variable is measured once before the intervention is implemented and after it is implemented.

Setting

The study was carried out at the inpatient units of El-Hadara Orthopedic and Traumatology University Hospital, Alexandria and the affiliated Outpatients Clinics. This setting was thought to be representative of patients in arthroscopic meniscus surgery. There were two sections in this hospital, the first section included two floors, in the first floor; there was male unit (B, D) which included 29 beds. In the second floor; there was female unit (H,G) which included 47 beds. In the second section; there was a female unit (B,D) which included 38 beds. The hospital serves three governorates namely; Alexandria, Matrouh and El Beheira.

Subjects

A convenience sample of 80 adult patients scheduled for arthroscopic meniscus surgery was included and assigned alternatively into two equal groups; 40 patients in each group. **Epi info 7** was used to estimate the sample size using a population size of 100, prevalence rates of 50%, confidence coefficient 95%, and acceptable error of 5 %. The minimum sample size required is 80 patients. **The study group** (**I**): was exposed to a nursing rehabilitation program. **The control group (II**): was exposed to routine hospital care only.

The study subjects enrolled in this study, according to the following criteria:

Inclusion criteria:

- Patients diagnosed with a meniscal injury and planned for arthroscopic meniscus surgery.
- Age: 20-60 years of both sexes with normal body mass index (BMI) 18.5-24.9.
- Patients who were able to communicate verbally, alert and able to follow instructions.
- Having no knee multiple ligaments injuries or knee fractures, infectious, neoplastic and /or inflammatory disease, and on corticosteroid drugs.

Tools: Three tools were used for data collection based on a thorough review of relevant literature **(Brophy et al., 2015, O'Donnell et al., 2017, Rucinski et al., 2019 & Harput et al., 2020)** to evaluate the effect of nursing rehabilitation program on knee functional outcomes for patients undergoing arthroscopic meniscus surgery.

Tool I: Patient's Assessment Structure Interview sheet:

This tool was developed by researchers based on a literature review **(Brophy et al., 2015 & Maffulli et al., 2021)** to collect the required baseline data and consisted of two parts;**.**

Part I: **Sociodemographic characteristic and clinical data:** This part was used to collect personal data of patients as age, gender, marital status, area of residence, level of education, occupation, income, previous hospital admissions, medical history, surgical history, mechanism of injury, present health problems, preoperative physiotherapy and sport practice.

Part III: Arthroscopic meniscus surgery patient's knowledge assessment sheet.

This part was utilized to assess patient's knowledge concerning meniscal injury, possible causes, signs & symptoms, methods of treatment, surgery, types of knee exercise, practicing of this exercise, frequency, duration, causes of not practicing these exercises, warning signs, complications reported to the doctor and source of information if present.

The scoring system of the patient's knowledge answers was scored on a 3 point Likert scale: Two scores were given for every correct and complete response , One score was given for every correct and incomplete response and Zero was given for every unknown and false response by the patient. The scores obtained for each set of questions were summed up and converted into a percent score. The total knowledge score was categorized by using a scoring system as follows: satisfactory if the percent score was 60% or more and unsatisfactory if less than 60%.

Tool II: knee pain scale

This scale was adopted from **(Kujala et al., 1993)** ,this scale was specifically designed for patients with patellofemoral pain to evaluate the intensity of pain. It consisted of 13 items. First, six items related to limping, taking weight on leg, walking, squatting, wasting of

their thigh muscles and loss of knee bending. The score ranged from 0 as a minimum to 5 as a maximum point. Second, the other seven items were related to stair climbing, running, jumping, and prolonged sitting with knee bent, pain, swelling and a feeling of instability in the knee cap). The score ranged from 0 as a minimum to 10 as a maximum point. Total pain score was summed up from 0 (no pain) as a minimum to10 (severe pain) maximum point.

Tool III: Mobility Index of the Knee:

This tool was developed to collect pertinent data and it was divided into four parts.

Part I: Muscle strength assessment scale

This part was adopted from **(LeMone et al.,** 2011**),** to assess muscle strength. This included assessment of the following muscles; quadriceps muscles, hamstring muscles, foot & ankle muscles. This scale was a six point scale ranging from zero to five where (zero) indicated no muscle contraction or paralysis, (one) indicated contraction muscles felt, but no limb movement, (two) indicated passive range of motion, (three) indicated active range of motion against gravity, (four) indicated full range of motion against some resistance and (five) indicated full active range of motion full resistance.

Part II: Knee range of motion assessment sheet

This part was adopted from **(Luttgen and Hamilton,1997)**.It was used in the present study by the researcher for measuring joint angles or range of motion in (degrees) for joint either active or passive joint range by using a goniometer. ROM was measured only on the injured knee, active extension and flexion of the injured knee was evaluated with the patients in the supine position. The reading of joint range of motion was compared against the normal value for each range and was classified into normal, limited, or no motion.

Part III: Knee Outcome Survey Activities of Daily Living Scale (ADLS).

This scale was adopted from **(Irrgang et al., 1998)**. It was used in the present study by the researcher to evaluate patient's activity of daily living. The Knee Outcome Survey was a patient self-report survey that included Activities of Daily Living Scale (ADLS) and a Sports Activity Scale (SAS) composed of 14 items. Items (1-6) ask respondents about how their knee symptoms affected their ability to perform general daily activities, e.g. pain, stiffness, swelling, giving way, buckling, or shift of the knee, weakness and limping. Items (7-14) asked about how their knee condition affected their ability to perform specific functional tasks, e.g. walking, going upstairs, going down stairs, standing, squatting, kneeling on the knee, sitting with knee bent and rising from a chair.

A five – point Likert scale was used ranging from (5) No difficult, (4) minimum difficult, (3) somewhat difficult, (2) fairly difficult, (1) Very difficult and (0) Unable. The total score of the scale ranged from 23 to 46 score. Then percent was categorized as follows: low functional ability range from - <23, moderate functional ability range 23-46 and high functional ability range from ≥46.

Part IV: Complications assessment sheet:

This part was developed by the researcher after reviewing the related literature to assess the presence of complications post-operatively **(Graveleau et al., 2016).** It included 10 items to be assessed as being" present" or "absent e.g. knee pain, knee stiffness, limited knee range of motion, knee swelling, knee loosing, arthrofibrosis, aseptic synovitis, cartilage damage, meniscal cyst formation and deep venous thrombosis DVT.

Method

The study was accomplished as follows:

1. Written approval

- An approval from the Ethics Research Committee, Faculty of Nursing, and Alexandria University was obtained.
- An official letter clarifying the purpose of the study was obtained from the Faculty of Nursing, Alexandria University forwarded to the concerned personnel at Alexandria University Hospital to take their permission to collect data**.**

2. Tools

- Tool 1 and Tool III part IV was developed by the researchers based on the recent relevant literature review and translated to Arabic by specialist in English language translation.
- Tool II, tool III part I, II, III was adopted, then translated into Arabic language specialist in English language translation.

- The validity of the study tools was tested by a jury of five experts in the field of medical surgical nursing and three Orthopedic surgery specialist
- The reliability of study tools was tested by means of Cronbach's alpha. Reliability coefficients for tools were 0.781 for tool I, 0.946 for tool II 0.917 ,for tool III and tool IV 0.812 which mean all tools were reliable.

3. Pilot study:

A pilot study was conducted before the actual study and was carried out on 8 patients to assess the feasibility and applicability of the different items of the tools to establish the most practical and comprehensive way of obtaining the necessary data and to identify any difficulties that may be faced during the actual study. In addition, the time needed to answer the tools was also estimated. The tools modifications were done.

4. Data collection:

- The data were collected by the researcher for each patient using individualized interview. Data was collected for a period of nine months from May 2021 to January2022.
- Each interview lasted for one hour. As for the sessions, one third of the session was required to cover theoretical knowledge (20 minute), and the two- thirds of the session (40 minutes) for knee exercise demonstrations and redemonstration for each individual patient.
- The data were collected from the control group patients first, to avoid contamination data and left for routine medical intervention including only taking prescribed medication.

The study was carried out in four phases.

I. Assessment phase:

Each patient in the study and control groups, interviewed by the researcher individually and in total privacy to assure confidentiality of information and its utilization only for the purpose of the research.

- **Initial assessment** was carried out preoperatively using the three study tools to collect baseline data, health history, assess patient's knowledge about meniscal injury and arthroscopic meniscal surgery, assessing anterior knee pain, muscle strength, knee range of motion, and activities of daily living before application of the rehabilitation program.
- **Subsequent assessment** was done two and three months post implementation of the rehabilitation program in order to evaluate the effect of the rehabilitation program on the patient's knee function of abilities.

II. Planning phase:

- Based on the data collected from the assessment phase and literature review; educational handout booklet was developed by the researchers in simple Arabic language based on review of the relevant recent literature **(Brophy et al., 2015, O'Donnell et al., 2017, Rucinski et al., 2019&Harput et al., 2020)** to support the given information. This booklet contained colored pictures with simple illustrations. It contains simple note about the anatomy of the knee, what is the miscues of the knee and their functions, meniscal injury, types, causes, signs &symptoms, treatment (non-surgical or surgical), knee arthroscopy information, pre-surgery instruction, post-surgery and follow up instructions, exercises (types, frequency & duration), signs and symptoms of complications.
- Teaching strategies used included the following: interactive lecture/ discussion & knee exercise demonstrations and re demonstration.

III. Implementation phase: (nursing intervention sessions for the study group :Nursing intervention consisted of the following:

- The developed rehabilitation program was conducted and applied individually to each patient in the patient department and was continued in the outpatient clinic, using demonstration, redemonstration, and colored booklet.
- Patients were asked to repeat the exercise until the investigator was assured that the patient had gained the skills. Each exercise was performed 5-6 times per day.

The program consisted of five sessions as the following:

- **In the first session**; At the beginning of this session, the researchers introduced herself to the patient and explained the general and specific objectives of the rehabilitation program, important items, time schedule and benefits of the rehabilitation program .
  - It included a simple introduction about the nature of the anatomy of the knee and

meniscal injury, such as (definition, signs & symptoms, cause & risk factors, its complications and methods of treatment),

- Knowledge related to arthroscopic meniscus surgery procedure, (its meaning, benefits, and instructions to be followed before, after the procedure and signs and symptoms of complications post meniscal surgery. The patient was instructed about five groups of exercises; I, II, III, IV, V groups during rehabilitation program.
- During the first session, the patient was instructed about the recommended group I exercise to be performed during the first week postoperatively. The goals of this exercise; maintain full knee extension, gain knee flexion (knee bending) to 90 degrees, decrease knee, leg swelling and promote quadriceps muscle strength. For example: knee extension, knee flexion (flex knee to 90 degrees, hold for 10 seconds) and leg control which included (active quadriceps contraction with quadriceps sets, ankle pumps, patellar mobilization, heel prop, heel slides assists with towel exercise and straight leg raises.

- **In the second session**, the researchers contacted each patient of the study group at the end of the first week postoperatively to observe patient's performance of the group I exercises and made corrections if needed. He was instructed about the recommended group II exercises, goal of this exercise are maintained full knee extension (straighten knee fully), begin quadriceps muscle strengthening, attain knee flexion of 110 degrees or more, decrease knee and leg swelling and normal gait without assistive devices. For example: heel slides with towel assists, sitting heel slides, towel extensions, hip abduction, prone hang, standing toe raises, wall slides, single leg stance, closed and open kinetic strengthening used bilateral 1/4 a knee bends, partial squat with chair and calf raise).
- **In the third session,** the researchers contacted each patient of a study group at the end of the fourth week postoperatively to observe the patient's performance of group II exercises and made corrections if needed. Then they were instructed about the recommended group III exercises, goal of this exercise; maintain full extension, flexion to 130 degrees, consistent weight bearing, walk with a normal heel-toe gait with no limp, muscle strength and conditioning improvements. For example**:** Heel slid, straight leg with lift light weights at the end of the foot, 1/4 squats, unilateral leg pressing, calf raising, leg extension, continued stairmaster.
- **In the fourth session**, the researcher contacted each patient of a study group at the end of the sixth weeks postoperatively to observe the patient's performance of group III exercises and made corrections if needed. They were instructed about the recommended group IV exercises, goal of this exercise is terminal extension, quadriceps tone continues to improve with a noticeable quadriceps definition returning. For example: standing hamstring curl, hamstring stretch, Quadriceps Calf/Achilles stretch, unilateral leg pressing, leg extension, calf raising, and wall slide**.**
- **In the fifth session**, the researcher contacted each patient of study group at the end of the eighth week postoperatively to observe patients' performance of the group IV exercises and made corrections. They were then instructed about the recommended group V exercises, goal of this exercise are returning to full activity, agility training and limited sports participation not only help patients to regain fast speed, strength, but also help to restore confidence in getting back to aggressive athletic activities as tolerated in the program. For example: Hamstring, quadriceps, calf/Achilles stretch, single leg, full squats, lateral slides and backward running.

IV. Evaluation phase All patients in both groups were evaluated three times immediately preprogram implementation, two and three months post program implementation using all study tools (Tools I, II & III)

5- Ethical consideration:

- Written informed patients' consent will be obtained before collection of data, and after an explanation of aim of the study.
- Confidentiality of the collected data will be assured.
- Privacy of the study participants will be maintained.

-The researchers will emphasize that participation in the study is entirely voluntary, and withdrawal from the study will not affect the care provided, and his/her withdrawal will not affect the care he/she receives at the hospital.

6- Statistical Analysis

After the collection of data, the data were fed to the computer and analyzed using the IBM Statistical Package for Social Sciences (SPSS) version 23. (Armonk, NY: IBM Corp). Qualitative data were described using numbers and percent. The Kolmogorov-Smirnov test was used to verify the normality of distribution. Quantitative data were described using range (minimum and maximum. The significance of the obtained results was judged at the 5% level.

The used tests were

- Pearson's Chi-square test: For categorical variables to compare between different groups
- Fisher's Exact : Correction for chi-square when more than 20% of the cells have expected count less than 5.
- Wilcoxon signed rank test for abnormally distributed quantitative variables, to compare between two periods.
- Statistical significance was considered at p-value <0.05.
- Graphics were done by using the Excel program.

Results

Table (1): show the frequency distribution of both studied sample according to their socio-demographic characteristics. Regarding patients' age, the results of this study revealed that, the age of the studied groups ranged between 20 to 50 years with a mean age (27.45±6.58, 28.45±5). Patients aged between 20 and 30 years represented the majority, while a minority were aged between 40 and 45 years .**Concerning gender**, it was found that males were more prevalent in the both studied groups samples. They represent the highest percentage (87.5, 85%) .**In relation to marital status**, more than half of both studied groups (62,5 ,60%) were single while the remainders were either married or widowed. **As regards educational level,** more than half of the studied groups had a secondary education, while (7. 5%) of them were illiterate. **In relation to occupation**, more than half of the studied groups (67.5%) were manual workers, (20%) of them were professional workers. **Concerning residence area**, it was observed that two - thirds of the studied groups were from urban areas and the rest of them from rural area. **Regarding monthly income**, it was noticed that around three quarter of patients mentioned that their monthly income was not sufficient enough, while, one quarter of the studied groups mentioned that it was sufficient.

Table (2): Show the frequency distribution of studied sample according to clinical data. More than one- third of studied groups (37.5, 35%) were previously hospitalized: due to previous surgery and high blood pressure .This table also reveals that a small percentage of the studied groups were exposed to previous knee surgery either arthroscopy or meniscus surgery respectively **Regarding causes of current hospital admission**, the majority of studied groups patients (75,80%) had a contact injury while 25, 20% of them had non-contact injury. **As regards sport practice**, the table illustrated that more than half of the studied group's patients were practicing sport. **Concerning physiotherapy,** around three- quarters of studied groups (75, 77.5%) were not performing physiotherapy preoperatively. **In relation to the main source of information**, nearly half of the studied groups (50, 52.5%) mentioned that they had general information. While, around less than one fourth of them (25, 22.5%) mentioned that they received their information from the medical team.

Table (3): show the differences knowledge in studied groups (control and study) patients regarding meniscus surgery throughout the intervention program. Highly statistically significant difference was found between both groups pre and immediate post program implementation in relation to definition of meniscus tear, causes, signs & symptoms, treatment, types of knee exercise, duration of exercise needed and the complications or problems post meniscus surgery (P <0.001*). Also a statistically significant difference was found between immediate post & post three months from program implementation in relation to causes of meniscus tear, type of knee exercise (P= 0.046*) respectively, signs and symptoms (P= 0.015*). Moreover, highly statistically significant difference was found

between pre and post three months from program implementation in relation to definition of meniscus tear, causes, signs & symptoms, treatment, types of knee exercises, duration of exercise needed and the complications or problems post meniscus surgery (P <0.001*).

In relation to overall knowledge level, the study results revealed that most of studied groups (87.5%) had obtained unsatisfactory level for total percent score of knowledge preprogram implementation, while 85% of them were achieved the satisfactory level post three months from program implementation. Moreover, high statistically significant difference was found in relation to total score of studied groups patient knowledge between pre and post three months from program implementation (P <0.001*). While in control group the most of studied groups had obtained unsatisfactory level during the three period of assessment.

Table (4): shows differences BMI and practicing exercise in the two studied groups throughout intervention program. It appears from the table that a high statistically significant difference in studied groups practice of knee exercise was found between pre and immediate post program implementation in relation to practicing exercise, time of practicing exercise and the ability to practice exercise (P <0.001*). Moreover, a highly statistically significant difference was found between pre and post three months from program implementation (P <0.001*).Although some decline was evident between immediate post and post three months from program implementation but it was still higher than preprogram implementation. Whereas in control group patients the difference was not statistically significant **Regarding body mass index**, the largest percentage of studied both groups, patients had normal BMI while a fewer proportion of them were obese or underweight post three months from program implementation with no significant statistical differences throughout program implementation.

Table (5): show the differences knee pain intensity in the two studied groups throughout the intervention program.

A high statistically significant difference between control and study group patients regarding pain intensity in relation to limping, taking weight on leg, walking, climbing stairs, squatting, running, jumping, prolonged sitting with knee flexed, knee pain, knee swelling, abnormal patellar movement, wasting of thigh muscle and loss of knee bend (P <0.001*).

It appears from the table that overall total percent scores intensity of knee pain in more than half control group patients (60.0%) who complained of severe knee pain as well as study group patients at preprogram implementation while all of them (100%) post-surgery experienced mild pain**.** The pain was improved significantly in the studied group's patient immediately after application of the program indicating a significant difference between pre, immediate post and post three months from program implementation (p<0.001*).

Table (6): Differences in muscle strength of the lower extremities in the two studied groups throughout the intervention program. This table showed a high statistically significant difference between both studied control and study groups in relation to hamstring, quadriceps and calf muscle strength in the studied groups between pre and immediate post program implementation (P <0.001*). Also, a statistically significant difference was found between immediate post & post three months from program implementation in relation to hamstring muscle strength (P= 0.003*), quadriceps muscle strength (P= 0.04*).Moreover, this table shows a highly statistically significant difference between both studied control and study groups pre and post three month program implementation in relation to hamstring, quadriceps and calf muscle strength (P <0.001*).

Table (7): Differences in knee joint range of motion in the two studied groups throughout the intervention program. The table notes a high statistically significant difference between both studied control and study groups pre and immediate post program implementation in relation to knee flexion and extension (P <0.001*). Moreover, this table shows a high statistically significant difference between both studied control and study groups in relation to knee flexion and extension (P <0.001*).

This table displays that the majority of control group and study groups (77.5, 80%) preprogram implementation complained limited knee flexion, while post three months from program implementation it was more than two third of study group patients 87.5% had normal knee flexion, while in the control group patients there was no improvement.

Table (8): Show differences in activities of daily living in the two studied groups throughout the intervention program.

The table reveals a highly statistically significant difference regarding knee symptoms affecting the ability to perform general activity was found between the control and study group pre and immediate post program implementation in relation to pain, stiffness, swelling, giving way or shifting of the knee, weakness and limping (P <0.001*). A statistically significant difference was different between control group patients and study group patients immediate post and post three months from program implementation regarding knee symptoms affecting the ability to perform general activity in relation to pain (P<0.011*), swelling (P=0.004*) and limping (P <0.001*). A high statistically significant difference was found between both groups pre and post three months from program implementation regarding knee symptoms affecting the ability to perform general activity in relation to pain, stiffness, swelling, giving way or shifting of the knee, weakness and limping (P <0.001*).

It appears from the table a high statistically significant difference in the ability to perform specific functional tasks in relation to walking, going up stairs, going down stairs, standing, kneeling in front of the knee, squatting, sitting on knee bent and rising from a chair (P <0.001*). Moreover, a highly statistically significant difference in the ability to perform specific functional tasks was found in relation to walking, going down stairs, kneeling in front of the knee and sitting on knee bent and rising from a chair (P <0.001*).

A statistically significant difference in ability to perform specific functional tasks between control group patients and study group patients immediate post and post three months from program implementation in relation to standing (p<0.023*) and squatting (P<0.017*). A high statistically significant difference in the ability to perform specific functional tasks was found in relation to walking, going up stairs, going down stairs, standing, kneeling in front of the knee, squatting, sitting on knee bent and rising from a chair (P <0.001*).

Figure (8): Comparisons between the two studied groups regarding total mean percent of the (KOS-ADLS) throughout the intervention program. This figure provides evidence that the overall total scores of activity of daily living, the majority of study groups (82.5%) had a moderate functional ability preprogram implementation, then the majority of study group patients (85%) three month post-surgery experienced high functional ability, where as in control group patients had a moderate functional ability preprogram during the three period of assessment.

Table (9): Distribution of studied sample in relation to presence of complications or problems post meniscus surgery.

This table shows that only a minority of study group patients (12.5%) had problems post meniscus surgery. Low percentages of study group patients were complaining of knee pain, limited knee range of motion, quadriceps muscle weakness (12.5%) respectively, while three patients (7.5%) had knee swelling post meniscus surgery**.** While the majority of control group patients (85%) had problems post meniscus surgery.

Table (1): Frequency distribution of the studied sample according to socio-demographic characteristics.

Socio-demographic characteristics	Control (n=40)		Study (n=40)		Test of sig. (P-value)
	No.	%	No.	%	
Age (years)					
• 20 -	28	70	27	67.5	χ^2 =2.881 (MCP=0.41)
• 30 -	10	25	11	27.5	
• 40-<50	2	5	2	5.0	
Mean ±SD	27.45±6.58		28.45±5.58		
Min-Max	21 – 45		22 – 44		t=-1.286 (P=0.204)
Gender					
• Male	35	87.5	34	85.0	χ^2 = =6.720 (^{MC}P=0.41)
• Female	5	12.5	6	15.0	
Marital status					
• Single	25	62.5	24	60.0	χ^2 =0.628 (^{MC}P= 0.757)
• Married	10	25	14	35.0	
• Widowed	5	12.5	2	5.0	
Educational level					
• Illiterate	3	7.5	3	7.5	χ^2 = 0.218 (^{MC}P=1)
• Read and write	4	10	5	12.5	
• Basic education	1	2.5	0	0.0	
• Secondary education	25	62.5	23	57.5	
• University education	7	17.5	9	22.5	
Occupation					
• Not working(housewife)	5	12.5	5	12.5	χ^2 =2.981 (^{MC}P=0.71)
• Professional worker	8	20.0	8	20.0	
• Manual worker	27	67.5	27	67.5	
Residence					
• Rural	15	37.5	16	40.0	χ^2 =2.78 (^{MC}P=0.61)
• Urban	25	62.5	24	60.0	
Monthly income					
• Sufficient	10	25	11	27.5	χ^2 =2.801 (^{MC}P=0.51)
• Insufficient	30	75	29	72.5	

Table (2): Frequency distribution of the studied sample according to clinical data

Past and current medical history	Control (n=40)		Study (n=40)		Test of sig. (P-value)
	No.	%	No.	%	
Previous hospitalization					
• No	25	62.5	26	65.0	χ^2 =2.991 (^{MC}P=0.59)
• Yes	15	37.5	14	35.0	
• Previous surgery	11	27.5	11	27.5	
• Hypertension	3	7.5	3	7.5	
Previous knee surgery					
• No	35	87.5	37	92.5	χ^2 =4.781 (^{MC}P=0.77)
• Yes	5	12.5	3	7.5	
• Arthroscopy	2	5.0	2	5.0	
• Meniscus surgery	3	7.5	1	2.5	
Cause of current admission					
• Contact injury	30	75	32	80.0	χ^2 =2.881 (^{MC}P=0.41)
• Non-contact	10	25	8	20.0	
Practice exercise					
• No	14	35.0	13	32.5	χ^2 =3.891 (^{MC}P=0.62)
• Yes (football)	26	65.0	27	67.5	
Previous physiotherapy					
• No	30	75	31	77.5	χ^2 =2.89 (^{MC}P=0.71)
• Yes	10	25	9	22.5	
Source of information about meniscus surgery					
• General information	20	50	21	52.5	χ^2 =3.781 (^{MC}P=0.61)
• Medical team	10	25	9	22.5	
• Friends/relatives	6	15	6	15	
• Reading	4	10	4	10	

Table (3): Differences knowledge between the two studied groups regarding meniscus surgery throughout the intervention program

Knowledge about meniscus surgery	Control (n=40)						Study (n=40)						Sig 1 Before/ immediate	Sig 2 Immediate /3m	Sig 3 Before/3 m
	Before surgery		Immediate Post		Post 3months		Before surgery		Immediate post		Post 3months				
	No	%	No	%	No	%	No	%	No	%	No	%			
1.Definition of meniscus tear															
Incorrect	28	70.0	34	85.0	28	70.0	28	70.0	0	0.0	0	0.0	<0.001*	=0.091	<0.001*
Incomplete	9	22.5	6	15.0	9	22.5	9	22.5	4	10.0	7	17.5			
Correct ,complete	3	7.5	0	0.0	3	7.5	3	7.5	36	90.0	33	82.5			
2.Causes of meniscus tear															
Incorrect	9	22.5	13	32.5	13	32.5	13	32.5	0	0.0	0	0.0	<0.001*	=0.046*	<0.001*
Incomplete	27	67.5	27	67.5	27	67.5	27	67.5	4	10.0	8	20.0			
Correct, complete	4	10.0	0	0.0	0	0.0	0	0.0	36	90.0	32	80.0			
3.Signs and symptoms															
Incorrect	13	32.5	13	32.5	13	32.5	9	22.5	0	0.0	0	0.0	<0.001*	=0.015*	<0.001*
Incomplete	27	67.5	27	67.5	27	67.5	27	67.5	5	12.5	11	27.5			
Correct, complete	0	0.0	0	0.0	0	0.0	4	10.0	35	87.5	29	72.5			
4.Type of meniscus injury treatment															
Incorrect	28	70.0	28	70.0	28	70.0	7	17.5	0	0.0	0	0.0	<0.001		<0.001*
Incomplete	9	22.5	9	22.5	9	22.5	28	70.0	0	0.0	0	0.0			
Correct, complete	3	7.5	3	7.5	3	7.5	5	12.5	40	100.0	40	100.0			
5.Types of knee exercise															
Incorrect	7	17.5	9	22.5	9	22.5	34	85.0	0	0.0	0	0.0	<0.001*	= 0.046*	<0.001*
Incomplete	28	70.0	27	67.5	27	67.5	6	15.0	5	12.5	9	22.5			
Correct, complete	5	12.5	4	10.0	4	10.0	0	0.0	35	87.5	31	77.5			
6.Duration of exercise needed															
Incorrect	31	77.5	35	87.5	35	87.5	35	87.5	3	7.5	6	15.0	<0.001*	=0.250	<0.001*
Correct, complete	9	22.5	5	12.5	5	12.5	5	12.5	37	92.5	34	85.0			
7.post operative complications															
Incorrect	31	77.5	31	77.5	31	77.5	31	77.5	0	0.0	0	0.0	<0.001*	=0.18	<0.001*
Incomplete	9	22.5	9	22.5	9	22.5	9	22.5	7	17.5	13	32.5			
Correct, complete	0	0.0	0	0.0	0	0.0	0	0.0	33	82.5	27	67.5			
Total knowledge scores															
Unsatisfactor level (<60%)	35	87.5	31	77.5	31	77.5	35	87.5	3	7.5	6	15.0	<0.001*	=0.250	<0.001*
Satisfactory lev (60%≤)	5	12.5	9	22.5	9	22.5	5	12.5	37	92.5	34	85.0			

* Statistically significant at $p \leq 0.05$ -p1: p value for comparing between the study and the control groups in before surgery, p2: p value for comparing between the study and the control groups immediate post- p3: p value for comparing between the study and the control groups after 3months

Table (4): Differences BMI and practicing exercise in in the two studied groups throughout intervention program

BMI and Practicing exercise	Control (n=40)						Study (n=40)						Sig 1 Before/ immediate	Sig 2 Immediate /3m	Sig 3 Before/3 m
	Before surgery.		Immediate post		Post 3 months		Before surgery		Immediate post		Post 3 months				
	No	%	No	%	No	%	No	%	No	%	No	%			
1.BMI															
Underweight	3	7.5	3	7.5	3	7.5	3	7.5	3	7.5	2	5.0	Z=-1.0 P=0.317	Z=-0.0 P=1.0	Z=-0.577 P=0.564
Normal BMI	32	80.0	32	80.0	33	82.5	32	80.0	33	82.5	35	87.5			
Overweight	5	12.5	5	12.5	4	10.0	5	12.5	4	10.0	3	7.5			
2.Practice of exercise															
Never	35	87.5	3	7.5	35	87.5	34	85.0	0	0.0	0	0.0	<0.001*	=0.150	<0.001*
Sometimes	5	12.5	33	82.5	5	12.5	6	15.0	5	12.5	3	7.5			
Always	0	0.0	4	10.0	0	0.0	0	0.0	35	87.5	37	92.5			
3.Time of practicing exercise															
Never	35	87.5	34	85.0	34	85.0	35	87.5	0	0.0	0	0.0	<0.001*	=0.325	<0.001*
Sometimes	5	12.5	6	15.0	6	15.0	5	12.5	3	7.5	4	10.0			
Always	0	0.0	0	0.0	0	0.0	0	0.0	37	92.5	36	90.0			
4.Patient ability to practice exercises															
Never	35	87.5	35	87.5	34	85.0	34	90.0	0	0.0	0	0.0	<0.001*	=0.156	<0.001*
Sometimes	5	12.5	5	12.5	6	15.0	6	10.0	5	12.5	3	7.5			
Always	0	0.0	0	0.0	0	0.0	0	0.0	35	87.5	37	92.5			

*: Statistically significant at $p \leq 0.05$ -p1: p value for comparing between the study and the control groups in before surgery, p2: p value for comparing between the study and the control groups immediate post- p3: p value for comparing between the study and the control groups after 3months -NA-: Not applicable

Table (5): Differences knee pain intensity in the two studied groups throughout the intervention program

Knee Pain Scale	Control (n=40)						Study (n=40)						Sig 1 Before/ immediate	Sig 2 Immediate /3m	Sig 3 Before/3m
	Before surgery		Immediate post		Post 3 months		Before surgery		Immediate post		Post 3 months				
	No	%	No	%	No	%	No	%	No	%	No	%			
1.Limping															
Constant	8	20.0	12	30.0	12	30.0	4	10.0	0	0.0	0	0.0	<0.001*	<0.001*	<0.001*
Slight or periodical	32	80.0	22	55.0	22	55.0	28	70.0	6	15.0	0	0.0			
None	0	0.0	6	15.0	6	15.0	8	20.0	34	85.0	40	100.0			
2.Taking weight on the leg															
Unable to fully weight bear on leg	4	10.0	4	10.0	4	10.0	8	20.0	0	0.0	0	0.0	<0.001*	=0.012*	<0.001*
Pain on weight bearing	28	70.0	28	70.0	28	70.0	32	80.0	30	75.0	14	35.0			
Full weight on leg without pain	8	20.0	8	20.0	8	20.0	0	0.0	10	25.0	26	65.0			
3.Walking															
Unable to walk any distance	0	0.0	0	0.0	12	30.0	0	0.0	0	0.0	0	0.0	<0.001*	<0.001*	<0.001*
Less than 1/2 kilometer	34	85.0	34	85.0	22	55.0	34	85.0	8	20.0	0	0.0			
Between1/2 to 1 kilometer	6	15.0	6	15.0	6	15.0	6	15.0	10	25.0	6	15.0			
More than one kilometer	0	0.0	0	0.0	0	0.0	0	0.0	7	17.5	6	15.0			
Unlimited	0	0.0	0	0.0	0	0.0	0	0.0	15	37.5	28	70.0			
4.Climbing stairs															
Unable to go up and down	4	10.0	12	30.0	4	10.0	0	0.0	0	0.0	0	0.0	<0.001*	<0.035*	<0.001*
Pain on going up and down	28	70.0	22	55.0	28	70.0	28	70.0	5	12.5	2	5.0			
Slight pain on going down	8	20.0	6	15.0	8	20.0	12	30.0	12	30.0	7	17.5			
No problems	4	10.0	0	0.0	4	10.0	0	0.0	23	57.5	31	77.5			
5.Squatting															
Unable to squat	12	30.0	12	30.0	4	10.0	12	30.0	0	0.0	0	0.0	<0.001*	<0.003*	<0.001*
Possible with partial weight bearing	22	55.0	22	55.0	28	70.0	22	55.0	13	32.5	0	0.0			
Painful each time	6	15.0	6	15.0	8	20.0	6	15.0	4	10.0	2	5.0			
Repeated squatting painful	0	0.0	0	0.0	4	10.0	0	0.0	10	25.0	11	27.5			
No difficulty	0	0.0	0	0.0	0	0.0	0	0.0	13	32.5	27	67.5			
6.Running															
Unable to run	5	12.5	5	12.5	5	12.5	40	100.0	40	100.0	40	100.0	=0.001*	-	=0.001*
Severe pain	11	27.5	11	27.5	11	27.5	0	0.0	0	0.0	0	0.0			
Slight pain on starting	24	60.0	24	60.0	24	60.0	0	0.0	0	0.0	0	0.0			
No difficulty	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			
7.Jumping															
Unable to jump	40	100.0	40	100.0	40	100.0	40	100.0	40	100.0	40	100.0	=0.001*	-	=0.001*
Constant pain	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			
Slight difficulty	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			
No difficulty	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			

Table (5) (Cont.…): Differences in pain intensity in the two studied groups throughout the intervention program.

Knee Pain Scale	Control (n=40)						Study (n=40)						Sig 1 Before/ immediate	Sig 2 Immediate/3m	Sig 3 Before/3m
	Before surgery		Immediate post		Post 3months		Before surgery		Immediate post		Post 3months				
	No	%	No	%	No	%	No	%	No	%	No	%			
8.Prolonged sitting with knee flexed															
Unable to sit with knee bent	5	12.5	5	12.5	5	12.5	5	12.5	0	0.0	0	0.0	=0.001*	=0.001*	=0.001*
Pain forces you to regularly straight knees	11	27.5	11	27.5	11	27.5	11	27.5	0	0.0	0	0.0			
Constant painful	24	60.0	24	60.0	24	60.0	24	60.0	0	0.0	0	0.0			
Pain is slight	0	0.0	0	0.0	0	0.0	0	0.0	22	55.0	9	22.5			
No problems	0	0.0	0	0.0	0	0.0	0	0.0	18	45.0	31	77.5			
9.Knee pain															
Occasionally,severe	5	12.5	4	10.0	4	10.0	4	10.0	0	0.0	0	0.0	=0.001*	=0.016*	=0.001*
Interferes with sleep	7	17.5	8	20.0	8	20.0	8	20.0	0	0.0	0	0.0			
Slight and occasional	28	70.0	28	70.0	28	70.0	28	70.0	12	30.0	5	12.5			
None	0	0.0	0	0.0	0	0.0	0	0.0	28	70.0	35	87.5			
10.Knee swelling															
After daily activities	20	50	22	55.0	22	55.0	22	55.0	8	20.0	0	0.0	=0.001*	=0.003*	=0.001*
After severe exertion	13	32.5	11	27.5	11	27.5	11	27.5	5	12.5	3	7.5			
None	7	17.5	7	17.5	7	17.5	7	17.5	27	67.5	37	92.5			
11.Abnormal patella movement															
More than 1 dislocation	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.001*	-	<0.001*
At least 1 dislocation	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			
Occasionally in ADLS	33	82.5	33	82.5	33	82.5	33	82.5	0	0.0	0	0.0			
Occasionally in sports	7	17.5	7	17.5	7	17.5	7	17.5	0	0.0	0	0.0			
None	0	0.0	0	0.0	0	0.0	0	0.0	40	100.0	40	100.0			
12.Wasting of thigh muscles															
Greatly reduced compared to the other leg	9	22.5	9	22.5	9	22.5	0	0.0	0	0.0	0	0.0	=0.004*	-0.790	=0.001*
Noticeable compared to other leg 1-2cm	31	77.5	31	77.5	31	77.5	17	42.5	8	20.0	5	12.5			
None	0	0.0	0	0.0	0	0.0	23	57.5	32	80.0	35	87.5			
13.Loss of knee bend															
Severe limitation of movement	9	22.5	9	22.5	9	22.5	9	22.5	0	0.0	0	0.0	<0.001*	=0.018*	<0.001*
Slight at end of movement	31	77.5	31	77.5	31	77.5	31	77.5	12	30.0	4	10.0			
None	0	0.0	0	0.0	0	0.0	0	0.0	28	70.0	36	90.0			
Total pain scores (%)															
Severe pain (60-<100%)	24	60.0	24	60.0	24	60.0	24	60.0	0	0.0	0	0.0	<0.001*	<0.001*	<0.001*
Moderate pain (30-<60%)	16	40.0	16	40.0	16	40.0	16	40.0	24	60.0	0	0.0			
Mild pain (10 -<30%)	0	0.0	0	0.0	0	0.0	0	0.0	16	40.0	40	100.0			
No pain (0%)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			

$\chi 2$: Chi square test - FE: Fisher Exact - *: Statistically significant at $p \leq 0.05$ -p1: p value for comparing between the study and the control groups in before surgery, p2: p value for comparing between the study and the control groups immediate post- p3: p value for comparing between the study and the control groups after 3months -NA-: Not applicable

Table (6): Differences in muscle strength of the lower extremities in the two studied groups throughout the intervention program

Muscle strength	Control (n=40)						Studied (n=40)						Sig 1 Before/ mmediate	Sig 2 mmediate /3m	Sig 3 Before/3m
	Before surgery		Immediate post		Post 3 months		Before surgery		Immediate post		Post 3 months				
	No	%	No	%	No	%	No	%	No	%	No	%			
1.Operated hamstring muscle															
No muscle contractions	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.001*	=0.03*	<0.001*
Contraction felt, but no limb movement	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			
Passive range	3	7.5	3	7.5	4	10.0	4	10.0	0	0.0	0	0.0			
Active range against gravity	23	57.5	23	57.5	22	55.0	22	55.0	0	0.0	0	0.0			
Active range against some resistance	14	35.0	14	35.0	14	35.0	14	35.0	11	27.5	4	10.0			
Fully active range against full resistance	0	0.0	0	0.0	0	0.0	0	0.0	29	72.5	36	90.0			

Muscle strength	Control (n=40)						Studied (n=40)						Sig 1 Before/ immediate	Sig 2 immediate /3m	Sig 3 Before/3m
	Before surgery		Immediate post		Post 3 months		Before surgery		Immediate post		Post 3 months				
	No	%	No	%	No	%	No	%	No	%	No	%			
2.Operated quadriceps muscle															
No muscle contractions	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			
Contraction felt, but no limb movement	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			
Passive range	3	7.5	5	12.5	5	12.5	5	12.5	0	0.0	0	0.0			
Active range against gravity	23	57.5	26	65.0	26	65.0	26	65.0	0	0.0	0	0.0	<0.001*	=0.04*	<0.001*
Active range against some resistance	14	35.0	9	22.5	9	22.5	9	22.5	14	35.0	5	12.5			
Fully active range against full resistance	0	0.0	0	0.0	0	0.0	0	0.0	26	65.0	35	87.5			
3.Operated calf muscle															
No muscle contractions	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			
Contraction felt but no limb movement	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			
Passive range	4	10.0	4	10.0	4	10.0	0	0.0	0	0.0	0	0.0			
Active range against gravity	13	32.5	13	32.5	13	32.5	4	10.0	0	0.0	0	0.0	<0.001*	=0.5	<0.001*
Active range against some resistance	23	57.5	23	57.5	23	57.5	13	32.5	4	10.0	2	5.0			
Fully active range against full resistance	0	0.0	0	0.0	0	0.0	23	57.5	36	90.0	38	95.0			
Total score of muscle strength															
No muscle strength 0%	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			
Very severe muscle weakness10- <30%	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			
Severe muscle weakness 30% <50%	0	0.0	0	0.0	0	0.0	4	10.0	0	0.0	0	0.0			
Moderate muscle weakness (50-<70%)	3	7.5	4	10.0	4	10.0	13	32.5	0	0.0	0	0.0	<0.001*	= 0.030*	<0.001*
Mild muscle weakness (70-<90%)	23	57.5	13	32.5	13	32.5	23	57.5	14	35.0	5	12.5			
Normal muscle strength (90-≤100%)	14	35.0	23	57.5	23	57.5	0	0.0	26	65.0	35	87.5			

$\chi 2$: Chi square test - FE: Fisher Exact - *: Statistically significant at $p \leq 0.05$ -p1: p value for comparing between the study and the control groups in before surgery, p2: p value for comparing between the study and the control groups immediate post - p3: p value for comparing between the study and the control groups after 3months

Table (7): Differences in knee joint range of motion in the two studied groups throughout the intervention program

Joints range of motion	Control (n=40)						Study (n=40)						Sig 1 Before/ immediate	Sig 2 Immediate/3m	Sig 3 Before/3m
	Before surgery		Immediate post		post 3months		Before surgery		Immediate post		post 3months				
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%			
1.Operated knee flexion															
Limited	33	77.5	32	80.0	32	80.0	32	80.0	14	35.0	5	12.5	<0.001*	=0.064	<0.001*
Normal	7	17.5	8	20.0	8	20.0	8	20.0	26	65.0	35	87.5			
2.Operated knee extension															
Limited	32	80.0	32	80.0	32	80.0	16	40.0	5	12.5	3	7.5	<0.001*	=0.25	<0.001*
Normal	8	20.0	8	20.0	8	20.0	24	60.0	35	87.5	37	92.5			

*: Statistically significant at $p \leq 0.05$ -p1: p value for comparing between the study and the control groups in before surgery, p2: p value for comparing between the study and the control groups immediate post - p3: p value for comparing between the study and the control groups after 3months

Table (8): Differences in activities of daily living in the two studied group's throughout the intervention program.

The Activities of Daily Living Scale (ADLS) of Knee Outcome Survey	Control (n=40)						Study (n=40)						Sig 1 Before/ immediate	Sig 2 Immediate /3m	Sig 3 Before/3m
	Before surgery		Immediate post		Post 3months		Before surgery		Immediate post		Post 3months				
	No	%	No	%	No	%	No.	%	No.	%	No	%			
The knee symptoms affecting the ability to perform general daily activities (6 items)															
1.Pain															
The symptom affects all daily activities	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.001*	<0.011*	<0.001*
It affects activity severely	0	0.0	0	0.0	0	0.0	4	10.0	0	0.0	0	0.0			
It affects activity moderately	0	0.0	0	0.0	0	0.0	23	57.5	0	0.0	0	0.0			
It affects activity slightly	0	0.0	0	0.0	0	0.0	13	32.5	5	12.5	0	0.0			
Have the symptom, but not affecting activity	0	0.0	0	0.0	0	0.0	0	0.0	10	25.0	5	12.5			
Do not have the symptom	40	100.0	40	100.0	40	100.0	0	0.0	25	62.5	35	87.5			
2.Stiffness															
The symptom affects all daily activities	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.001*	-	<0.001*
It affects activity severely	3	7.5	3	7.5	4	10.0	0	0.0	0	0.0	0	0.0			
It affects activity moderately	23	57.5	23	57.5	23	57.5	0	0.0	0	0.0	0	0.0			
It affects activity slightly	14	35.0	14	35.0	13	32.5	0	0.0	0	0.0	0	0.0			
Have the symptom, but not affecting activity	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			
Do not have the symptom	0	0.0	0	0.0	0	0.0	40	100.0	40	100.0	40	100.0			
3.Swelling															
The symptom affects all daily activities	9	22.5	9	22.5	9	22.5	0	0.0	0	0.0	0	0.0	<0.001*	=0.004*	<0.001*
It affects activity severely	24	60.0	24	60.0	24	60.0	3	7.5	0	0.0	0	0.0			
It affects activity moderately	7	17.5	7	17.5	7	17.5	19	47.5	0	0.0	0	0.0			
It affects activity slightly	0	0.0	0	0.0	0	0.0	11	27.5	13	32.5	3	7.5			
Have the symptom, but not affecting activity	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			
Do not have the symptom	0	0.0	0	0.0	0	0.0	7	17.5	27	67.5	37	92.5			
4.Giving way, buckling, or shifting of the knee															
The symptom affects all daily activities	0	0.0	0	0.0	0	0.0	9	22.5	0	0.0	0	0.0	<0.001*	-	<0.001*
It affects activity severely	4	10	3	7.5	3	7.5	24	60.0	0	0.0	0	0.0			
It affects activity moderately	19	47.5	19	47.5	19	47.5	7	17.5	0	0.0	0	0.0			
It affects activity slightly	11	27.5	11	27.5	11	27.5	0	0.0	0	0.0	0	0.0			
Have the symptom, but not affecting activity	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			
Do not have the symptom	6	15	7	17.5	7	17.5	0	0.0	40	100.0	40	100.0			

Table (8) (Cont…): Differences in activities of daily living in the two studied groups throughout the intervention program

The Activities of Daily Living Scale (ADLS) of Knee Outcome Survey	Control (n=40)						Study (n=40)						Sig 1 Before/ immediate	Sig 2 Immediate /3m	Sig 3 Before/3m
	Before surgery		Immediate post		Post 3months		Before surgery		Immediate post		Post 3months				
	No	%	No	%	No	%	No	%	No	%	No.	%			
5.Weakness															
The symptom affects all daily activities	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.001*	<0.121	<0.001*
It affects activity severely	4	10.0	4	10.0	4	10.0	3	7.5	0	0.0	0	0.0			
It affects activity moderately	20	50.0	20	50.0	20	50.0	22	55.0	0	0.0	0	0.0			
It affects activity slightly	8	20.0	8	20.0	8	20.0	15	37.5	9	22.5	4	10.0			
Have the symptom, but not affecting activity	0	0.0	0	0.0	0	0.0	0	0.0	5	12.5	3	7.5			
Do not have the symptom	8	20.0	8	20.0	8	20.0	0	0.0	26	65.0	33	82.5			
6.Limping															
The symptom affects all daily activities	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.001*	<0.001*	<0.001*
It affects activity severely	3	7.5	4	10.0	4	10.0	4	10.0	0	0.0	0	0.0			
It affects activity moderately	22	55.0	20	50.0	20	50.0	20	50.0	0	0.0	0	0.0			
It affects activity slightly	15	37.5	8	20.0	8	20.0	8	20.0	0	0.0	0	0.0			
Have the symptom, but not affecting activity	0	0.0	0	0.0	0	0.0	0	0.0	4	15.0	0	0.0			
Do not have the symptom	0	0.0	8	20.0	8	20.0	8	20.0	36	85.0	40	100.0			
The knee condition affects the ability to perform specific functional tasks (8 items).															
7.Walking															
Unable to do the activity	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0			
Activity is very difficult	12	30	12	30	12	30	4	10.0	0	0.0	0	0.0	<0.001*	<0.001*	<0.001*
Activity is fairly difficult	14	35	15	37.5	15	37.5	25	62.5	0	0.0	0	0.0			
Activity is somewhat difficult	8	20.0	8	20.0	8	20.0	11	27.5	5	12.5	0	0.0			
Activity is minimally difficult	6	15	5	12.5	5	12.5	0	0.0	9	22.5	3	7.5			
Activity is not difficult	0	0.0	0	0.0	0	0.0	0	0.0	26	65.0	37	92.5			
8.Going up stairs															
Unable to do the activity	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.001*	<0.131	<0.001*
Activity is very difficult	4	10.0	4	10.0	4	10.0	12	30	0	0.0	0	0.0			
Activity is fairly difficult	26	65	25	62.5	25	62.5	15	37.5	0	0.0	0	0.0			
Activity is somewhat difficult	10	25	11	27.5	11	27.5	8	20.0	6	15.0	3	7.5			
Activity is minimally difficult	0	0.0	0	0.0	0	0.0	5	12.5	11	27.5	6	15.0			
Activity is not difficult	0	0.0	0	0.0	0	0.0	0	0.0	23	57.5	31	77.5			

The Activities of Daily Living Scale (ADLS) of Knee Outcome Survey	Control (n=40)						Study (n=40)						Sig 1 Before/ immediate	Sig 2 Immediate /3m	Sig 3 Before/3m
	Before surgery		Immediate post		Post 3months		Before surgery		Immediate post		Post 3months				
	No	%	No	%	No	%	No	%	No	%	No.	%			
9.Going down stairs															
Unable to do the activity	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	<0.001*	<0.001*	<0.001*
Activity is very difficult	9	22.5	9	22.5	9	22.5	9	22.5	0	0.0	0	0.0			
Activity is fairly difficult	10	25	11	27.5	11	27.5	11	27.5	0	0.0	0	0.0			
Activity is somewhat difficult	6	15	5	12.5	5	12.5	5	12.5	5	12.5	0	0.0			
Activity is minimally difficult	7	17.5	7	17.5	7	17.5	7	17.5	9	22.5	6	15.0			
Activity is not difficult	8	20.0	8	20.0	8	20.0	8	20.0	26	65.0	34	85.0			
10.Standing															
Unable to do the activity	4	10.0	11	27.5	11	27.5	0	0.0	0	0.0	0	0.0	<0.001*	<0.023*	<0.001*
Activity is very difficult	26	65	24	60.0	24	60.0	0	0.0	0	0.0	0	0.0			
Activity is fairly difficult	10	25	5	12.5	5	12.5	15	37.5	0	0.0	0	0.0			
Activity is somewhat difficult	0	0.0	0	0.0	0	0.0	8	20.0	5	12.5	0	0.0			
Activity is minimally difficult	0	0.0	0	0.0	0	0.0	6	15.0	11	27.5	7	17.5			
Activity is not difficult	0	0.0	0	0.0	0	0.0	11	27.5	24	60.0	33	82.5			

Table (8): (Cont.…): Differences in activities of daily living in the two studied groups throughout the intervention program.

The Activities of Daily Living Scale (ADLS) of Knee Outcome Survey	Control (n=40)						Study (n=40)						Sig 1 Before/2m	Sig 2 Immediate /3m	Sig 3 Before /3m
	Before surgery		Immediate post		Post 3 months		Before surgery		Immediate post		Post 3 months				
	No	%	No	%	No	%	No	%	No	%	No	%			
11.Kneeling on front of knee															
Unable to do the activity	11	27.5	11	27.5	11	27.5	11	27.5	0	0.0	0	0.0	<0.001*	<0.001*	<0.001*
Activity is very difficult	24	60.0	24	60.0	24	60.0	24	60.0	0	0.0	0	0.0			
Activity is fairly difficult	5	12.5	5	12.5	5	12.5	5	12.5	3	7.5	0	0.0			
Activity is somewhat difficult	0	0.0	0	0.0	0	0.0	0	0.0	8	20.0	4	10.0			
Activity is minimally difficult	0	0.0	0	0.0	0	0.0	0	0.0	19	47.5	9	22.5			
Activity is not difficult	0	0.0	0	0.0	0	0.0	0	0.0	10	25.0	27	67.5			
12.Squatting															
Unable to do the activity	11	27.5	11	27.5	11	27.5	11	27.5	0	0.0	0	0.0	<0.001*	<0.017*	<0.001*
Activity is very difficult	24	60.0	24	60.0	24	60.0	10	25.0	0	0.0	0	0.0			
Activity is fairly difficult	5	12.5	5	12.5	5	12.5	12	30.0	4	10.0	0	0.0			
Activity is somewhat difficult	0	0.0	0	0.0	0	0.0	7	17.5	6	15.0	3	7.5			
Activity is minimally difficult	0	0.0	0	0.0	0	0.0	0	0.0	17	42.5	9	22.5			
Activity is not difficult	0	0.0	0	0.0	0	0.0	0	0.0	13	32.5	28	70.0			
13.Sitting on knee bent															
Activity is very difficult	15	37.5	15	37.5	15	37.5	15	37.5	0	0.0	0	0.0	<0.001*	<0.001*	<0.001*
Activity is fairly difficult	19	47.5	19	47.5	19	47.5	20	50.0	5	12.5	0	0.0			
Activity is somewhat difficult	6	15.0	6	15.0	6	15.0	5	12.5	7	17.5	3	7.5			
Activity is minimally difficult	0	0.0	0	0.0	0	0.0	0	0.0	10	25.0	8	20.0			
Activity is not difficult	0	0.0	0	0.0	0	0.0	0	0.0	18	45.0	29	72.5			

The Activities of Daily Living Scale (ADLS) of Knee Outcome Survey	Control (n=40)						Study (n=40)						Sig 1 Before/2m	Sig 2 Immediate /3m	Sig 3 Before /3m
	Before surgery		Immediate post		Post 3 months		Before surgery		Immediate post		Post 3 months				
	No	%	No	%	No	%	No	%	No	%	No	%			
4.Rising from chair															
Activity is very difficult	16	40	15	37.5	15	37.5	15	37.5	0	0.0	0	0.0	<0.001*	<0.001*	<0.001*
Activity is fairly difficult	20	50.0	20	50.0	20	50.0	19	47.5	0	0.0	0	0.0			
Activity is somewhat difficult	4	10	5	12.5	5	12.5	6	15.0	5	12.5	0	0.0			
Activity is minimally difficult	0	0.0	0	0.0	0	0.0	0	0.0	13	32.5	6	15.0			
Activity is not difficult	0	0.0	0	0.0	0	0.0	0	0.0	22	55.0	34	85.0			
Total ADSL score (%) of knee outcome															
High functional ability (≥46)	0	0.0	0	0.0	0	0.0	0	0.0	27	67.5	34	85.0	P<0.001*	P = 0.180	P<0.001*
Moderate functional ability (23 - <46)	34	8.5	33	82.5	33	82.5	33	82.5	13	32.5	6	15.0			
Low functional ability (<23)	6	15	7	17.5	7	17.5	7	17.5	0	0.0	0	0.0			

*: Statistically significant at $p \leq 0.05$ -p1: p value for comparing between the study and the control groups in before surgery, p2: p value for comparing between the study and the control groups immediate post - p3: p value for comparing between the study and the control groups after 3months . -NA-: Not applicable

Figure (8): Comparisons between the two studied groups regarding total mean percent of the (KOS-ADLS) throughout the intervention program.

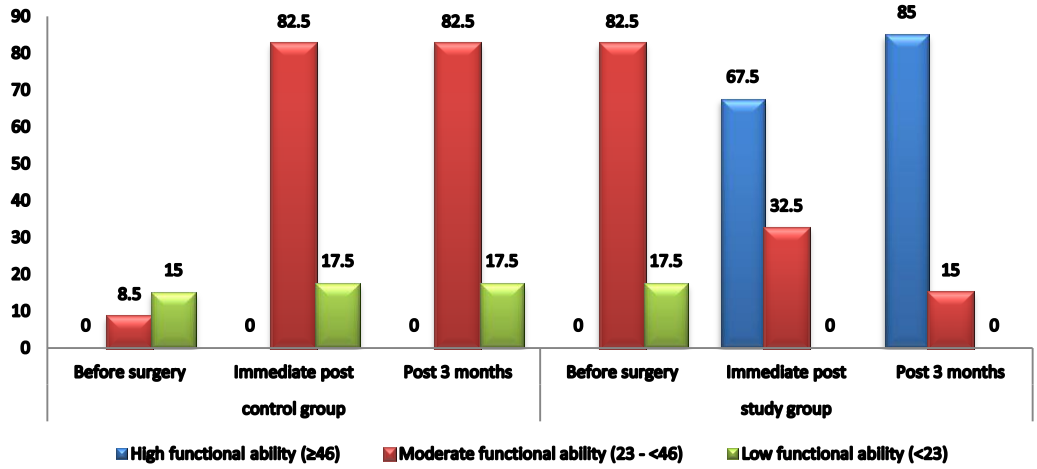

Table (9): Frequency distribution of studied sample in relation to presence of complications or problems post meniscus surgery.

Complications/problems post meniscus surgery	Control group (n=40)				Study group (n=40)			
	Absent		Present		Absent		Present	
	No	%	No	%	No	%	No	%
Overall problems/ complaints	6	15	34	85	35	87.5	5	12.5
Knee Pain	4	10	36	90	35	87.5	5	12.5
Cartilage damage	40	100.0	0	0.0	40	100.0	0	0.0
Limited knee range of motion	5	12.5	35	87.5	35	87.5	5	12.5
Knee stiffness	37	92	3	7.5	37	92.5	3	7.5
Knee loosening	0	0.0	40	100.0	40	100.0	0	0.0
Knee swelling	5	12.5	35	87.5	35	87.5	5	12.5
Arthrofibrosis	0	0.0	40	100.0	40	100.0	0	0.0
Aseptic synovitis	40	100.0	0	0.0	40	100.0	0	0.0
Meniscal cyst formation	40	100.0	0	0.0	40	100.0	0	0.0
Deep venous thrombosis	40	100.0	0	0.0	40	100.0	0	0.0

Discussion

Few musculoskeletal conditions have stimulated as much controversy, debate, and research as meniscal tears, are common sports related injuries in young adults and can also present as a degenerative condition in older patients. Meniscal surgery and arthroscopy changes over the past decade, due to extensive clinical experience, improved surgical techniques and better understanding of rehabilitation Nursing rehabilitation program is an important, powerful tool that can have amazing effects that include improvement in patient self-care, quality of care, treatment, and patient satisfaction with benefits of training and education (**Avelar , 2018)**.

Rehabilitation is one of the most important, yet too often neglected, aspect of meniscus surgery. The main aim of the rehabilitation programs following meniscus surgery is decreased pain level of the affected knee, improved joint range of motion, maintenance of muscle strength, improved capacities for meeting self-care requirements, maintenance of patients function abilities, mobilize independently and safely, and prevention of complications or problems. Patient education, teaching weight bearing limit, ambulation with the use of crutches and exercise restrictions, assessing for signs and symptoms of complications or problems and post-operative follow up schedules must be considered in the rehabilitation program. More broadly, rehabilitation aims at activating patients and thus improving their health related quality of life and long term maintenance of the surgical results. Early mobilization after surgery is important to prevent deconditioning and other secondary postoperative morbidities **(Doenges et al., 2016)**.

The present study was carried out in order to evaluate the effect of nursing, rehabilitation program on knee functional outcomes for patients undergoing arthroscopic meniscus surgery. **Concerning socio- demographic data**, the results of the present study revealed that more than two- thirds of the studied patients were in the age group between 20 to <30 years old with mean age was (27.45±6.58& 28.45± 5.58) years. This finding may be due to that these age groups have an active lifestyle as well as higher participation in sports. The results of the study agree with **(Hollier et al., 2018)** which found that meniscus injury is most prevalent in patients 15-45 years of age. Also , **(Beaufils et al .,2017)** revealed that the highest percentage of patients were in the age group of 40 to 45 years old with a mean of (30±.2.0).

In relation to gender the findings of this study showed that the majority of the studied group were males .This result is supported by **(Abd-Elmohsen et al., 2013**) who found that the majority of the studied sample in both the study and the control groups were male (80 % and 90 %).In the same line,**(Kurzweil et al., 2017)** in their study found that males had a higher incidence rate in females. These results contradicted **(Bryan et al., 2016)** who reported higher rates of injury among female . **Regarding patient occupation** in the present study there was no statistical significant difference between the study and control group and this is also a benefit as that half of the studied sample in both the study and control group their injury was related directly to their manual work. This result is supported by **(Abd-Elmohsen et al., 2013)** who reported that the majority of patients with the meniscus tear were machinery workers.

The present study revealed that a minority of patients had a chronic disease and previous knee surgery. This result in line with **(Chirichella et al., 2019)** who reported that the majority of patients with meniscal tear had no chronic disease and no previous knee surgery. In this matter, **(Smoak et al., 2020)** reported that the majority of studied patients were having no chronic diseases. **Regarding BMI,** in the present study no statistically significant differences were found between pre, immediate and post three months from program implementation. This may be due to that high percent of both studied group had normal BMI before the program implementation, this result is supported by **(Crawford et al., 2019)** who reported that the highest percentage of both study and control groups were having an ideal weight with no statistically significant difference between them.

Concerning patient's knowledge about meniscus surgery, the findings of the present

study revealed that there was a high statistically significant improvement in the studied patients knowledge about definition, causes, signs & symptoms, methods of treatment, types of knee exercise, duration of exercise, complications or problems and total knowledge score immediately after the interventional program. This improvement declined after three months, but was still more significant than the preprogram. The high statistically significant improvement post program implementation might be due to health instruction given to patients about meniscus injury and treatment using different teaching strategies as lecture, discussion, using media as hand out including colored booklet. It also emphasized the importance of reinforcing the patient's knowledge. This finding was supported by **(Kurzweil et al., 2017)** who reported that revealed that there was a significant statistical difference between the control and study groups regarding their knowledge pre and post intervention. In addition, this finding was reported by **(Hagmeijer et al., 2019)** who mentioned that patient teaching is crucial and the patient should be involved in the treatment plan .

Concerning intensity of knee pain the current study shows that pain intensity changed from severe in almost all patients preprogram to moderate in the majority immediately post program then to mild for all patients post three months from program implementation. The present study indicated that there was a high a statistically significant difference and improvement total score of the knee pain pre, immediately post and post three months from program implementation. This may be related to the fact that patients gained information and knowledge about their conditions, and their exercise educated during the rehabilitation program helped decrease their pain. The majority of studies, patients had no knee pain related to limping, knee swelling, abnormal patellar movement, wasting of the thigh muscles and loss of knee bending. More than half of studied patients had no knee pain related to taking weight on leg, walking, climbing stairs, squatting and prolonged sitting with knee flexed, a statistically significant difference was found. This finding was congruent with those of **(Frontera et al., 2018)** who stated that patients had less pain when mobilized within 4 weeks postoperatively. In addition, **(Kostov et al., 2018)** who reported that the modalities after meniscal surgery had been more effective in improving pain intensity.

As for muscle strength of the lower extremities the current study emphasized that there was a statistically significant improvement in studied patients related to hamstring, quadriceps and calf muscles strength at immediate post and increased more after 3 months of program implementation than preprogram. This may be related to the application of the rehabilitation program which included isometric exercises that were demonstrated to the patient by the investigator. They were illustrated in a colored booklet with pictures so that it was clear to the patients who perform them.

In this respect **Grossman ,2013** pointed that in order to keep muscle strength, the patient should perform isometric exercises properly. Disuse of muscles leads to loss of approximately one eighth of its strengths each week of disuse. In addition, immobilizations muscles leads to changes in their structure and function. These changes become apparent after immobilization even after normal activity has been resumed. Furthermore, muscle atrophy not only contributes to wasting and weakening of muscle tissues, but also it plays a role in the development of contractures. Therefore, regular isometric exercises are important to prevent muscle contractures and maintain muscle tone. In addition, the findings of the present study are in agreement with (**Hinkle et al., 2014)** who documented that home exercise program after meniscectomy appears to improve knee muscle strength. In addition, **Uçar, et al ,.2014** added that hamstring as well as quadriceps muscle strength can be increased via early knee motion after knee arthroscopy with no negative impact on knee motion. Results were in contradiction with (**Grant and Mohtadi , 2010)** who mentioned that traditional physical therapy program was more effective in improving of muscle strength than closed kinetic chain exercise. This discrepancy might be due to the combination of both open and closed kinetic chain exercises in the present study rather than use of closed kinetic chain exercise only.

Concerning knee joint range of motion, the results of the present study revealed that there are improvement in flexion and extension of an affected knee with a statistically significant difference. This result may be due to the continuous application of exercises by studied patients as instructed by the researcher and demonstrated by the colored booklet which was distributed to each patient as continuous knee exercise improves circulation, increases flexibility, prevents knee joint stiffness, improves range of motion of affected knee and improves overall physical conditioning. Moreover, decreased pain level experienced by studied patients might increase self-trust and self-confidence of patients to extend and flex their knees successfully. This finding agrees with (**Anna et al., 2015**) added that the accelerated rehabilitation program with both open and closed kinetic chain exercises has been more effective in reducing the limitation of motion particularly knee extension.

Moreover, **Ombreget ,2013** mentioned that joint function may be diminished as a result of immobility, decreased protein intake, altered fluid and electrolyte, poor circulation until ultimately contractures occur and heterotopic bone is formed. Full range of motion, joint exercise should begin early in the postoperative period and continue at regular daily intervals. In this respect, (**Kozier et al ,.2016)** reported that there was a short term benefit exercises for knee range of motion. Also **(Hiyama et al ,.2016)** mentioned that patients performing exercises demonstrated grater changes in knee ROM, quadriceps strength and knee pain. If a body part is left immobile for a protracted period of time, capsular contracture, and shortening of tendon and muscle groups which cross the joints occur. This rapid process can be prevented by a regular program of range of motion exercise.

In the present study, the exercise program was carried out three times daily for 10 minutes for each exercise. This is congruent with (**Jewiss et al ., 2017)** who pointed that short and frequent exercise and active participation in daily living activities can be effective in counteracting the contractile forces that are present 24 hours a day. The exercise program should be kept simple moving in a direction opposite to the contractile forces.

In relation to activity of daily living of the knee outcome, the results of the present study revealed that there was an improvement and a statistically significant difference regarding performing ADLs pre, immediately post and post three months from program implementation. The patient's ability to master their activities improved as a result of pain reduction, which improved knee muscles strength and range of motion of the affected knee. These findings are attributed to adherence of the studied patients to the instructions provided by the researcher to perform self-care activities or due to incorporating home exercises regularly into their daily living. This may ameliorate the patient's functional abilities as regular exercises may lead to an increase in autonomy for daily and routine activities, preventing functional incapacity and dependency. As regards total ADLs of knee outcome, the present findings revealed that the majority of studied patients had high knee functional ability after three months of program implementation. This finding is due to that studied patients were encouraged to participate in the program. Active participation gives patients the psychological benefits, emotional stability and promotes habits of a daily routine, which must be conscientiously adhered to after discharge.

These findings are in line with (**Mohamed et al., 2016**) who found that there was a highly statistically significant difference between the study and control group in relation to the performance of ADLs. Furthermore, (**Salem et al., 2012**) found that there were significantly improved knee function, promoting earlier weight bearing and reduced pain during activity in the patients who performed neuromuscular exercise program. Moreover, these findings are supported by **Letchford ,2015** who clarified that active participation in rehabilitation and self-exercise programs are crucial to prevent complications and increase functional abilities. In this context, **Arundale et al., 2017** stated that patients are encouraged to perform early ADLs, as soon as possible, this will help to maintain capillary tone, improve ventilation, maintain muscular tone and above all restore the patients' confidence in themselves and their recovery.

Finally, the present study is bridging the gap between clinical practice and research in order to translate research findings and apply best evidence into practice. Additionally, the obtained results show the evidence that a well-planned rehabilitation program carried out by the nurse could be successful in improving in knee muscle strength, ROM, functional abilities, reducing pain and complications or problems post meniscus surgery. Nurses play an important role in planning and applying exercise program (**Nyland et al., 2015)**. So, nurses should incorporate exercise programs into their routine general practice activities According to the results of the current study, the proposed hypotheses has been fulfilled in patients undergoing for patients undergoing arthroscopic meniscus surgery who received a nursing rehabilitation program and exhibited improvement in postoperative knee functional outcomes.

Conclusions:

Nursing rehabilitation program following arthroscopic meniscal surgery has a significant positive effect on patient's knee functional outcomes (improve pain level, muscle strength and range of motion of the affected knee, activities of daily living and absence postoperative complications).

Recommendations

Based on the findings of the present study, the following recommendations are suggested:

- Patient education and home based exercises that should be performed post arthroscopic meniscal surgery such as, ROM, isometric exercises and increase level of independence in performing activities of daily living.
- The developed booklet with its straightforward instructions and illustrations should be utilized in hospitals as a teaching aid for patient undergoing arthroscopic meniscal surgery.
- Job training program should be carried out for nurses working in the orthopedic department about types, frequency and benefits of exercise for patients with arthroscopic meniscal surgery.
- A procedure manual should be updated and available for nurses working in the orthopedic department about rehabilitation program that should be implemented to each patient after arthroscopic meniscal surgery.
- A specialized rehabilitation nurse should be full time attending the outpatient arthroscopy clinic to teach the patient rehabilitation instructions needed.
- Replication of the present study under dissimilar circumstances (sampling, setting, measurement, duration of management) is recommended to confirm its results.

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