

Effect of Educational Program on Nurses' Knowledge, Practices and Patients' Outcomes Post Total Knee Arthroplasty

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ABSTRACT

Context: Total knee arthroplasty (TKA) is a surgical procedure in which the damaged parts of the patient's kneecap, thighbone, and shinbone are replaced with artificial parts.

Aim: This study aimed to evaluate the effect of an educational program on nurses' knowledge, practices, and patients' outcomes post total knee arthroplasty.

Methods: A quasi-experimental design was utilized in the orthopedic department and outpatient orthopedic clinic affiliated to Benha University Hospital from the beginning of July 2020 to the end of June 2021. A convenience sample of all available nurses (50) working in the orthopedic department. A purposive sample of 64 adult patients from both genders was divided into (32) control and (32) study groups. Three tools were used: The nurses' knowledge assessment questionnaire, nurses' practice observational checklist, and patient' outcomes assessment sheet.

Results: The present study revealed that 58% of nurses age was from 40 to less than 60 years old, 92% were females, 66% had secondary nursing education, 28 % of studied nurses had total satisfactory knowledge pre-program implementation, which reached 80%, 58 %, respectively immediately after and in follow up of program implementation. 22% of studied nurses had a competent level of practice scores pre-program implementation, which improved to 82%, 74 %, respectively, immediately after and in follow up of program implementation. There were highly statistically significant differences between study and control group patients regarding the frequency of most of the general and local complication and lower extremity function scale after two weeks and one month post-surgery at p-value<0.00.

Conclusion: Implementing the educational program had statistically significantly improved the knowledge and practices of the studied nurses that could reflect positively on patient condition. The study recommended a continuous educational program for all nurses working in the orthopedic departments. Further study to search the correlation between the nurses' performance and the patient outcomes is recommended.

Keywords: Educational program, knowledge, practices, outcomes, total knee arthroplasty

1. Introduction

Total knee arthroplasty (TKA), or knee replacement, is a common surgical procedure to replace the weight-bearing surfaces of the knee joint for individuals with advanced osteoarthritis, rheumatoid arthritis, and post-traumatic arthritis. It is often an option when conservative treatments have been exhausted, and patients have severe pain and functional disabilities (Ferfket *et al.*, 2017).

Approximately 40 percent of the global population over age 55 experiences chronic knee pain. Of those, 50.8 million suffer from disabling pain, and about 2.6 million turns to knee replacement surgery yearly (Stewart, 2019). Total knee arthroplasty (TKA) is a surgical procedure in which the diseased parts of the knee joint are replaced with artificial parts. The most appropriate term for TKA is total knee resurfacing because only the surfaces of the bones are replaced. TKA is one of the most cost-effective and consistently successful surgeries in orthopedics. It was performed first in 1968; since then, surgical materials and techniques have greatly increased its effectiveness and safety (Martin, 2017).

Total knee arthroplasty surgery is contraindicated in severe vascular disease, knee sepsis, dysfunction of the extensor mechanism, well-functioning knee arthrodesis, and recurvatum deformity secondary to weakness of muscles. Relative contraindications involve Charcot joint, osteomyelitis, and patients' medical conditions that may prohibit safe anesthesia, surgery, and rehabilitation (Mohindra & Jain, 2017).

Total knee arthroplasty (TKA) may be associated with serious complications that adversely affect outcomes and increase the likelihood of disability. Total Knee replacement complications can be catastrophic and life-threatening. The complications of total knee replacement can be divided into major systemic complications, such as cardiac, pulmonary, renal, and cerebrovascular complications, necessitated complex medical intervention. Local complications consisted of superficial wound infection or delayed wound healing, deep wound infection, peripheral nerve injury, and others (Feng *et al.*, 2017).

Infection is considered the main complication post-TKA as it prohibits healing, prolongs recovery, and may lead to loss of joint function and necessitate revision surgery.

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Another problem is postoperative chronic pain that was experienced in the respected proportion of patients. Other potential complications include circulatory impairment to the operated limb, venous thromboembolism, bleeding, stiffness, and nerve damage (Batarfi et al., 2018).

The major goals of nursing management during the preoperative period for patients undergoing TKA focus on education concerning the surgical procedure, its risks, potential complications, and the postoperative course. After surgery, the main goals of nursing care are preventing complications, relieving surgical pain, assisting the patient in achieving a higher level of function, and improving mobility and positive self-esteem (Meiner, 2015).

Previous studies that have examined the efficacy of implementing nursing care protocol on total hip replacement patients' outcomes in the orthopedic department concluded that protocol of care education was effective and successfully enhancing orthopedic nurses' knowledge and clinical practices for total joint replacement and improved patients' outcomes through reducing the frequency of general and local complication (El Shemey & Elsaay, 2015). Another research conducted to study the effect of nursing care guidelines on preventing deep venous thrombosis among patients undergoing arthroplasty surgery" reported statistically significant improvements in nurses' knowledge and practice and patient outcomes after implementing nursing care guidelines (Elkattan & Elderiny, 2019).

Moreover, a study about safe nursing practices applied for patients post-hip joint replacement established that nursing education has an effective role in improving safe nursing practices and recommended improving nurse practices by encouraging them to participate in educational programs through workshops and lectures (Weheida et al., 2018).

2. Significance of the study

The orthopedic department at Benha University Hospital documented an admission number of patients for TKA of 200 in 2018 and 2019 (Benha University Admission Office Census, 2019).

Based on the clinical observation in the orthopedic department and outpatient orthopedic clinic at Benha University Hospital. It was observed that the number of patients under total knee arthroplasty 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 the quality of patient care and establish evidence-based data that can promote nursing practice and research.

3. Aim of the study

This study aimed to evaluate the effect of an educational program on nurses' knowledge, practices, and patients' outcomes post total knee arthroplasty.

3.1. Operational definitions

In this study, patient outcome is meant as possible patient general and local complications and the lower extremity functions.

3.2. Research Hypotheses

The following hypotheses were formulated to achieve the aim of this study:

H1: Nurses' knowledge scores regarding total knee arthroplasty will significantly improve after implementing an educational program compared to pre-program implementation.

H2: Nurses' practice scores related to caring for a patient with total knee arthroplasty will significantly improve after an educational program compared to pre-program implementation.

H3: There will be a significant positive correlation between nurses' knowledge and their practices.

H4: The frequency of total knee arthroplasty complications for the study group patients will be significantly less than for the control group.

H5. Lower extremity function score will be significantly better for the study group patients than the control group post-program implementation.

4. Subjects & Methods

4.1. Research Design

A quasi-experimental research design (pre/post-test for nurses' performance, study/control group for patients' outcomes) was used in this study. A quasi-experimental design aims to establish a cause-and-effect relationship between an independent and dependent variable. However, unlike a true experiment, a quasi-experiment does not rely on random assignment. Instead, subjects are assigned to groups based on non-random criteria. A quasi-experimental design is useful in situations where true experiments cannot be used for ethical or practical reasons (Reichardt, 2019). The independent variable in the current study is the educational program, while the dependent variables are nurses' knowledge, practices, and patient outcomes.

4.2. Study setting

This study was conducted in the orthopedic department and followed the patients through the orthopedic outpatient clinic at Benha University Hospital. The orthopedic department was composed of eight rooms containing thirty-one beds.

4.3. Subjects

Group A: A convenience sample of all available nurses (50) working in the orthopedic department and agreed to participate in the study.

Group B: A purposive sample of 64 adult patients from both genders with one or both knee affected, they were undergoing total knee arthroplasty and agreed to participate in the study, had no cognitive impairment or previous history of DVT affecting the legs, or was not being overweight.

Group B is divided into two groups:

- Pre-educational program implementation group (control group=32).
- Post educational program implementation group (study group=32).

Both study and control groups were subjected to hospital routine of care. The difference was that the control group received the care by the nurses before education. However, the study group patients were received routine care from nurses who were enrolled in the educational program.

The sample size was calculated based on the previous year's census report of admission in the orthopedic department at Benha University Hospital (*Benha University Admission Office Census, 2019*), utilizing the following formula (*Yamane, 1967*).

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n= sample size (64)

N= total population (80)

e= margin error (0.05)

4.4. Tools of data collection

Three tools were used to collect data for this study.

4.4.1. Nurses' Knowledge Assessment Questionnaire

The researchers developed it based on reviewing relevant recent literature *El Shemey and Elsaay (2015)* and *El-Sayed et al. (2016)*. It was developed in the simple Arabic language and used to assess nurses' knowledge regarding care of patients undergoing total knee arthroplasty surgery and included two parts:

Part one: Demographic characteristics of nurses such as age, gender, marital status, educational qualification, years of experience, training courses regarding knee arthroplasty.

Part two: Nurses' knowledge regarding care of patients undergoing TKA. It included 53 closed-end MCQ questions. It involved the following items:

- General knowledge regarding TKA surgery (10 questions) distributed as definition (1 question) causes (1 question), types of knee arthroplasty surgery (1 question), advantages and disadvantages of surgery (2 questions), contraindication (2 questions), complications of surgery (3 questions).
- Knowledge regarding preoperative nursing care (5 questions).
- Knowledge regarding postoperative nursing care (16 questions).
- Knowledge regarding postoperative complications and how to prevent them (9 questions).
- Knowledge regarding health education for the patient and discharge planning (13 questions).

Scoring system

The total score of knowledge was 53 marks equal (100%). Each correct answer was given one mark, and the incorrect answer was given zero. A total score $\geq 80\%$ was considered a satisfactory level of knowledge (≥ 42 -degree

correct answers). Less than 80% was an unsatisfactory level of knowledge (< 42 -degree incorrect answers).

4.4.2. Nurses' Practice Observational Checklist

The researcher developed it based on a review of relevant recent literature *El Shemey and Elsaay (2015)*; *Parker (2011)*; *Lucas (2008)*. It was used to assess nurses' practice regarding care of the patient undergoing TKA and included:

- Preoperative nursing care (11 steps).
- Nursing care on the day of surgery (15 steps).
- Postoperative nursing care (17 steps).
- Teach patients early postoperative exercises, which included:
 - Quadriceps set (8 steps).
 - Straight leg exercises (9 steps).
 - Ankle pump (6 steps).
 - Knees straighten exercises (7 steps).
 - Bed supported knee bends (8 steps).
 - Using walker for ambulation (23 steps).

Scoring system

Items observed to be done completely were scored (2), the items incompletely done were scored (1), and the items not done were scored (0). The total score for all items was 208 degrees (100%). If the practice level was $\geq 80\%$, it was considered a competent level of practice (≥ 166 -degree correct answers). If the total score was $< 80\%$, it was considered incompetent practice level (< 166 degree correct answers).

4.4.3. Patient' Outcomes Assessment Record

The researchers constructed it after reviewing the relevant literature *Fawzy et al. (2020)*; *Feng et al. (2017)*; *Frosch et al. (2004)*. It was used to assess patients' outcomes after TKA surgery. It included four parts:

Part 1 is concerned with the patient's sociodemographic data such as age, gender, marital status, educational level, occupation, residence, and living status.

Part 2 was used to assess the past and present medical history of patients. The present history included the onset of complaint, main complaint during hospitalization, surgical indication according to patients' diagnosis, conservative treatment before the operation, the replaced knee side, smoking, and practicing regular exercises. The past medical history included comorbidities and previous orthopedic surgeries.

Part 3 encompassed the complications assessment record. It was adopted from *Feng et al. (2017)*; *Frosch et al. (2004)*. It comprised six general complications: circulatory (deep venous thrombosis), respiratory complications, signs of pulmonary embolism, cardiac complications, neurological, GIT, and urinary and musculoskeletal complications. Also, It comprised 15 items about local complications categorized under four main categories: Wound complication (as delayed wound healing, superficial wound infection, deep intraarticular infection, necrosis of skin or subcutaneous tissue, dehiscence of the wound), bleeding or thrombotic complications (hematoma without further therapy,

hematoma requiring blood transfusion or antibiotic treatment, hematoma requiring revision, hemarthrosis or effusion with puncture or without puncture, seroma with conservative therapy), instability, malalignment (malpositioning, implant dislocation, ligament rupture), and implant losing.

Part 4 included the Lower Extremity Functional Scale (LEFS). It was adopted from *Binkley et al. (1999)*. It is a questionnaire containing 20 questions about a person's ability to perform everyday tasks. The LEFS can be used by clinicians to measure patients' initial function, ongoing progress, outcome, and set functional goals.

Scoring system

The LEFS comprises 20 items. Each scored on a 5 point adjectival scale with '0' extreme difficulty or unable to perform the activity and '4' for no difficulty. The items are summed to produce a total LEFS score, which can vary from 0 to 80. Patients with higher total LEFS scores signifying better lower extremity functional status. It is categorized as follows:

The score from 0-16 was considered extremely difficult, score from 17-32 was considered quite difficult, score from 33-49 was considered moderately difficult, score from 50-66 was considered a little bit difficult, and score from 67-80 was considered no difficulty.

4.5. Procedures

Official permission was granted from the Dean of Faculty of Nursing, Benha University, hospital directors, and head of the orthopedic department at Benha University Hospital. The researcher obtained approval for data collection. The study's objectives and nature were explained, making it possible to conduct it without any resistance.

Ethical consideration: This study was conducted after primary approval from the Scientific Research and Ethical Committee, Faculty of Nursing, Benha University. An explanation about the aim of the study was given to the study sample. Additional verbal consent was taken for participation in the study. Study groups were also informed that they could withdraw from the study at any time before the completion of the study. Moreover, they were reassured that the information gathered would be confidential and used only for the study.

Tools validity and reliability: The data collection tools were revised for comprehensiveness, appropriateness, and legibility by a panel of five experts in medicine and nursing to test the face and content validity. The same experts validate the educational program's objectives and content. The modification was carried out according to the panel's judgment on the clarity of sentences, appropriateness, and completeness of the content.

Cranach's Alpha coefficient test tested the reliability of the tools (I, II), which revealed that each item consisted of relatively homogenous items. It was 0.943 for the nurses' knowledge assessment questionnaire, 0.972 for the nurses' practice observational checklist.

The pilot study was implemented on 10% of the total study subjects (five nurses and six patients) to test the tools'

clarity, applicability, the relevance of the tools used to estimate the length of the required time for data collection, and the feasibility of the research process. Some modification was made on the tools used for nurses. Therefore, five nurses included in the pilot study sample were excluded from the final sample, but no modification was done on tools used for patients, so the six patients in the pilot study were included in the final sample.

Field of work: The data collection process extended over 12 months, from the beginning of July 2020 to the end of June 2021. The study was carried out through four phases (preparatory and assessment, planning, implementation, and evaluation).

The preparatory and assessment phase included reviewing the available literature and studies related to the research problem and theoretical knowledge using textbooks, evidence-based articles, internet periodicals, and journals.

For Nurses: The researchers visited the orthopedic department three days weekly (morning & afternoon) to collect the data using previous tools. The researchers interviewed the available nurses, an average of four to five nurses were interviewed per/day. At the beginning of the interview, the researchers greeted nurses in the orthopedic department, explained the nature, aims, and expected outcomes of the study, and took their verbal approval to participate in the study before data collection; then, the researcher assessed the nurses' knowledge and practice level regarding caring for patients with total knee arthroplasty by using nurses' knowledge assessment questionnaire and nurses' practice observational checklist (Tools I and II). This interview took about 25-35 minutes. This period is called pre implementing phase of the educational program (pre-test), which takes one month.

For patients: The researcher interviewed the control group patients (pre-educational program implementation) who received routine hospital care to complete the socio-demographic and medical history sheet (Tool III part 1,2) as well as to detect the frequency of complications and level of lower extremity function (LEFS) through filling the patient outcomes sheet (Tool III part 3,4). Complication and LEFS were assessed two times (2 weeks post-surgery and one-month post-surgery). This phase took three months.

Planning phase (Educational program development): A designed educational program was developed by researchers based on nurses' needs assessment, literature review, researchers' experience, and experts' opinions. The researchers designed an Arabic instruction booklet with illustrations involving theoretical and practical parts.

The theoretical part included general knowledge regarding TKA surgery as definition, causes, types of knee arthroplasty surgery, advantages and disadvantages of surgery, contraindication and complications of the surgery, health education about diet, medication, exercises, and daily living activities.

The practical part included preoperative nursing care, nursing care on the day of surgery, postoperative nursing care, teach patients early postoperative exercises, which included: quadriceps set exercise, straight leg exercises,

ankle pump, knee straighten exercise, bed supported knee bends, using a walker for ambulation.

The implementation phase was achieved through sessions at a period of 2 weeks for each sub-group of nurses. This phase took five months. Each session started with a summary of the previous session and the objectives of the new one taking into consideration the use of Arabic language that suits the nurses' educational level. Motivation and reinforcement during the session were used to enhance motivation for sharing in this study.

The total numbers of sessions were six. It is divided as follows: Two sessions for knowledge and four sessions for practice. The time of knowledge sessions ranged between 45 minutes to 60 minutes. The nurses are divided into groups. Each group contains 4-5 nurses to acquire the related information. Each nurse was supplemented with a booklet. The researcher continued to reinforce the gained information, answered any raised questions, and gave feedback.

The duration of practical sessions ranged between 45-60 minutes, and the numbers of sessions were four sessions for each group (4-5 nurses). Teaching methods were lecture, group discussion, demonstration, and re-demonstration. The media utilized were handouts, videos, and data shows.

Evaluation phase:

For nurses: The researchers evaluated the effectiveness of implementing the educational program by comparing the nurse's knowledge and practice level before and after the educational program by filling out study tools such as nurses' knowledge assessment (tool I) and nurses' practice observational checklist (tool II) was used three times, pre, immediately and three months post educational program implementation. It took one month.

For patients: The researcher interviewed the study group patients post educational program implementation who received care based on the educational program to complete the socio-demographic and medical history sheet (Tool III part 1, 2) as well as to detect the frequency of complications and level of lower extremity function through filling the patient outcomes (complication assessment record) (Tool III part 3,4). Complication and LEFS were assessed two times (2 weeks post-surgery and one-month post-surgery). This phase took three months.

4.6. Data analysis

The collected data were organized, coded, computerized, tabulated, and analyzed using the Statistical Package for Social Science (SPSS) version (21). Data analysis was accomplished using the number, percentage distribution, chi-square test, mean, standard deviation, and correlation coefficient; a paired t-test was used to test the significance of some variables. Statistical significance was considered as follows:

- P-value >0.05 Not significant
- P-value ≤0.05 Significant
- P-value ≤0.001 Highly significant

5. Results

Table 1 presents the demographic characteristics of the studied nurses. It was noted that more than half (58%) of nurses their age was from 40 to less than 60 years old, with a mean±SD of 35.72±8.66 years. Most nurses were females (92%), married (72%), had secondary nursing education (66%), had experienced more than ten years (50%). At the same time, the majority was not attending any previous training courses regarding total knee arthroplasty (84%).

Table 2 demonstrates a comparison of nurses' knowledge about total knee arthroplasty surgery throughout the educational program phases. It illustrates that the mean score of total knowledge was significantly improved post-program implementation immediately. After three months post-program implementation, it got low in the follow-up but still significantly higher than pre-program regarding all the knowledge elements. Highly statistically significant differences were observed at a p-value of ≤0.001.

Figure 1 reveals the studied nurses' total knowledge level distribution at pre, post, and follow-up program implementation. It demonstrates that 28% of studied nurses had total satisfactory knowledge pre-program implementation, which reached 80%, 58%, respectively, immediately and after three months post-program implementation.

Table 3 displays a comparison of nurses' practice about total knee arthroplasty surgery throughout educational program phases. It illustrates that the mean score of total practice was significantly improved post-program implementation immediately. After three months post-program implementation, it decreased in the follow-up but was still significantly higher than pre-program regarding all the practices and the total. Highly statistically significant differences were observed at a p-value of ≤0.001.

Figure 2 shows the studied nurses' total practice level distribution regarding pre, post, and follow-up. It illustrates that 22% of the studied nurses had a competent level pre-program implementation, which improved to 82%, 74%, respectively, immediately after and following three months post-program implementation.

Table 4 clarifies the correlation between the total knowledge and practice scores of the studied nurses pre, immediately post, and after three months post-program implementation. It shows a statistically significant positive correlation between the total nurses' knowledge and their practices pre, immediately, post, and three months post-program implementation with a p-value of ≤0.05.

Table 5 shows a comparison of control and study groups patients regarding their demographic characteristics. It shows age between 51 and ≤60 among 59.5% and 86.5% of control and study group patients. Regarding gender, 81.5%, 75% of the control and study groups respectively were females. Also, the majority (87.5%, 84%, respectively of both control and study groups were married, lived with family (81.5%, 87.5%, of the study and control group, respectively). Half of them (50%, 53.5%, of control and study group respectively) had secondary education, and their residence was in rural areas (84.5%, 81.5%, respectively).

There was no statistical significance difference between both groups with a p-value >0.05 , indicating that the two groups were nearly homogenous.

Table 6 presents a comparison of the control and study groups regarding their medical history. The present history reveals that 40.7%, 46.75% of the control and study group, respectively, their onset of complaint that was more than ten years old. Regarding main complaints during hospitalization, they were complaints from knee pain (75% & 84.4%, respectively) in both control and study groups, and their indications for surgery were knee osteoarthritis among 87.5%, 71.9%, respectively. It was found that 75%, 71.9%, respectively, of both the control and study groups, had the left knee diagnosis. At the same time, 87.5%, 84.4%, respectively of both control and study groups were nonsmokers and did not practice regular exercises (93.75% & 87.5%, respectively). There were no statistically significant differences between both groups with a p-value >0.05 , which indicates that the two groups were nearly homogenous.

Regarding past history, 34.3% and 50% of both control and study groups had a history of hypertension. Also, 84.4%, 75% respectively of both the control and study groups have no previous orthopedic surgeries. There was no statistically significant difference between both groups with a p-value >0.05 , indicating that the two groups were nearly homogenous.

Table 7 clarifies the comparison between control and study groups patients regarding their general complications after two weeks and one month of TKA surgery. The frequency of complications was significantly high among the control group, 62.5%, 68.7% compared to 28%, 34% for the study group after two weeks and one month, respectively, regarding the GIT complications. The table also shows that 59.5% and 62.5% of the control group suffered deep venous thrombosis after two weeks and one month, respectively, compared with 15.5% 21.8% for the study group.

Also, it shows 56.2%, 46.8% of the controls affected by respiratory complications after two weeks and one month, respectively, compared to 12.5% and 9.3 of the study group after two weeks and one month, respectively. Musculoskeletal complications were more frequent in the control group after two weeks and one month 28.2%, 34.3%, respectively, compared to 9.5%, 12.5% of the study group, respectively with highly statistically significant differences between the frequency of general complications in control and study group at ($P \leq 0.001$).

Table 8 clarifies the comparison between control and study groups of patients regarding their local complications after two weeks and one month of TKA surgery. The

frequency of complications was high among the control group 31.25%, 28.2%, respectively of them had superficial wound infection compared to 6.3% and 9.3% of the study group after two weeks and one month, respectively. 28.2%, 18.75%, of the control group were affected by bleeding and thrombotic complication (hematoma without further treatment) after two weeks and one month, respectively, compared to 6.3%, 3.2% of the study group after two weeks and one month, respectively.

Also, 25%, 31.3% of the controls compared to 3.2%, 6.3% of the study group had delayed wound healing after two weeks and one month respectively, with highly statistically significant differences between the frequency of many local complications in control and study group at ($p \leq 0.05$).

Table 9 displays a comparison between control and study groups of patients regarding lower extremity functional score (LEFS) after two weeks and one month of TKA surgery. The table reveals a statistically significant difference between the study and control groups regarding the lower extremity functional score two weeks post-surgery ($p < 0.05$). Also, there was a statistically significant difference in the LEFS score between both groups after one month post-surgery ($p < 0.001$).

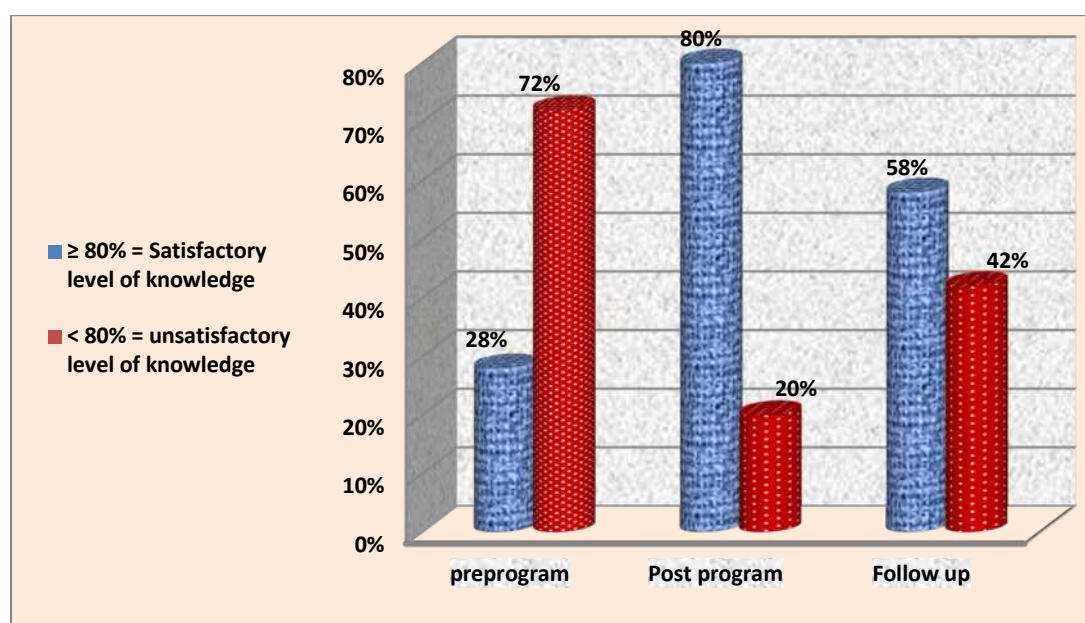
Table (1): Percentage distribution of the studied nurses' demographic characteristics (n=50).

Demographic characteristics	No=50	%
Age in years		
20-<30	15	30.0
30-<40	9	12.0
40-<60	26	58.0
Mean $\pm$ SD	35.72 $\pm$ 8.66	
Gender		
Male	4	8.0
Female	46	92.0
Marital status		
Married	36	72.0
Single	12	24.0
Divorced	2	4.0
Educational qualification		
Secondary nursing education	33	66.0
Technical nursing education	15	30.0
Bachelor degree	2	4.0
Years of experience		
Less than one year	4	8.0
1-<5	12	24.0
5-10	9	18.0
>10	25	50.0
Mean $\pm$ SD	8.66 $\pm$ 4.80	
Training courses related to total knee arthroplasty		
Yes	8	16.0
No	42	84.0

Table (2): Comparison of nurses' knowledge about total knee arthroplasty surgery throughout the educational program phases (N= 50).

Knowledge elements	Pre-program	Immediately post	After three months	*T-test 1	P-value1	T-test 2	P-value2
	Mean±SD	Mean±SD	Mean±SD				
General knowledge about total knee arthroplasty.							
Definition	0.500±0.505	0.900±0.303	0.860±0.350	5.71	<0.001	4.84	<0.001
Causes	0.480±0.504	0.860±0.350	0.860±0.350	4.46	<0.001	4.46	<0.001
Types	0.660±0.478	0.860±0.350	0.860±0.350	2.21	0.03	2.21	0.03
Advantages	0.580±0.498	0.860±0.350	0.840±0.370	3.25	0.002	2.90	0.005
Disadvantages	0.620±0.490	0.860±0.350	0.860±0.350	2.87	<0.001	2.87	0.006
Contraindications	0.900±0.762	1.760±0.431	1.720±0.496	6.56	<0.001	6.31	<0.001
Complications	1.26±0.943	2.52±0.614	2.52±0.614	8.36	<0.001	8.36	<0.001
Preoperative nursing care	2.40±1.399	4.42±.730	4.38±7.25	9.09	<0.001	8.83	<0.001
Knowledge regarding postoperative nursing care	8.82±3.49	14.08±2.202	12.74±2.23	9.09	<0.001	6.74	<0.001
The complications of TKA and prevention	4.380±1.88	6.70±1.982	5.900±1.619	6.02	<0.001	4.27	<0.001
Health education for patients and discharge plan	6.979±3.24	11.204±1.77	10.97±1.952	7.44	<0.001	7.16	<0.001
Total knowledge	28.18±11.64	45.06±7.095	43.52±7.41	8.94	<0.001	7.77	<0.001

*T₁ and P₁: Compare pre-and post-program implementation, T₂ and P₂: Compare pre-and follow-up post-program implementation.

**Figure (1): Percentage distribution of the studied nurses' total knowledge level pre, post, and follow up program implementation (n=50).****Table (3): Comparison of nurses' practices in caring for patients with total knee arthroplasty surgery throughout the educational program phases (N= 50).**

Practice elements	Pre-program	Immediately post	After three months	*T-test 1	P-value1	T-test 2	P-value2
	Mean±SD	Mean±SD	Mean±SD				
Preoperative nursing care	9.840±2.667	16.640±2.537	15.640±2.833	13.951	<0.001	11.548	<0.001
Nursing care on the day of surgery	16.820±2.536	21.020±3.184	20.340±2.503	7.350	<0.001	6.789	<0.001
Postoperative nursing care	17.620±4.646	25.800±3.730	23.080±3.128	9.781	<0.001	7.594	<0.001
Teach patients early postoperative exercises	64.780±7.982	87.460±8.064	81.100±8.795	15.521	<0.001	9.793	<0.001
Total practice	109.060±10.108	156.820±10.626	143.400±15.101	28.49	<0.001	15.101	<0.001

*T₁ and P₁: Compare between pre and post-program implementation, T₂ and P₂: Compare between pre and follow-up after three months post-program implementation.

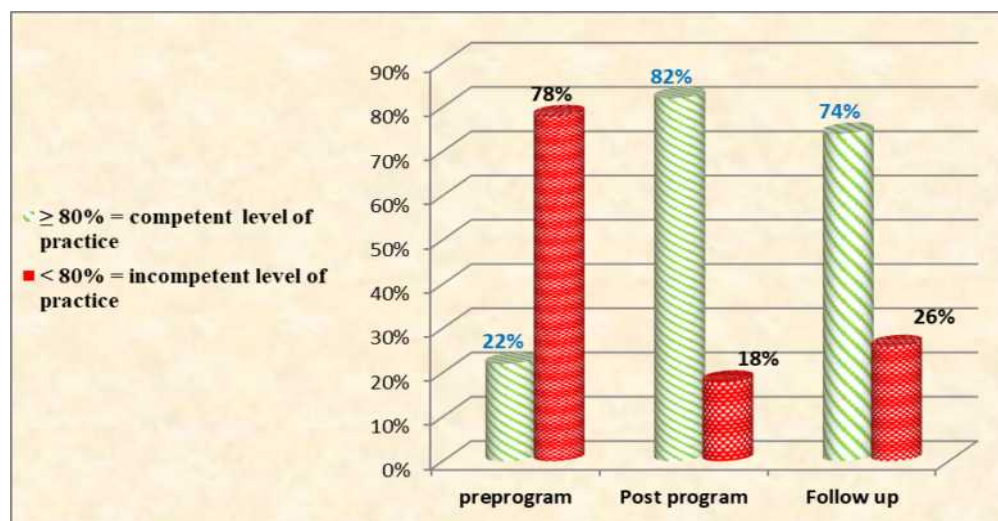


Figure (2): Percentage distribution of the studied nurses' total practice level pre, post, and follow-up program implementation (n=50).

Table (4): Relationship between total knowledge score and total practice score of the studied nurses pre, immediately post, and after three months post-program implementation (N=50).

Variables	Total knowledge score					
	Pre-intervention		Immediately Post-implementation		Follow up (after three months)	
	r	P	r	P	r	p
Total practice score	0.280	0.049	0.318	0.024	0.355	0.011

Table (5): Comparison between the control and study groups patients regarding their socio-demographic characteristics (N=64).

Demographic characteristics of the patients	Control group n= 32		Study group n= 32		χ^2	P-value
	No	%	No	%		
Age						
31-≤40	3	9.5	2	6.5	0.642	0.726
41-≤50	10	31	8	25		
51-≤60	19	59.5	22	86.5		
Mean ±SD	54.031±6.156		54.125±5.689		t=0.063	p=0.949
Gender						
Male	6	18.5	8	25	0.366	0.763
Female	26	81.5	24	75		
Marital status						
Married	28	87.5	27	84	0.161	0.923
Divorced	1	3	1	3		
Widow	3	9.5	4	13		
Educational level						
Cannot read and write	7	22	5	15.5	1.983	0.576
Read and write	7	22	5	15.5		
Secondary education	16	50	17	53.5		
University education	2	6	5	15.5		
Occupation						
Housewife	11	34.5	10	31	3.214	0.360
Worker	8	25	8	25		
Employee	13	40.5	11	34.5		
Retirement	0	0	3	9.5		
Residence						
Rural	27	84.5	26	81.5	0.111	0.5
Urban	5	15.5	6	18.5		
Living status						
Live alone	6	18.5	4	12.5	0.474	0.491
Live with family	26	81.5	28	87.5		

Table (6): Comparison between control and study groups' medical history (N=64).

Medical history	Control group n= 32		Study group n= 32		χ^2	P-value
	No	%	No	%		
Present history						
Onset of complain						
<1 year	2	6.3	2	6.25	0.676	0.879
1-5 years	2	6.3	3	9.5		
>5-10 years	15	46.7	12	37.5		
<10 years	13	40.7	15	46.75		
Mean±SD	9.031±3.46		9.125±3.508		T=0.107	P=0.915
Main complaint during hospitalization						
Knee pains	24	75.0	27	84.4	2.110	0.348
Knee stiffness	7	21.8	3	9.3		
Others (tumor, trauma)	1	3.2	2	6.3		
Surgical indication (according to patients' diagnosis)						
Knee osteoarthritis	28	87.5	23	71.9	3.308	0.191
Knee rheumatoid arthritis	4	12.5	7	21.8		
Others (tumor, trauma, deformities)	0	0	2	6.3		
Conservative treatment before the operation						
None	1	3.1	2	6.3	4.218	0.239
Overweigh reduction	6	18.7	4	12.5		
Physiotherapy	12	37.5	6	18.7		
Analgesics / intra-articular steroid injection	13	40.7	20	62.5		
The replaced knee side						
Right knee	6	18.7	7	21.8	0.098	0.952
Left knee	24	75	23	71.9		
Bilateral	2	6.3	2	6.3		
Smoking						
Yes	4	12.5	5	15.6	0.129	0.719
No	28	87.5	27	84.4		
Practicing regular exercises						
Yes	2	6.3	4	12.5	0.739	0.391
No	30	93.7	28	87.5		
Past history						
Comorbidities						
Diabetes mellitus	12	37.5	6	18.7	3.126	0.537
Hypertension	11	34.3	16	50.0		
Kidney diseases	4	12.5	4	12.5		
Liver diseases	2	6.25	3	9.4		
Cardiac diseases	3	9.3	3	9.4		
Previous orthopedic surgeries						
Yes	5	16.6	8	25.0	0.869	0.351
No	27	84.4	24	75.0		
If yes, what is the surgery						
Total knee replacement	1	20	3	37.5	3.494	0.322
Total hip replacement	0	0.0	2	25.0		
Plates and wires	3	60	3	37.5		
External fixation	1	20	0	0.0		

Table (7): Comparison between control and study groups of patients' general complications after two weeks and one month of TKA surgery (N=64).

General complication	Control group (pre-educational program) (n = 32)				Study group (post educational program) (n = 32)				χ^2 1*	P1	χ^2 2	P 2
	Two weeks post- surgery		One month post-surgery		Two weeks post-surgery		One month post-surgery					
	No	%	No	%	No	%	No	%				
Deep venous thrombosis												
Yes	19	59.5	20	62.5	5	15.5	7	21.8	13.067	0.001	10.827	0.001
No	13	39.5	12	37.5	27	84.5	25	78.2				
Pulmonary embolism												
Yes	4	12.5	2	6.25	2	6.6	1	3.2	0.736	0.391	0.350	0.500
No	28	87.5	30	93.7	30	93.4	31	96.8				
Respiratory complications												
Yes	18	56.2	15	46.8	4	12.5	3	9.3	13.576	0.001	11.130	0.001
No	14	43.8	17	53.2	28	87.5	29	90.6				
Cardiac complications												
Yes	13	40.5	9	28.2	4	12.5	2	6.25	6.486	0.01	5.379	0.022
No	19	59.5	23	71.8	28	87.5	30	93.7				
Neurological complications												
Yes	7	22	5	15.6	2	6	1	3.2	3.232	0.07	2.943	0.098
No	25	78	27	84.4	30	94	31	96.8				
GIT complications												
Yes	20	62.5	22	68.7	9	28	11	34.3	7.630	0.006	7.570	0.006
No	12	37.5	10	31.3	23	72	21	65.7				
Urinary complications												
Yes	8	25	9	28.2	3	9.5	2	6.25	2.744	0.09	5.379	0.022
No	24	75	23	71.8	29	89.5	30	93.7				
Musculoskeletal complications												
Yes	9	28.2	11	34.3	3	9.5	4	12.5	3.692	0.05	4.267	0.037
No	23	71.8	21	65.7	29	89.5	28	87.5				

* $\chi^2 1(P 1)$ between control and study 2-week post-surgery, $\chi^2 2(P 2)$ between control and study 1 month post-surgery.

6. Discussion

Total knee arthroplasty (TKA) is considered the most common treatment for end-stage knee osteoarthritis (OA), which also makes great sense for some other underlying indications, including inflammatory arthritis, fracture (post-traumatic OA or deformity), dysplasia, and malignancy (Ghosh & Chatterji, 2019). The present study aimed to evaluate the effect of an educational program on nurses' knowledge, practices, and patients' outcomes post total knee arthroplasty.

Nurses' demographic characteristics revealed that more than half of the studied nurses' ages were from 40 to less than 60 years old, with a mean $\pm$ SD 35.72 $\pm$ 8.66 years. This young age may reflect the early graduation from secondary school as two-third of them graduated from secondary nursing schools. This result is in the same line with Soliman *et al.* (2019), whose study was about "Effect of implementing guidelines for nurses caring for immobilized orthopedic patients on their performance" and reported that nearly half of the studied nurses' age ranged between (45- <61) years old with mean $\pm$ SD of 34.266 $\pm$ 2.52. Also, this result agreed with the study conducted by El-Sayed *et al.* (2016) about "Effect of nursing care standards for preventing deep vein thrombosis among patients undergoing hip surgery on nurses' performance and patients' outcome" and founded

that about half of the studied nurses were in the age category >30 years old with mean age of 31.3667 $\pm$ 8.70784. Also, this result was supported by El Shemey and Elsaay (2015), whose study was about "Efficacy of implementing nursing care protocol on total hip replacement patient's outcome in the orthopedic department at Tanta university hospital," which reported that most of the studied group aged from 30-<50.

Related to nurses' gender and marital status, the current study shows that most nurses were females and married. This finding might be because females constitute a greater percentage than males in the nursing profession in Egypt. Also, females in Egypt are married at a young age. These results follow other Egyptian studies by El-Sayed *et al.* (2016); El Shemey and Elsaay (2015), who reported that most nurses were females and married.

Regarding the level of education for nurses, the present study's finding indicates that two-thirds of nurses had a secondary school diploma in nursing. This finding might be due to the new nurses with bachelor's degrees in nursing education were distributed in critical care units rather than other units in the hospital. This result agrees with Soliman *et al.* (2019) but disagrees with El Shemey and Elsaay (2015), who reported that most studied nurses had a Baccalaureate degree in nursing education.

Table (8): Comparison between control and study groups of patients regarding their local complications after two weeks and one month of TKA surgery (N=64).

Local complication	Control group (pre-educational program) (n = 32)				Study group (post-educational program) (n = 32)				χ^2 1	P 1	χ^2 2	P 2	
	Two weeks		1-month		Two weeks		1-month						
	post-surgery		post-surgery		post-surgery		post-surgery						
	No	%	No	%	No	%	No	%					
Wound complications													
Delayed wound healing													
Yes	8	25	10	31.3	1	3.2	2	6.3	6.33	0.01	6.465	0.01	
No	24	75	22	68.7	31	96.8	30	93.7	5				
Superficial wound infection													
Yes	10	31.25	9	28.2	2	6.3	3	9.3	6.56	0.02	3.692	0.05	
No	22	68.75	23	71.8	30	93.7	29	90.7	1				
Deep (intraarticular) infection													
Yes	6	18.75	9	28.2	0	0	3	9.3	6.62	0.01	3.692	0.05	
No	26	81.25	23	71.8	32	100	29	90.7	1				
Necrosis of skin or subcutaneous tissue													
Yes	8	25	6	18.75	1	3.2	1	3.2	6.33	0.01	4.010	0.04	
No	24	75	26	81.25	31	96.8	31	96.8	5				
Dehiscence of the wound													
Yes	10	31.3	9	28.2	3	9.3	3	9.3	4.73	0.03	3.692	0.05	
No	22	68.7	23	71.8	29	90.7	29	90.7	0				
Bleeding or thromboembolic complications													
Hematoma without further therapy													
Yes	9	28.2	6	18.75	2	6.3	1	3.2	5.37	0.02	4.010	0.04	
No	23	71.8	26	81.25	30	93.7	31	96.8	9				
Hematoma requiring blood transfusion or antibiotic treatment													
Yes	2	6.3	4	12.5	0	0	0	0	2.06	0.15	4.267	0.03	
No	30	93.7	28	87.5	32	100	32	100	5				
Hematoma requiring revision													
Yes	7	21.8	7	22.0	1	3.2	1	3.2	5.14	0.02	5.143	0.02	
No	25	78.2	25	78.0	31	96.8	31	96.8	3				
Hemarthrosis or effusion – with a puncture or without puncture													
Yes	4	12.5	7	22.0	2	6.3	3	9.3	0.73	0.39	1.896	0.16	
No	28	87.5	25	78.0	30	93.7	29	90.7	6				
Seroma with conservative therapy													
Yes	6	18.7	7	22.0	0	0	2	6.3	6.62	0.01	3.232	0.07	
No	26	81.3	25	78.0	32	100	30	93.7	1				
Instability													
Yes	7	21.8	10	31.3	1	3.2	3	9.3	5.14	0.02	4.730	0.03	
No	25	78.2	22	68.7	31	96.8	29	90.7	3				
Malalignment													
Malpositioning													
Yes	6	18.7	2	6.3	0	0	0	0	6.62	0.01	2.065	0.1	
No	26	81.3	30	93.7	32	100	32	100	1				
Implant dislocation													
Yes	7	15.6	2	6.3	1	3.2	1	3.2	5.14	0.02	0.350	0.5	
No	25	84.4	30	93.7	31	96.8	31	96.8	3				
Ligament rupture													
Yes	1	3.2	1	3.2	0	0	0	0	1.01	0.5	0.016	0.3	
No	31	96.8	31	96.8	32	100	32	100	0				
Implant losing													
Yes	5	15.6	3	9.3	0	0	0	0	5.42	0.02	3.148	0.7	
No	27	84.4	29	90.7	32	100	32	100	4				

χ^2 1(P 1) between control and study two weeks post-surgery, χ^2 2(P 2) between control and study one month post-surgery.

Table (9): Comparison between control and study groups of patients regarding lower extremity functional scale (LEFS) after two weeks and one month of TKA surgery (N=64).

lower functional (LEFS)	extremity scale	Control group (pre-educational program) (n = 32)				Study group (post-educational program) (n = 32)				χ^2 1*	P 1	χ^2 2	P 2
		Two weeks post-surgery		1-month post-surgery		2weeks post-surgery		1-month post-surgery					
		No	%	No	%	No	%	No	%				
Extreme difficult		0	0	0	0	0	0	0	0	6.51 3	0.039	15.66 5	0.00 0
Quite difficult		4	12.5	0	0	2	6.25	0	0				
Moderate difficult		20	62.5	22	68.7	12	37.5	7	21.8				
Little bit		8	25	9	28.3	18	56.25	17	53.2				
No difficulty		0	0	1	3	0	0	8	25				

* χ^2 1(P 1) between control and study two weeks post-surgery, χ^2 2(P 2) between control and study 1 month post-surgery.

Regarding years of experience for nurses, the present study's finding reveals that half of them had an experience of more than ten years. This finding might be due to most of the nurses having been stabilized in their places since their appointment to the orthopedic unit.

The present study shows that most nurses had not attended any previous training courses about total knee arthroplasty; this can be explained in the light of the belief that lacks hospital financial resources, shortage of nursing staff, and work overload which considered a barrier for nurses to leave the work and attend a training course. This finding is supported by *Soliman et al. (2019)*; *Al-Barwari (2016)*, who evaluate the nursing knowledge and practices concerning nursing care of the patient with skin traction in orthopedic units in the Kurdistan region and reported that nearly all the studied nurses were not participating in the training sessions.

Nurses' total knowledge level at pre, post, and follow-up program implementation demonstrates that nearly three-quarters of studied nurses had unsatisfactory total knowledge scores pre-program implementation, while immediately post-implementation, most of them had a satisfactory level of knowledge. Unsatisfactory level of knowledge pre-educational program implementation might be due to lack of educational and training background for nurses under the study whereas, majority of staff nurses did not receive formal training courses about total knee arthroplasty surgery. In addition, most of the nurses had only a secondary school diploma in nursing education. On the other hand, a satisfactory level of knowledge post educational program implementation pointed to the positive effect of theoretical sessions in the educational program on nurses' knowledge that is revealed in the statistically significant improvement in the knowledge elements' mean score and the total throughout the program phases.

These results are in the same line as *Elkattan and Elderiny (2019)*. They studied "Effect of nursing care guidelines on preventing deep venous thrombosis among patients undergoing arthroplasty surgery" and reported statistically significant improvements in almost all knowledge items among the studied nurses after implementing nursing care guidelines. Also, these results are in the same line with *El Shemey and Elsaay (2015)*, who stated that the mean scores of nurses' knowledge regarding

hip joint replacement throughout the study period have significant improvement between studied nurses pre, immediately, and follow up.

These results supported by *Das et al. (2014)*, whose study was about "Effectiveness of the planned teaching program on deep vein thrombosis among the staff nurses of the selected hospital," the study documented that most staff nurses had an unsatisfactory level of knowledge pre-implementation of planned teaching program which improved post-program. Also, it agreed with *Soliman et al. (2019)*; *El Shemey and Elsaay (2015)*, who documented that most studied nurses had unsatisfactory knowledge pre-implementation, which improved post-implementation. These findings support the first research hypothesis.

The current study findings demonstrate a statistically significant improvement in the total practice mean score and all the practice elements. The mean scores increased significantly immediately post-program implementation and at follow-up, although the practice score declined but was still statistically significantly higher than the pre-intervention level. This finding reflects the need for continuous reinforcement of the nurses through on job training and continuous education.

Regarding nurses' total practice level at pre, post, and follow-up program implementation, the current study revealed that most nurses had an incompetent level pre-educational program implementation; this might be due to most nurses had unsatisfactory knowledge of pre-educational program implementation and lack of in-service training programs. However, post educational program majority of nurses had a competent level of practice, but after three months follow up, there was a slight decline in total practices, but still, improvement in nurses' practice was very high compared to pre-program

These results agree with *El Shemey and Elsaay (2015)*, who reported a significant improvement in nurses' performance throughout the study phases. The current study is consistent with *Weheida et al. (2018)*, whose study was about "Safe nursing practices applied for patient post-hip joint replacement," and documented that all the studied nurses had poor, unsafe nursing practices concerning postoperative care applied for patients post-hip joint replacement. Also, these results agree with *Elkattan and Elderiny (2019)*, who reported that all nurses had an

unsatisfactory level of practice pre-nursing care guidelines implementation. However, post to its implementation, more than two-thirds of them had a satisfactory level of practice. These findings support the second research hypothesis.

The result of the current study reveals a statistically significant positive correlation between the total nurses' knowledge and their practices pre, immediately post, and three months post-program implementation. This result indicates that practice can be easily improved, especially with a relevant scientific knowledge base. Also, it settles the positive effect of educational program on improving nurses' knowledge and practice. This result is in line with *Das et al. (2014)*, who found a statistically significant positive correlation between total nurses' knowledge and their total practice score pre- and post-implementing teaching program. These findings support the third research hypothesis.

The demographic characteristics of studied patients reveal that more than half of the control and majority of the study group were in the age category between 51 to 60 years old with a mean age of 54.031 ± 6.156 and 54.125 ± 5.689 for the control and study group respectively. This result relates the changes in joint tissues to the increasing age. Advanced age contributes to knee osteoarthritis, which considers the main indication of total knee arthroplasty surgery. This result agrees with *Kwuh et al. (2015)*, whose study entitled "Determinants of patient preferences for total knee replacement" and documented that the mean age of patients was 58.68 ± 8.13 . Also, this finding is in the same line with *Fawzy et al. (2020)*; in his study "Biopsychosocial needs of patients undergoing total knee replacement," they reported that slightly more than half of the studied patients were above 60 years at mean age 59.7 ± 6.86 and range from 41-72 years.

Regarding patients' gender, the current study reveals that most control and study groups were females. This result may be explained by the fact that the prevalence of knee OA is higher in women than men due to variation in some factors such as anatomic structures, genetic issues, hormonal influences, and menopause. This result is supported by *Reslan et al. (2018)*, who studied "Does intervention improve the outcomes of patients after total knee replacement surgery?" and reported that more than half of both control and intervention groups were females. However, this finding is inconsistent with *Zacharia et al. (2016)* in a study entitled "Patient-based outcome analysis is important to determine the success of total knee arthroplasty," the study found that most of the studied patients were males.

The current study reveals that most of both control and study groups were married. This result might be related to most of the patients being over 50 years old, and by this age, most people were married. This result is agreed by *Reslan et al. (2018)*, who reported that most of both groups were married. Also, the study shows that majority of both groups are from rural areas and live with their families. This finding might be due to people in rural areas practicing heavy work that requires muscle effort, leading to a burden on the knee joint. This result is inconsistent with *Cankaya et al. (2016)*, who studied "The influence of social and demographic

features on a functional level and quality of life after total knee arthroplasty," the study reported that most subjects were from rural areas. However, disagreed with *Fawzy et al. (2020)*, who stated that about three-quarters of patients under study were from urban areas.

The study reveals that more than half of the control and study group had a secondary level of education. This finding is consistent with *Vina et al. (2016)* in a study entitled "Improvement following total knee replacement surgery: Exploring preoperative symptoms and change in preoperative symptoms," which found that most participants had secondary education, also, the result is in the same line with *Reslan et al. (2018)* who founded that half of both groups had high school. Nevertheless, the current study disagrees with *Franklin et al. (2017)* in a study entitled "Important patient characteristics differ prior to total knee arthroplasty and total hip arthroplasty," they reported that most patients had a college education.

Concerning occupation, the current study reveals that two-fifths of the control group and one-third of the study group were employees. This result relates to the age of retirement in Egyptian law at 60 years old, not before. This result disagrees with *Fawzy et al. (2020)*, who reported that two-fifth of studied patients were retired. The current study result reveals no statistical significance difference between both groups regarding their demographic characteristics with $p\text{-value} > 0.05$, which indicates that the two groups were nearly homogenous.

Related to the assessment of the patient's health history, the result of this study reveals that two-fifths of both control and study groups complained of knee disorders from more than ten years old. This finding might be related to patients eager to get rid of the pain. They avoid proceeding with major surgery. Therefore, they choose to continue conservative measures to delay or avoid TKR. These results agreed with *Singh and Lewallenin (2014)* in a study entitled "Time trends in the characteristics of patients undergoing primary total knee arthroplasty," they found that nearly half of patients had knee disease for more than ten years.

Concerning the main complaint during hospitalization, the result of this study reveals that more than three-fourths of the control group and most of the study group complained of knee pains. Because the main symptom and the biggest problem that indicates TKR is pain that conservative measures cannot control. This result was supported by *Khired (2018)* in a study entitled "The influence of improvement in pain and function after total knee replacement in patient's satisfaction," who reported that pain was the primary indication for TKR in most patients.

Regarding surgical indication, the present study findings report that majority of the control group and more than two-thirds of the study group were undergoing TKR due to knee osteoarthritis. This finding might be because TKA is generally accepted as a definitive treatment for advanced knee arthritis after a patient fails non-operative treatments. These results are in the same line with *Fawzy et al. (2020)*, who reported that about three-quarters of patients under study were candidates to the TKR due to knee osteoarthritis. Also, this result agrees with *Souza et al.'s (2016)* study

entitled "Clinical demographics characteristics of total knee arthroplasty in a university hospital," which reported that osteoarthritis affected 87.65% of patients.

The current study reveals that nearly three-quarters of the control and study group replaced the left knee. These findings are consistent with *Wimmer et al. (2015)*, whose study was "Knee flexion and daily activities in patients following a total knee replacement," who reported that most subjects had replaced the left knee. Contrary to this study, *Lindberg et al. (2017)*, who studied "The impact of demographic, clinical, symptom and psychological characteristics on the trajectories of acute postoperative pain after total knee arthroplasty," and reported that more than half of the total knee arthroplasty subjects were replaced the right knee.

Regarding smoking, the current study results reveal that the majority of both the control and study group were non-smokers. This finding might be due to most studied patients being females and living in rural areas, which shows that smoking for females is such a shame. Concerning regular exercises, the result of the present study reveals that most of both groups were not practicing exercises. This result may be attributed to the fact that most of the studied patients had knee osteoarthritis (one of the leading causes of disability in adults), which progressively restricted their daily functioning, working and sports activities, making them less active than they were supposed to be. This result agrees with *Fawzy et al. (2020)*, who stated that three-fifths of patients under study were not practicing exercises.

About the comorbidities, the result of this study reveals that more than one-third of the control group and half of the study group had hypertension. This finding might be due to more than half of the control and majority of the study group in the age category between 51 to 60 years old, and in this age category, most people in Egypt had chronic diseases as hypertension. Also, *Ryu et al. (2021)* reported that osteoarthritis was significantly associated with hypertension diagnosis in this middle-aged after adjustment for age, smoking, alcohol, and obesity. This finding was congruent with *Souza et al. (2016)*, who found that hypertension was the most prevalent comorbidity in participants.

Also, the result of this study reveals that most of the control and three-quarter of the study group had no history of previous orthopedic surgeries. This result may be attributed to knee arthroscopy usually performed for arthritic patients to relieve symptoms and delay replacement surgery. These results are supported by *El Shemey and Elsaay (2015)*, who reported that most of the control and study group had no previous orthopedic surgery. Also, the current study result reveals that there was no statistical significance difference between both groups regarding medical history with a p -value >0.05 , which indicates that the two groups were nearly homogenous.

The general complications after TKA for both control and study groups of patients at two weeks and one month post-surgery reveal a lesser frequency of general complications among the study group patient compared to the controls with statistically and highly statistically significant differences between control and study group

regarding most of the general complication after two weeks and one-month post-surgery. The improvement in the study group might be referred to the highly performed nurses they care for after the educational program implementation. This result was in line with *El Shemey and Elsaay (2015)*. They reported a significant difference between the control group, study group one, and study group two regarding general complications of hip replacement, as circulatory, neurological, and musculoskeletal complications for the sake of the study groups.

Also, the current study result reveals a lesser frequency of local complications among the study group patient compared to the controls at two weeks with statistically and significant differences between the control and study group regarding many of local complications; this may be due to the improved performance of nurses caring for a patient under TKA surgery after implementation of the educational program. Also, there were statistically significant differences between both groups at one month up regarding many local complications. These results are supported by *El Shemey and Elsaay (2015)*, who reported significant improvement between the control group, study group one, and study group two regarding local complications after total hip replacement. These findings support the fourth research hypothesis.

The current study clarifies a statistically significant difference between the study and control group with a better outcome in the study group patients than the control in lower extremity function score in the study group than in the control group at two weeks post-surgery and after one month. This finding provides evidence that access to supportive nursing care can influence patient outcomes and importantly indicates that there are areas of quality-of-care improvement, particularly post-operatively, that nursing could provide better care if they receive better and continuous training. This result agreed with *Reslan et al. (2018)*, who reported that the intervention group in their study had higher scores of LEFS than the control group with highly statistically significant differences between both groups at post (2 weeks) and at follow up (4 weeks). These findings support the fifth research hypothesis.

7. Conclusion

In the light of the study findings, it might be concluded that, after implementing the educational program, the nurses' knowledge and practices scores regarding total knee arthroplasty were improved than pre-implementation, and there was a statistically positive correlation between nurses' knowledge and practice. Also, the frequency of complications was significantly less in the study group compared to the controls. Besides, the lower extremity function score was significantly better in the study group patients than the controls. The educational program for nurses might positively reduce the frequency of general and local complications among the study group compared to the controls.

8. Recommendations

In the light of the results of the current study, the following recommendations are suggested:

- Educational programs should be provided for all new nurses regarding the care of patients undergoing total knee arthroplasty surgery to reduce the frequency of patients' complications and improve outcomes.
- Continuing education regarding total knee arthroplasty surgery and encourage creativity to create programs that encourage nurses to seek knowledge and update their skills.
- To generalize the findings, further studies should be conducted on a larger sample obtained from different geographical areas in Egypt.

9. References

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