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EFFECT OF ILIZAROV NURSING CARE GUIDELINES ON PATIENTS' KNOWLEDGE AND SELF-CARE PRACTICE

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Abstract

Background: Ilizarov has been the gold standard for treating many types of fractures and bone deformities. The patient with Ilizarov has restricted activity in daily living and poor self-care practices that need to be improved. Patient education is essential aspect that helps in acquiring knowledge, self-care practice and enhancing physical activity **Aim:** Evaluate effect of Ilizarov nursing care guidelines on patients' knowledge and self-care practices. **Design:** In this study, a quasi-experimental design was used. **Setting**: Orthopedic inpatient units at main Mansoura University Hospital**. Subject:** A purposive sample of 40 patients was divided into two equal groups: control and study groups. **Tools:** (I): Structured interview questionnaire for Ilizarov patients. Tool (II) Ilizarov self-care practice. **Results:** The study and control group 80%, 85% respectively had unsatisfactory level of knowledge pre implementation of guidelines while70%, 35% of study and control group respectively had higher level of knowledge post guidelines implementation .Also there was an improvement in study group self-care practice level in post and follow up after guidelines implementation with statistically significant differences between both groups. Additionally there were a highly statistically significant difference between study and control group regarding lower extremity functional scale and modified barthel index with ($p<0.001$) and ($p<0.005$ - 0,035) respectively post and follow up guidelines implementation. **Conclusion:** patients' knowledge and self-care practice improved after the Ilizarov guidelines implementation at post and follow-up with highly statistically significant results. **Recommendations:** A standardized colored booklet about Ilizarov patient self-care guidelines should be available.

Keywords: Ilizarov Nursing Care Guidelines, Patients Knowledge, Self-Care Practice.

INTRODUCTION

Ilizarov fixators are a type of external fixation that is considered the main treatment used for complex fracture management[1]. It is commonly used in traumatology and reconstructive surgery to stretch or reshape lower limb bones as a limb-sparing method to treat open bone fractures and infected non-union bones[2]. The Ilizarov method is effective, simple, rapid, and minimally invasive. It preserves the biomechanical microenvironment that is necessary for fracture healing[3]. The device involves numerous

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wires that penetrate the limb and are attached to a circular metal frame. In order to benefit from this device, patients must adapt to it and demonstrate an understanding of self-care[4].

Despite Ilizarov benefits it has disadvantages as complex operations and long treatment times, Ilizarov frame is inconvenient to wear, and affects the life quality of patients [5]. Moreover there are many different complications that can occur with Ilizarov frame such as Pin site infection, osteomyelitis, frame or pin/wire failure or loosening, malunion, non-union, soft-tissue impalement, neurovascular injury, compartment syndrome, and refracture around pin[6]. Also patient with Ilizarov unable to perform activity of daily living, self-care practice and have restricted physical mobility[7]. Therefore patient education is a vital item of nursing care. It supplies the patient with the needed knowledge and skills necessary for optimal safe performance, self-care abilities such as (bathing, dressing, walking, getting out of bed), improving outcome, minimizing complication, allow patient to participate actively in personal care and to use assistive device safely. Accordingly, teaching them how to take care of themselves at home[8].

SIGNIFICANCE OF THE STUDY

Patients with Ilizarov always experience maladaptive coping due to pain and a lack of information and skills to deal with the Ilizarov device[9]. The application of the Ilizarov frame affects patients' self-care activities because it is bulky, constructed with wires penetrating skin, fixed for a long time, and patients experience difficulty in mobility[10]. In addition, no written Ilizarov nursing care guidelines or research are applied to Ilizarov patients in orthopedic department.

Aim:

Ilizarov nursing care guidelines were evaluated on patients' knowledge and self-care practices in the study.

Design

This study was conducted using a quasi-experimental approach.

Setting

A study of this type was conducted in the main orthopedic inpatients units at Mansoura University Hospital.

Participants

A purposive sample of forty adult patients with an Ilizarov external fixator was assigned to two equal groups.

Group I (control group): patients receiving routine hospital care after Ilizarov fixation.

Group II (study group): patients who received nursing care according to developed guidelines.

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Inclusion criteria: Adult patients (21-60) years and newly admitted patients post lower extremity Ilizarov fixator operation.

Exclusion criteria: Patients with mental illness or with diabetic foot or having chronic illness.

The sample size

For a paired t-test to detect the difference between two dependent means, the sample size for each patient was calculated using the G power program using the following data: effect size 0.5, error prop 0.05, one tail, power (1-β err prop) 86%.

Tools:

In the study, baseline data were collected using two tools, the researcher developed tools based on recent pertinent literature. It included the following.

Tool I: Structured interview questionnaire for Ilizarov patients:

The researcher developed this tool to collect personal, medical data and assess patient's knowledge. It consisted of two parts:

Part 1: Patient's demographic characteristics and medical data:

It included gender, age, marital status, educational level, occupation, residence, the reason for Ilizarov's use and current smoking status.

Part 2: Ilizarov patients' knowledge questionnaire:

This part was used to assess patients' knowledge regarding Ilizarov and self-care practice for study and control group three times as pre, post and follow up guidelines implementations. It included (15) main item divided in to 48 sub item as follow. Five question for Ilizarov definition, numbers of stages of bone healing, first stage description, second and third stage.

Six main items each item divided in to four questions regarding uses, advantages, disadvantages, investigations, Complications and clothes choosing. Two main items, each item divided in to five questions regarding follow up, home preparations. One item divided in to three questions regarding contraindication. One item divided in to six questions regarding nutritional regimen.

The questions total number was 48 in form of know or don't know.

Scoring system: One point was awarded for each correct answer and zero for each incorrect answer. There was a range of 0 to 48 for the total knowledge score. The patients' knowledge is as follows[11].

- Unsatisfactory < 65% of total scores (score 0 to < 31.2).
- Satisfactory ≥ 65% of total scores (score ≥ 31.2 to 48).

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Tool II: Ilizarov self-care practice: This tool consisted of 3 main parts; the researcher developed part 1 based on a recent literature review. Part 2&3 was adopted. It was used 3 times: pre-, post-, and follow-guideline implementations for the study and control group.

Part 1: Patient-reported self-care practice checklist

The researcher developed this part of the tool to assess patient's self-care practices such as bathing and showering, clothing, exercise, pin site care, Ilizarov adjustment, and care of nutritional status. The researcher checked it as "done "or need assistance or "not done. The questionnaire included 6 main items with subcategories as follows: Pin site care (17), adjustment of nuts of Ilizarov (7), Exercises for injured extremities (6), Bathing and showering (7), Patient clothes (2), care of nutritional status (2).

Scoring system: Score 2 was given to correctly done, score 1 was given to need assistance, and score 0 for not done. Scores of each item were summed up, and the total scores ranged from 0 to 84. The patients' self-care scores are classified as follows[12]:

Unsatisfactory <60% (score 0 to < 50, 4).

Satisfactory ≥ 60% (score ≥ 50, 4 to 84).

Part 2: Lower Extremity Functional Scale

This part was adopted [13] to measure patient's physical function. It comprises 20 questions about the activity, each answered as (extreme difficulty or unable to perform the self-care activity=0, quite a bit of difficulty=1, moderate difficulty=2, little difficulty=3, no difficulty=4).

Scoring system: Standardized answer options are given (5 Likert Scale), and each question is assigned a score from 0 to 4. Scores between 0 and 80 represent the percentage of the total possible score achieved. The self-care is defined as 0-19, extreme difficulty or unable to perform the self-care activity; 20-39, quite a bit of difficulty; 40-59, moderate difficulty; 60-79, little difficulty; and 80, no difficulty [14].

Part 3: Modified Barthel Index.

This part was adopted to assess patient ability to do activity of daily living 10 items (bathing, dressing, grooming, chair\bed transfer, ambulation, stair climbing, toilet transfers, bowel control, bladder control and feeding). It use 5-item scale range from (0 to 15) where 6 items are scored as (0) unable to perform task, (2) considerable help required, (5) moderate help provided, (8) minimal help required, or (10) fully independent; 2 items scored as (0) unable to perform task, (1) considerable help required, (3) moderate help provided, (4) minimal help required, or (5) fully independent; and 2 items scored as (0) unable to perform task, (3) considerable help required, (8) moderate help provided, (12) minimal help required, or (15) fully independent. The total score is calculated by summing each item score with higher scores suggesting a greater degree of independence in ADL functioning. The patients' level of independency score classified as follow[15].

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Scoring system: Scores of each item were summed up, and the total scores ranged from 0 to 100 as follow.

- Total dependent =Score of (0-20)
- Severely dependent= Score (21-60)
- Moderate Dependent = Score (61-90)
- Slight dependent = Score (91-99)
- Physically independent= Score (100)

Methods

- This study was officially approved by the Faculty of Nursing of Mansoura University and from the administration of Mansoura University hospital.
- Following an explanation of the study's purpose and nature, participants consented to the study. Voluntary participation was explained to the participant.
- Tools were tested for validity and reliability and essential modifications were done consequently. The Cronbach's alpha value of the Patients' Knowledge tool is 0.902, and of the self-care practice tool is 0.897.
- We conducted a pilot study on 10% of the patients (4 patients) before collecting data. This group was excluded from the total study sample.
- Ilizarov's nursing guidelines were designed into a colored booklet given to patients by the researcher. To help patients understand the guidelines, it was written in a simple Arabic language and accompanied by pictures.
- During the period of April 2022 to April 2023, (12) months of data collection were conducted.

In order to conduct the study, three phases were followed: Assessment, Implementation and evaluation phase.

A. Assessment:

- The researcher introduced herself to the patients and briefly explained the study's purpose.
- To collect the necessary data, all study tools were used to interview each participant individually.
- Patients' control and study groups were assessed to collect patients' demographic, medical data, patients' knowledge about Ilizarov, self-care practice, physical activity, and level of independence as a pretest.

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B. Implementation:

- This phase was started by implementing Ilizarov guidelines for study group in form of 3 sessions as follows.
    1. **The First session** covered the definition of Ilizarov external fixation, its uses, advantages, disadvantages, indications, contraindications, and complications.
    2. **The second session** covered the stages of bone lengthening, home preparations, Ilizarov adjustment and pin site care.
    3. **The Third session** covered health instructions related to self-care practices, exercises, uses of assistive devices and follow-up appointments.
- Every patient was interviewed individually throughout the sessions. Each session took about 20 to 30 min.
- Videos and PowerPoint presentations about Ilizarov's self-care practice were used throughout the sessions.
- A colored booklet, which was presented in clear and concise form and with colored photos, was given to every patient as a gift to be a guide in self-care at home.
- The control group was exposed to routine hospital care.

C. Evaluation:

The study &control group were evaluated two times as follow:

- First time after implementation of Ilizarov nursing care guidelines as posttest.
- Second time after two months of first time as follow up implementation of Ilizarov nursing care guidelines.
- The results of the two groups of patients post &follow up were compared to pretest to evaluate the effect of Ilizarov nursing care guidelines on patients' knowledge and self-care practice.

RESULTS

Table (1): Statistically significant differences were not found between the two groups in demographics and medical data (P > 0.05). It was found that 50% of the studied group was aged (20-30) years old, while 55% of the control group was aged (20-30) years old. Regarding gender, more than half of the study group were males (65%), but in the control group (60%) were females. Concerning the level of education, it was found that (55%) of the study group was secondary level, and half of the control group was the same. Regarding working status, more than half of the study and control groups worked (55% and 60%).Concerning medical history (65%), the study group used an Ilizarov external fixator to correct bone deformity. In comparison (70%) of the control group used Ilizarov for deformity correction but for fracture limb fixation (35% and 30%) of the study and

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control group, respectively. Regarding smoking, more than half of the study and control group were non-smokers (65% and 70%), respectively.

Table 1: Demographic and medical data of the studied patients (N= 40)

Demographic data	study group (N=20)		control group (N=20)		Chi-Square	
	N	%	N	%	X2	P
Age (years)						
• 20 – 30	10	50.0	11	55.0		
• 31 – 40	4	20.0	3	15.0		
• 41 – 50	4	20.0	3	15.0		
• 51 – 60	2	10.0	3	15.0	0.533	0.912
Gender						
• Male	13	65.0	8	40.0		
• Female	7	35.0	12	60.0	2.506	0.113
Education level						
• Basic	2	10.0	3	15.0		
• Secondary	11	55.0	10	50.0		
• University	7	35.0	7	35.0	0.248	0.884
Marital status						
• Single	6	30.0	9	45.0		
• Married	14	70.0	11	55.0	0.960	0.327
Occupation						
• Working	11	55.0	12	60.0		
• Not working	9	45.0	8	40.0	0.102	0.749
Residence						
• Rural	8	40.0	11	55.0		
• Urban	12	60.0	9	45.0	0.902	0.342
Reason for ilizarov use						
• Repairing bone deformity	13	65.0	14	70.0		
• Bone inflammation	7	35.0	6	30.0	0.114	0.736
Current smoking						
• No	13	65.0	15	75.0		
• Yes	7	35.0	5	25.0	0.476	0.490

*Significant at P<0.05 Non-significant at P >0.05

Figure (1) Shows that more than three-quarters of the study and control groups (80% & 85%) had an unsatisfactory level of knowledge in pre-implementation of guidelines. After implementing the guidelines, 70% of the study group and only 35% of the control group had satisfactory knowledge levels.

The study group had a satisfactory knowledge level of 60% at follow-up, compared to only 25% of the control group. Post and follow-up implementation of the guidelines, there is a statistically significant difference between the study and control groups.

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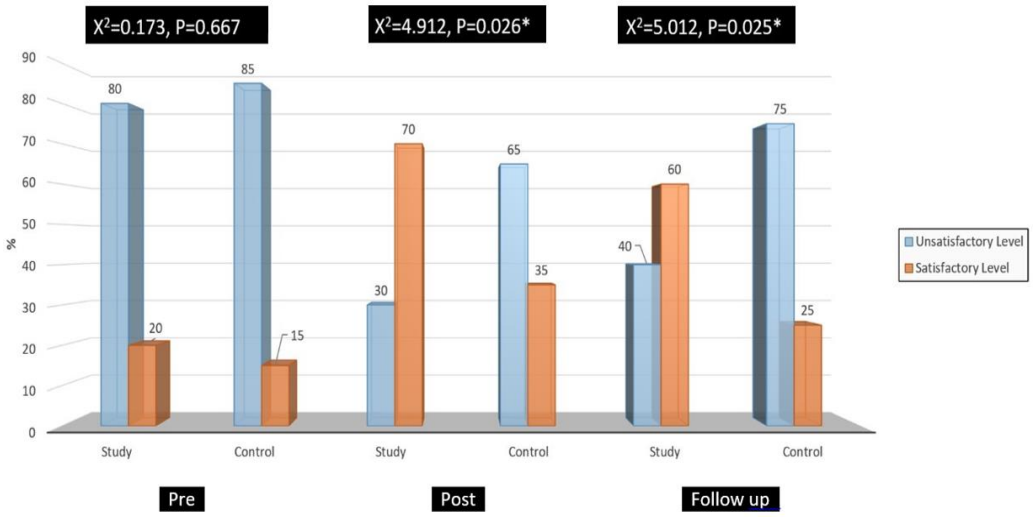


Figure 1: Comparison of patient's total knowledge level between study and control group

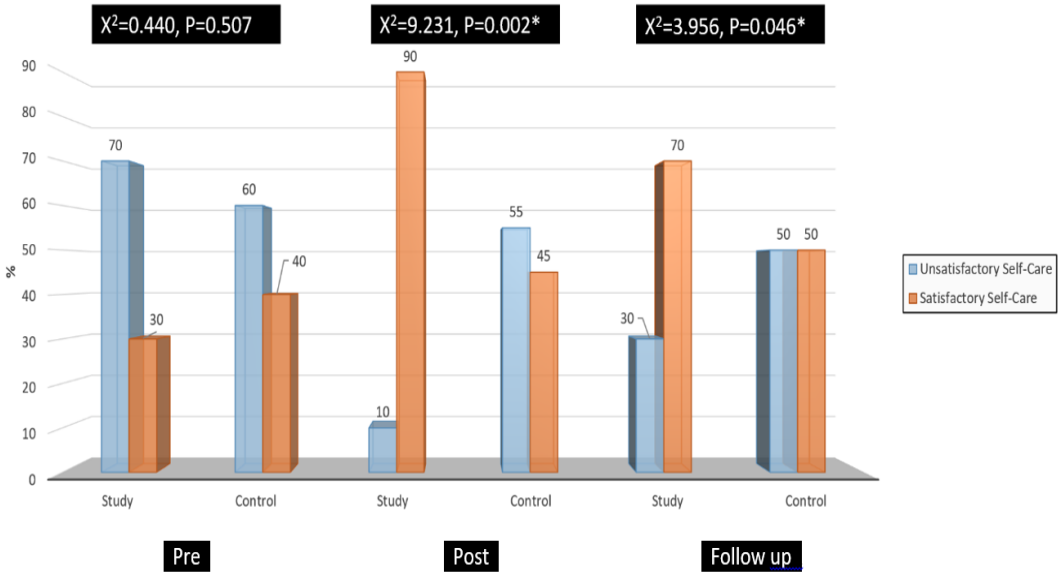


Figure 2: Comparison of the patient-reported self-care practice total level between study and control group

Figure (2): Compared to the control group (60%) and the study group (70%), more than two-thirds had an unsatisfactory level of practice pre-implementation of guidelines. In the post-implementation of guidelines, 90% of the study group showed satisfactory practice, compared to (45%) of the control group. In the follow-up phase, 70% of the study group had satisfactory practice compared with 50% of the control group, with a statistically significant difference between the two groups.

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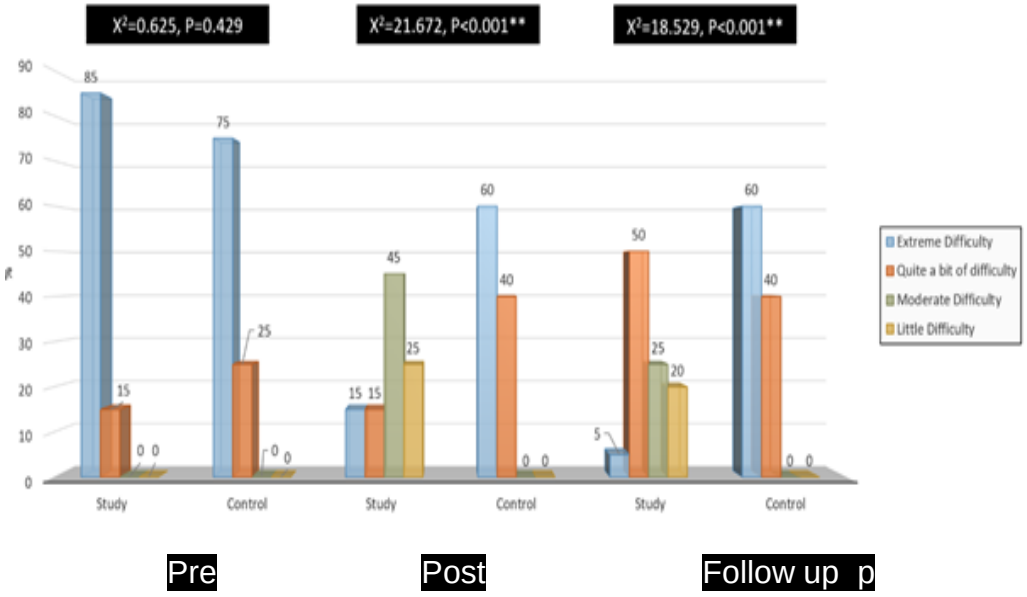


Figure 3: Comparison of the Lower Extremity Functional Index total level between Study and Control group

Figure (3): In the study group, there was a highly statistically significant difference in post and follow-up guidelines implementation ($p < 0.001$). 85% of the study group experienced extreme difficulty performing self-care compared to 75% of the control group before guidelines were implemented. The study group had moderate difficulty performing the self-care activity post-implementation (45%), and the study group had little difficulty performing the activity at follow-up (25%).

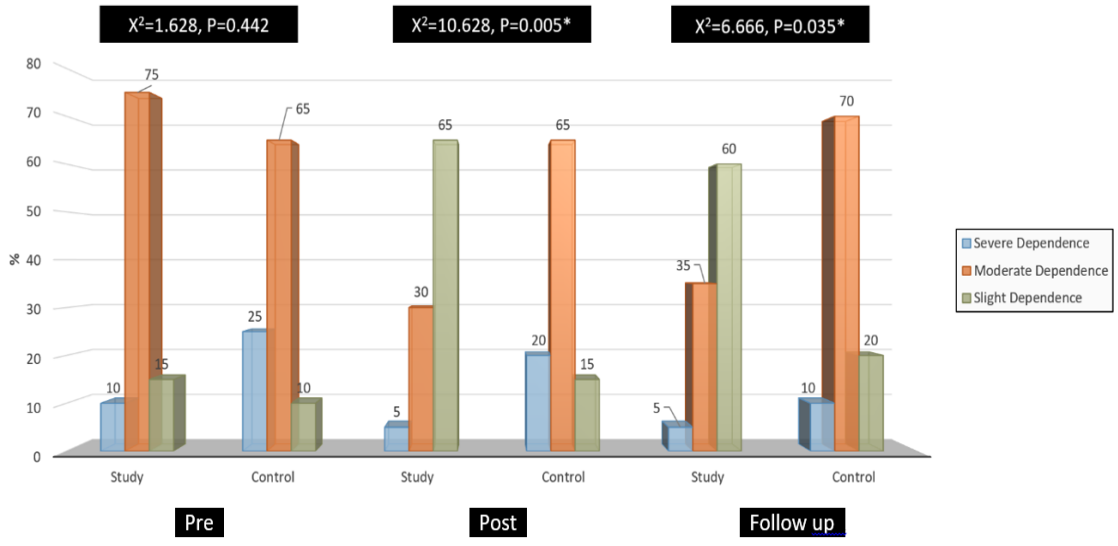


Figure 4: Comparison of the Modified Barthel Index total level between study and control groups

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Figure (4): The study group (75%) had moderate dependence on activities of daily living in comparison with the control group (65%) pre-implementation of the guidelines. A slight dependence on activities of daily living was seen in the study group (65%) after implementing the guidelines compared to the control group (15%). (60%) of the study group had slight dependence on daily living activity at follow-up, compared to (20%) of the control group. As a result, according to the study, the study group had a statistically significant difference from the control group with p (0.005 - 0,035) for both post and follow-up guidelines.

Table 2: Correlation between knowledge, self-care lower extremity functional index (LEFI), and modified Barthel index (MBI) Scores

	Study								Control							
Variables	**Knowledge**		**Self-care**		**LEFI**		**MBI**		**Knowledge**		**Self-care**		**LEFI**		**MBI**	
	r	**p**	**r**	**p**	**r**	**p**	**r**	**p**	**r**	**p**	**r**	**p**	**r**	**p**	**r**	**p**
Pre																
• Knowledge			0.033	0.890	0.109	0.647	0.284	0.226			0.088	0.712	0.228	0.334	0.104	0.662
• Self-care	0.033	0.890			0.287	0.220	0.324	0.164	0.088	0.712			0.177	0.456	0.227	0.335
• LEFI	0.109	0.647	0.287	0.220			0.401	0.080	0.228	0.334	0.177	0.456			0.176	0.457
• MBI	0.284	0.226	0.324	0.164	0.401	0.080			0.104	0.662	0.227	0.335	0.176	0.457		
Post																
• Knowledge			0.507	0.022*	0.468	0.037*	0.671	<0.001**			0.453	0.043*	0.478	0.040*	0.533	0.017*
• Self-care	0.507	0.022*			0.523	0.018*	0.551	0.006*	0.453	0.043*			0.502	0.023*	0.493	0.025*
• LEFI	0.468	0.037*	0.523	0.018*			0.637	<0.001**	0.478	0.040*	0.502	0.023*			0.499	0.024*
• MBI	0.671	<0.001**	0.551	0.006*	0.637	<0.001**			0.533	0.017*	0.493	0.025*	0.499	0.024*		
2 Months follow																
• Knowledge			0.479	0.030*	0.451	0.042*	0.523	0.020*			0.471	0.032*	0.462	0.048*	0.497	0.024*
• Self-care	0.479	0.030*			0.483	0.029*	0.506	0.022*	0.471	0.032*			0.491	0.027*	0.481	0.033*
• LEFI	0.451	0.042*	0.483	0.029*			0.601	<0.001**	0.462	0.048*	0.491	0.027*			0.485	0.031*
• MBI	0.523	0.020*	0.506	0.022*	0.601	<0.001**			0.497	0.024*	0.481	0.033*	0.485	0.031*		

****Highly statistically significant at p<0.001** ***Significant at P<0.05**

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Table (2): At the post and follow-up stages of implementation of guidelines, there was a significant statistically positive correlation between patient knowledge, self-care reported practices, lower extremity functional index (IEFI), and the modified Barthel index (MBI) in study group compared to control group.

DISCUSSION

A number of musculoskeletal injuries, including non-unions of long bones, have been treated with the Ilizarov external fixation technique for the past five decades[16]. Since the Ilizarov can be in place for an extended period of time, patients need to demonstrate awareness of accepted practices for daily living and self-care[17]. The nurses have a significant role in helping patients and their families learn new behavior that enhances self-care practice and quality of life for patients with Ilizarov[11]. Therefore, this study evaluated the effect of Ilizarov nursing care guidelines on patients' knowledge and self-care practice.

Concerning demographic characteristics of the studied patients:

In terms of demographics and medical data, there is no statistically significant difference between the two groups. Therefore, both the control and study groups are homogeneous and comparable. Steimle et al. (2018) reported similar demographic and personal characteristics between both groups in their study[18].

The current study showed that more than half of the control group and half of the study group were between the ages of twenty and thirty. The research supports the findings of Khorais et al. (2018), who found that the mean age of the study's patients was around thirty years old[11]. The World Health Organization (2021) has stated that youth, health, and productivity are most likely to suffer the effects of trauma[19]. Similarly, Mohamed, al, (2015) found that patients with external fixators had a mean age of over forty years old[20].

In addition, over two-thirds of the study participants were male. As stated by Morsy, et al., (2021), among the studied subjects, men were the majority[21]. Xing et al. (2020), who claimed that more than half of the patients were female, disagreed with this result[22]. This may be due to the fact that the most common cause of fracture and fixation are motor car and motorcycle accidents of young male and this supported by[23] (Daif,Sharaf,Shekidaf &Kamar,2022) who mentioned that trauma is primarily a disease of the young, active and productive young men .

Concerning patients' knowledge regarding Ilizarov:

Studied patients who received Ilizarov's self-care guidelines were found to have higher levels of knowledge than the control group throughout the study phases, with statistically significant differences between both groups. In addition, Ahmed & Abd-El Mohsen (2018) discovered that, in comparison to the control group, orthopedic patients in the study group had better understanding after the educational program[24]. After implementing the self-management program, Khorais et al. (2018) found statistically significant differences in the knowledge levels of the investigated patients[11]. This improvement could be due to the

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feasibility and attractiveness of the teaching methods used, such as videos and colored booklets reinforced by photos. This opinion is supported by Bhattad & Pacifico, (2022), who mentioned that Integrating different media for teaching increases patient knowledge acquisition[25].

Concerning patients' self-care reoprted practices regarding Ilizarov:

There were noticeable improvements in total self-reported practices level in post and follow up after implementation of the ilizarov guidelines. This is supported by Mohamed et al., (2023) who reported that there was an obvious improvement in self-reported practices scores in post and follow-up in the study group compared to control group[26]. Also, the similar finding was noticed by Morsy et al., (2021) who asserted that highly significant differences regarding patients' reported practices of external skeletal fixation pin site and wound care among studied group after applying of nursing guidelines for patients with external fixation[21]. The present results reflect the positive effect of the implemented Ilizarov guidelines in improving the self-care reported practice among the study group. The improvement in self-care practice occur as a result of patients knowledge improvement ,increase the awareness of patients about their condition, presence of booklet used as a simple guide in self-care practice .

This study shown that, there was a significant positive improvement regarding patients' independency in activities of daily living and self-care in study group compared to control group post implementation of the ilizarov guidelines .This finding was matching with Morsy et al., (2021) who mentioned that There was an improvement in total independency in activities of daily living among studied patients' post implementation of guidelines[21]. Moreover these findings agreed with Khorais et al., (2018) who stated that there were statistically significant differences in the physical functioning, physical limitations due to physical problems, and feeling of fatigue[11]. It means that patients with external fixation become more powerful in dealing with their physical limitations after the program implementation.

Correlations between patients' variables

At the post and follow-up of the guidelines' implementation, there was a statistically significant positive correlation between patients' knowledge, self-care reported practice, lower extremity functional scale, and modified Barthel index. According to Morsy et al. (2021), patients' knowledge, independence, reported practice, and pain levels were statistically significantly correlated before and after implementing guidelines. Gethin et al. (2020) reported significant improvements in knowledge, pain, and self-care among patients[27]. This positive correlation resulted from increasing patient knowledge by applying Ilizarov nursing guidelines, enhancing patient knowledge and self-care practice. This enhancement gives the patient more power and responsibility to be more independent in the activity of daily living.

Finally, we found that the Ilizarov nursing care guidelines achieved their goal of increasing patients' knowledge and self-care practice.

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CONCLUSION

Following the implementation of the Ilizarov guidelines, patients' knowledge and self-care practices improved statistically significantly.

RECOMMENDATION

Based on the findings, the study recommended to:

- Availability of standardized colored booklet about Ilizarov self-care guidelines for patients.
- It is recommended that the study be replicated over a longer period and with a larger sample of patients to make the results more generalizable.
- In order to reduce and prevent complications in patients with Ilizarov external fixation, further research is needed.

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